केंद्रीय विद्यालय संगठन

जम्मू संभाग

रसायन विज्ञान कार्यशाला

२६ - २७ अगस्त २०१९

केंद्रीय विद्यालय कालूचक सुन्जुवान

श्री मनीष तुली

कार्यशाला संयोजक

श्रीमती रचना शर्मा

संसाधक

श्रीमती मृदुला रामबल

श्री राम प्रसाद

श्रीमती किरण

श्री भारत भूषण मीना

श्री सुनील कुमार

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श्रीमती शबनम

श्रीमती पूनम सहगल

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श्री शशि पाल

श्री देस राज

कक्षा १२

प्रश्न पत्र

CLASS XII

CHEMISTRY

ANNUAL EXAMINATION

BLUE PRINT

QUESTION PAPER

MARKING SCHEME

PAPER NO 01

Max. Time: 3hrs   **Max. Marks=70**

Sl.No	Name of the Chapter	VSA 1mk	SA-2mk	SA-3mk	LA 5mk	Total
1	Solutions	2			1	5
2	Electrochemistry	1	2	1		6
3	Chemical kinetics	1			1	4
4	Surface chemistry	1	1	1		5
5	General Principles	1				5
6	P block elements	2	1	1		5
7	D and f block elements	2				6
8	Coordination compounds	1				4
9	Haloalkanes and Haloarenes	1	1			4
10	Alcohols,phenols and ethers	1		1		4
11	Aldehydes ,ketones and carboxylic acids	1		1	1	4
12	Amines	1				7
13	Biomolecules	1		1		8
14	Polymers	1	1	1		3
15	Chemistry in everyday life	1	1			
	TOTAL	**20**	**14**	**21**	**15**	**70(37)**

General Instructions

All questions are compulsory

Question no 1-20 carry one mark each.

Question no 21-27 carry one mark each.

Question no 28-34 carry one mark each.

Question no 35-36 carry one mark each.

Use log table, if necessary. Use of calculator is not allowed.

There is no overall choice in the question paper but there is internal choice

1. Low concentration of oxygen in the blood and tissues of people living at high

altitude is due to _____.

(i) low temperature

(ii) low atmospheric pressure

(iii) high atmospheric pressure

(iv) both low temperature and high atmospheric pressure

2. Which of the following aqueous solutions should have the highest boiling point?

(i) 1.0 M NaOH

(ii) 1.0 M Na2SO4

(iii) 1.0 M NH4NO3

(iv) 1.0 M KNO3

3. Which cell will measure standard electrode potential of copper electrode?

(i) Pt (s) H2 (g,0.1 bar) H+ (aq.,1 M) Cu2+(aq.,1M) Cu

(ii) Pt(s) H2 (g, 1 bar) H+ (aq.,1 M) Cu2+ (aq.,2 M) Cu

(iii) Pt(s) H2 (g, 1 bar) H+ (aq.,1 M) Cu2+ (aq.,1 M) Cu

(iv) Pt(s) H2 (g, 1 bar) H+

(aq.,0.1 M) Cu2+ (aq.,1 M) Cu

4.An electrochemical cell can behave like an electrolytic cell when _____.

(i) Ecell = 0

(ii) Ecell > Eext

(iii) Eext > Ecell

(iv) Ecell = Eext

5. The role of a catalyst is to change _____.

(i) gibbs energy of reaction.

(ii) enthalpy of reaction.

(iii) activation energy of reaction.

(iv) equilibrium constant.

6.Sucrose (cane sugar) is a disaccharide. One molecule of sucrose on hydrolysis

gives _____.

(i) 2 molecules of glucose (ii)

2 molecules of glucose + 1 molecule of fructose

(iii) 1 molecule of glucose + 1 molecule of fructose

(iv) 2 molecules of fructose

7. Which of the following will show Tyndall effect?

(i) Aqueous solution of soap below critical micelle concentration.

(ii) Aqueous solution of soap above critical micelle concentration.

(iii) Aqueous solution of sodium chloride.

(iv) Aqueous solution of sugar.

8. A colloidal system having a solid substance as a dispersed phase and a liquid

as a dispersion medium is classified as _____.

(i) solid sol

(ii) gel

(iii) emulsion

(iv) sol

9. Electrolytic refining is used to purify which of the following metals?

(i) Cu and Zn

(ii) Ge and Si

(iii) Zr and Ti

(iv) Zn and Hg

10. Extraction of gold and silver involves leaching the metal with CN –

ion. The metal is recovered by _____.

(i) displacement of metal by some other metal from the complex ion.

(ii) roasting of metal complex.

(iii) calcination followed by roasting.

(iv) thermal decomposition of metal complex.

11. The oxidation state of central atom in the anion of compound NaH2PO2 will

be _____.

(i) +3

(ii) +5

(iii) +1

(iv) –3

12. Which of the following are peroxoacids of sulphur?

(i) H2SO5 and H2S2O8

(ii) H2SO5 and H2S2O7

(iii) H2S2O7 and H2S2O8

(iv) H2S2O6 and H2S2O7

13.Electronic configuration of a transition element X in +3 oxidation state is

[Ar]3d 5What is its atomic number?

(i) 25

(ii) 26

(iii) 27

(iv) 24

14. Which of the following polymers are condensation polymers?

(i) Bakelite

(ii) Teflon

(iii) Butyl rubber

(iv) Nylon 6

15. The correct IUPAC name of [Pt(NH3)

2Cl2] is

(i) Diamminedichloridoplatinum (II)

(ii) Diamminedichloridoplatinum (IV)

(iii) Diamminedichloridoplatinum (0)

(iv) Dichloridodiammineplatinum (IV)

16.Compound which is added to soap to impart antiseptic properties is _____.

(i) sodium laurylsulphate

(ii) sodium dodecylbenzenesulphonate

(iii) rosin

(iv) **bithional**

17. Phenol is less acidic than _____.

(i) ethanol

(ii) o-nitrophenol

(iii) o-methylphenol

(iv) o-methoxyphenol

18. In Clemmensen Reduction carbonyl compound is treated with _____.

(i) Zinc amalgam + HCl

(ii) Sodium amalgam + HCl

(iii) Zinc amalgam + nitric acid

(iv) Sodium amalgam + HNO3

19. The correct order of increasing acidic strength is _____.

(i) Phenol < Ethanol < Chloroacetic acid < Acetic acid

(ii) Ethanol < Phenol < Chloroacetic acid < Acetic acid

(iii) Ethanol < Phenol < Acetic acid < Chloroacetic acid

(iv) Chloroacetic acid < Acetic acid < Phenol < Ethanol

20. Which of the following is a 3° amine?

(i) 1-methylcyclohexylamine

(ii) Triethylamine

(iii) tert-butylamine

(iv) N-methylaniline

21. Explain:

a. Why is an increase in temperature observed on mixing chloroform and acetone?

b. Why is CaCl 2 used to clear snow in cold countries?

22. A solution of Ni(NO 3) 2 is electrolysed between platinum electrodes using a current of 5.0

amp for 20 minutes. What mass of nickel will be deposited at the cathode (atomic mass of

Ni= 56.7 gm/mole)

23.a) What is the role of zeolite in petroleum industry?

b) Why does persistent dialysis lead to coagulation?

OR

(a) What is the role of humus in the fertility of the soil?

(b) What is the charge of colloidal particle when NaOH solution is added to ferric chloride

solution

24. Draw the structure of (a) XeF 4 (b) H 2 S 2 O 8

25. (a)Out of (CH3) 3 C-Br and CH 3 Br which one would react faster by SN 2 mechanism?

(b) Why chloroform is stored in the dark colored bottles and filled upto brim? Explain with

equation.

26. Write the structure of the monomer of each of the following –

(i) Nylon 6,6 (ii) Neoprene

27. (a) Which of the following is a food preservative - Equanil, Morphine, Sodium benzoate.

(b) Why is bithional added to soap?

0R

What are antagonists?

28. Calculate the freezing point depression expected for 0.0711 m aqueous solution of Na_2SO_4.

If this solution actually freezes at -0.3200C, what would be the value of Van't Hoff factor?

(Kf for water is 1.860C mol-1)

29.(i) Name the method of refining to obtain silicon of high purity?

(ii) What is the role of SiO_2 in the extraction of copper?

(iii) What is the role of depressants in froth floatation process?

30. a) $CrCl_3.5H_2O$ gives two moles of AgCl when treated with excess of $AgNO_3$ solution. Write the structural formula of the complex .

b) Write the hybridisation, shape and magnetic properties of $[Fe(CN)_6]^{3-}$ (atomic number of Fe=26)

31.A solution of $Ni(NO3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. What mass of Ni is deposited at the cathode?

32. (i) NH_3 , CH_3NH_2 , $C_6H_5NH_2$, $(CH_3)_2NH$ (arrange in increasing order of basic strength)

(ii) Why does aniline not undergo Fridel Craft reaction?

(iii) How is phenol prepared from aniline?

33. Explain why (i)ortho nitrophenol is more acidic than ortho methoxyphenol

(ii)During preparation of ester from alcohol and acid, water has to be removed as soon

as it is formed.

34. What happens when D-glucose is treated with the following reagents?

(i) HI (ii) Bromine water (iii)HNO3

35.(a) Write chemical equations to illustrate the following name reactions:

(i) Cannizzaro's reaction (ii) Hell Volhard-Zelinsky reaction

(b) Give chemical tests to distinguish between the following pairs of compounds:

(i) Propanal and propanone (ii) Acetophenone and Benzophenone (iii) Phenol and Benzoic acid

OR

An organic compound contains 69.77% carbon,11.63% hydrogen and rest is oxygen.

The molecular mass of the compound is 86. It does not reduce 'Tollens reagent' but

forms an addition compound with sodium hydrogen sulphite and gives positive iodoform

test. On vigorous oxidation it gives ethanoic acid and propanoic acid. Write the possible

structure of the compounds and the reactions associated with it .

36. (a)What is the effect of temperature on the rate constant of a reaction? How can this
temperature effect on rate constant be represented quantitatively?

 (b) The decomposition of NH 3 on platinum surface is a Zero order reaction. What are the

rates of production of N 2 and H 2 if k = 2.5 x10 -4 molL -1 s

Or

a) For a first order reaction, show that time required for 99% completion is twice the

time required for the completion of 90% of reaction.

b) A reaction is first order in "A" and second order in "B"

(a) Write differential rate equation

(b) How is the rate affected if the conc. of "B" is tripled ?

(c) How is the rate affected when the conc. of both "A" and "B" are doubled ?

37.A. What is lanthanoid contraction? What are the consequences of lanthanoid

contraction?

Explain giving reasons:

B. (i) Transition metals and many of their compounds show paramagnetic

behaviour.

(ii) The enthalpies of atomisation of the transition metals are high.

or

 Explain giving reasons:

(i) Transition metals and many of their compounds show paramagnetic behaviour.

(ii) The enthalpies of atomisation of the transition metals are high.

(iii) The transition metals generally form coloured compounds.

(iv) Transition metals and their many compounds act as good catalyst.

(v) Transition metalas have high melting point.

MARKING SCHEME

1.(ii)

2.(ii)

3.(iii)

4.(iii)

5.(iii)

6.(iii)

7. (ii)

8.(iv)

9. (i)

10.(i)

11.(ii)

12.(i)

13.(ii)

14.(i)

15.(i)

16.(iv)

17.(ii)

18.(i)

19.(iii)

20.(ii)

21. (i) The bonds between chloroform molecules and molecules of acetone are dipole-dipole interactions but on mixing they start forming hydrogen bonds which are stronger results in the release of energy. (1M)

(ii) when a non-volatile solute is dissolved in a solvent the VP decreases. Solvent freezes at a lower temperature. (1M)

22.M= zit (1/2)

= 58.7 x 5x 20 x60/2x 96500=1.8248 g (1/2)

23.a) It depends upon pore structure of catalyst and size of reactant and product. (1)

b) dialysis removes crystalloids or stabilizing ions so persistency leads to precipitation of the colloid (1)

OR

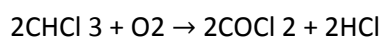a) protective colloids that hold water and soil together

b) –ve charge

24.Correct answer

25.(a) CH 3 Br , steric hindrance less (1/2+1/2)

(b)Because chloroform is

oxidized by atmospheric oxygen in presence of light to phosgene.

(1+1=2)

$2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

26.correct structure

27. Sodium Benjoate

or

A drug that blocks biological

 response by binding and blocking a receptor.

28.$\Delta Tf= Kfx$ m= 1.86 x 0.071= 0.132 (1/2+1/2+1/2)

i= Observed colligative property/ calculated colligative property= 0.320/0.132=2.42

(1/2+1/2+1/2)

29.(i) Silicon of high purity can be obtained by zone refining. (1)

(ii) $SiO2$ acts as acidic flux to remove the impurities of iron oxide (1)

(iii) Depressants prevent the formation of froth with air bubbles of other sulphide ore. (1)

30. a) [Cr(H_2O) 5 Cl]Cl_2 pentaquacholoridochrominum(III)chloride.

b)$d_2 sp_3$ hybridization,octahedral shape and para magnetic (1+ 1+1)

31. Given,

Current = 5A

Time = = 1200 s

Therefore,

= 6000 C

32. i)(C_2H_5) 2 NH , , C_6H_5 NH 2 , C_2H_5 NH 2 , NH 3 (1)

ii)aniline is a lewis base reacts with the catalyst $AlCl_3$ which is a lewis acid to form salt.

(1)

iii) anilinediazonium salt- (+ warm water)--------→phenol

33. Ans. The reaction between alcohol and carboxylic acid is reversible and goes in backward

direction if water is not removed as soon as it is formed

(iii) Ethers are soluble in water alkanes are not.

Ethers can form H- bonding with water molecule whereas alkenes cannot. Therefore ethers are soluble in water and alkanes are not.

34(i) When D-glucose is heated with HI for a long time, n-hexane is formed.

(ii) When D-glucose is treated with water, D- gluconic acid is produced.

(iii) On being treated with HNO_3, D-glucose get oxidised to give saccharic acid.

35. a) correct Statement with reaction

b) i) tollens reagent test/ iodoform test with reaction

ii) iodoform test with reaction

iii) FeCl 3 test/NaHCO 3 test with reaction

36. Correct answer

b)For finding k=2.5 x10 -4 molL -1 s -1 = rate of the reaction

Rate of of production of N 2 = k=2.5 x10 -4 molL -1 s -1

Rate of of production of H 2 = 3 x 2.5 x10 -4 molL -1 s -1

Or

a)Derivation with steps Rate law= k {A} {B} 2 , 9times , 8 times

37. Correct answer

OR

(i) Transition metals have unpaired electrons .

(ii) Due to strong metallic bonding.

(iii) Due to d-d transition.

(iv) Variable oxidation states.

(v) Due to strong metallic bonding.

PAPER NO 02

S.No.	Unit	VSA (1 Mark)	SA (2 Marks)	LA-I (3 Marks)	LA-II (5 Marks)	Total
1	Solutions	1(1)		3(1)		23
2	Electrochemistry	1(1)	2(1)	3(1)		
3	Chemical Kinetics	1(1)			5(1)	
4	Surface Chemistry	1(2)		3(1)		
5	General Principles and Processes of extraction of elements	1(1)				19
6	p-Block Elements	1(1)			5(1)	
7	d- and f-Block Elements	1(1)	2(1)	3(1)		
8	Co-ordination compounds	1(1)	2(1)	3(1)		
9	Haloalkanes and Haloarenes	1(1)		3(1)		28
10	Alcohols, Phenols and Ethers	1(1)	2(1)	3(1)		
11	Aldehydes, Ketones and Carboxylic Acids	1(1)			5(1)	
12	Organic Compounds Containing Nitrogen	1(1)	2(1)			
13	Biomolecules	1(2)	2(1)			
14	Polymers	1(2)	2(1)			
15	Chemistry in everyday life	1(2)				
Total		20X1=20	7X2=14	7X3=21	3X5=15	70(37)

1.   Molarity of pure water is
    (a)   1   (b)   18
    (c)   55.5   (d)   6

2. In metallic conductor the current is conducted by

    1) ions 2) atoms 3) electrons 4) molecules

3. Arrhenius equation is represented by

    a. $K = Ae^{-EaRT}$

    b. $K = Ae^{EaRT}$

    c. $T1/2 = .693/K$

    d. None of the above

4. For zero order reaction, the integrated rate equation is:

    a. $kt = \dfrac{[A]}{[A]^\circ}$

    b. $kt = [A] - [A]^\circ$
    c. $[A] = -kt + [A]^\circ$
    d. $[A] = kt - [A]^\circ$

5. The random or zig-zag motion of the colloidal particles in the dispersion medium is referred to as:

    a. Electro-osmosis
    b. Electrophoresis

c. Brownian Movement

d. Tyndall Effect

6. Which of the following element cannot be refined by zone refining is

a) Cu b) Ge c) Si d) Ga

7. **Fluorine react with water to give :**
   (a) Hydrogen fluoride and oxygen
   (b) Hydrogen fluoride and ozone
   (c) Hydrogen fluoride and oxygen fluoride
   (d) Hydrogen fluoride, oxygen and ozone

8. Which of the following compounds can exhibit fac-mer isomerism?

a) $[Cr(H_2O)_4Br_2]^+$ b) $[Fe(CO)_5ONO]^{2+}$ c) $[Fe(CO)_3(NH_3)_3]^{3+}$

d) $[Cu(CO)_5Br]^+$

9.Which C-X bond has the highest bond energy per mole?

a)   C-Br

b)   C-Cl

c)   C-F

d)   C-I

10. Which alkyl halide has the highest reactivity for a particular alkyl group?

a)   R-F

b)   R-Cl

c)   R-I

d)   R-Br

11. Which among the following is alcohol?

   a. $CH_3CH(OH)CH_2CHO$
   b. $HO\ CH_2CH_2CH_2CH_2\ CH_3$
   c. $CH_3CH(OH)CO\ CH_3$
   d. $CH_3CH(OH)CH(CN)\ CH_3$

12.Aldol condensation will not take place in

   a) CH_3CHO
   b) $CH_3CO\ CH_3$
   c) HCHO

   d) CH_3CH_2CHO

13.Amine group is susceptible to oxidation by HNO3 therefore nitration is done in the presence of

   a)CH3COCl b)Water c)H2SO4 d)CS2

14.whatistheproportionofhydrogenandoxygeninmoleculeofallmemberofcarbohydrate?
   (A) 2:1   (B)1:1   (C) 1:2   (D) no certainratio

15.whichcarbohydrate isn't soluble in water and tasteless?
A)monosaccharide(B)trisaccharide(C)oligosaccharide (D) none ofabove

16.whichcarbohydrate isn't soluble in water and tasteless?
a)lactose (B)dextrin   (C)fructose   (D) maltose

17. Which one of the following is not a condensation polymer?
   A) Dacron   B) Neoprene   C) Melamine   D) Glyptal

18.Chloroxylenol is an important component of

   (a) Antibiotics   (c) Dettol
   (b) Tincture of iodine   (d) Detergents

19.Which of the following is a broad spectrum antibiotic?

   (a) Penicillin   (c) Ampicillin
   (b) Chloramphenicol   (d) Aspirin

20.Which of the following substance is added to soap to make it antiseptic?

(a) Iodine

(b) Bithional

(c) Chlorine

(d)Alitame

21. Calculate the mass of urea (NH$_2$CONH$_2$) required in making 2.5 kg of 0.25 molal aqueous solution.

22. What is the order of reaction whose rate constant has the same units as the rate of reaction?

23. Write Arrhenius equation.

24. State two features of chemical adsorption which is not found with physical adsorption.

25Describe the following types of colloids giving one example for each?
    (i)Multi molecular colloids (ii) Macro molecular colloids

26 Define transition elements. Explain why is Zn not considered as transition element while Cu does?
27Explain the difference between Buna-N and Buna-s.

28.   Calculate (a) molality (b) molarity and (c) mole fraction of KI if the density of 20% (mass/mass) aqueous KI is 1.202 g mL$_{-1}$.

29 a) Describe the method of refining of Titanium.
    b) What is Zone Refining? Explain with example.
    c) Write the principal of electro-refining.

30 (a) Highest manganese flouride is MnF4 whereas the highest oxide is Mn2O7, why?
(b) Copper can notlibrate H2 from dilacids,why?

(c)Which of the 3d- series of transition metals exhibits largest number of oxidation states and why?
31(a) Write the IUPAC name of [Ti(H$_2$O)$_6$]$_{+3}$.
    (b) [Ti(H$_2$O)$_6$]$_{+3}$ is coloured why?
    (c) A Complex having scandium in +3 oxidation-state was found colorless why?
32.Explain why:
(a).Dipole moment of cholorobenzene is lower than cyclohexyl chloride.
(b).Grignard reagent should be prepared under anhydrous conditions?
(c).Chloroform is stored in dark Brown bottles?

33. **How are the following conversions carried out?**
(i) Benzyl chloride to benzyl alcohol,
(ii) Methyl magnesium bromide to 2-methylpropan-2-ol

34.**$pK_b$for aniline is more than that for methylamine.**

35.(a)What do you understand by strong and weak electrolytes? [1+2+2]
    (b)State Faraday's Laws of electrolysis?
    (c)Silver is deposited on a metallic vessel by passing a current of 0.2 amps. for 3 hrs. Calculate the
weight of silver deposited. (At mass of silver = 108 amu, F = 96500 C?

OR

(a) State the factors that affect the value of electrode potential? [1+2+2]
(b) Write Nernst equation for a Al-$ZnSO_4$ cell?
(c) write the chemistry of rusting of iron

36.What happens when Concentrated H_2SO_4 is added to/ Give the reactions of
H_2SO_4 with(i) calcium fluoride (ii) KCl, (iii) Sugar (iv) Cu turnings.(v) Sulphur

OR

Give reason for the following observations.
a) HF is weakest acid and HI is strongest.
b)Fluorides of Xe undergo hydrolysis readily
c)Oxygen is diatomic but S is octatomic?
d)Reaction of NaBr and H_2SO_4 does not form HBr but it forms Br_2 gas.
e)HF is liquid but HCl is a gas.

37. What is meant by the following terms:-
(a) Cyanohydrin (b) Semicarbazone (c)Hemiacetal (d)Ketal (e) 2,4 –DNP derivative

OR

An organic compound (A) with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-
DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens' or Fehlings' reagent, nor does it

decolourise bromine water or Baeyer's reagent.On drastic oxidation with chromic acid, it gives a carboxylic acid (B) having molecular formula $C_7H_6O_2$.
Identify the compounds (A) and (B) and explain the reactions involved.

MARKEING SCHEME

1 .c

2. c

3.a

4.c

5.c

6.a

7.d

8.c

9.c

10.c

11.b

12.c

13

14.d

15.d

16.b

17.b

18.c

19.b

20.b

21   16.23 M

22   Zero order.

23Ae-Ea/RT Where,k = Rate constant Ea = Activation energy A = Arrhenius factor

24(i) Chemical adsorption has high enthalpy of heat.
        (ii) It is highly specific.

25(i) Multi molecular colloids consist of aggregates of atoms or small molecules with diameter less than

1 nm. The colloidal particles are held by weak van der Waal's forces, e.g. sols of S_8.

   (ii) Macromolecular colloids are those in which molecules of dispersed phase are of colloidal dimensions

1-1000nm. These have very high molecular mass, e.g. sols of proteins

26Transition elements are those whose neutral atom or stable ion has partly filled dorbitals. Cu_{2+} has partly filled d-orbitals which are absent in Zn or Zn_{2+}.

27Buna-N is a polymer of 1,3-Butadiene and acrylonitrile and buna-s is a polymer of 1,3-Butadiene and styrene.

28 0.617 m, 0.01 and 0.99, 0.67

29A)In the Van- Arkel Process, Ti is heated in a stream of I2 forming a volatile complex, which then decomposes at higher temperature to giveTi.

$Ti + 2I_2 \rightarrow TiI_4$

$TiI_4 \rightarrow Ti + 2I_2$
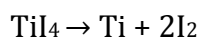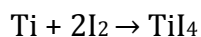
B). Zone refining is a method of obtaining a metal in very pure state. It is based on the principal that impurities are more soluble in molten state of metal than solidified state. In this method, a rod of impure metal is moved slowly over circular heater. The portion of the metal being heated melts & forms the molten zone. As this portion of the rod moves out of heater, it solidified while the impurities pass into molten zone. The process is repeated to obtain ultrapure metal and end of rod containing impure metal cutoff.

C). In this method of purification impure metal is made Anode and pure metal is made the cathode. On passing electricity, pure metal is deposited at the cathode while the impurities dissolve dissolve in solution as anode mud. E.g. electro- refining of copper:- At Cathode: - $Cu_{2+} + 2e \rightarrow Cu$ At Anode: - $Cu \rightarrow Cu_{2+} + 2e$

30(A) The ability of oxygen to form multiple bonds to metals, explain its superiority to Show higher oxidation state with metal.

(B) Positive E° value (+ O. 34 Volt) accounts for its inability to liberate H2 from acids.

(C)Mn, Maximum no. of unpaired electrons.

31(a) hexaaquotitanium(III) ion

(b) Due to presence of single electron in d orbitals so that d-d transition is possible.

(c) Due to absence of unpaired electron in d orbital

32(a).SP_2 carbon of chlorobenzene is more electronegative than the SP_3 carbon of cyclohexyl chloride.

(b).Grignard reagent are very reactive.These are readily reacts with water

$RMgX + H_2O ----> RH + Mg(OH)X$
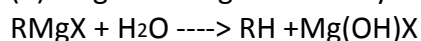
(c).Because it reacts with oxygen in presence of sunlight to form phosgene gas.

$CHCl_3 + \frac{1}{2} O_2 ---Sunlight ---> COCl_2 + HCl$

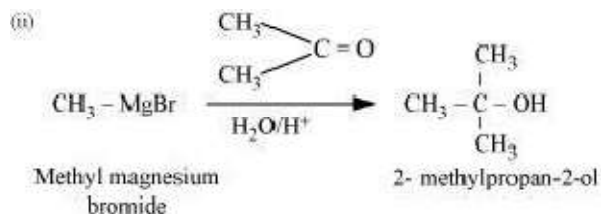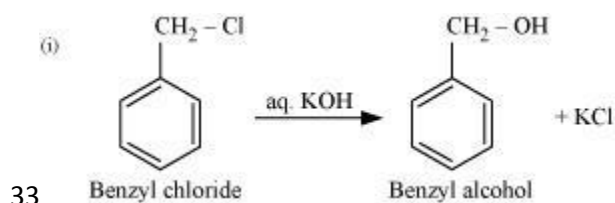(i) Benzyl chloride → (aq. KOH) → Benzyl alcohol + KCl

33

(ii) CH₃–MgBr (Methyl magnesium bromide) + (CH₃)₂C=O → (H₂O/H⁺) → $CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - OH$ 2-methylpropan-2-ol

34 In aniline, the lone pair of e- on the N atom is delocalised over the benzene ring. As a result, the e density
on the nitrogen atom decreases. In contrast, in CH_3NH_2, the +I effect of CH_3 increases the e density
on the N atom. Therefore, aniline is a weaker base than methylamine. Hence, its pK_b value is
higher than that of methylamine.

35(a)An electrolyte that ionizes completely in solution is a strong electrolyte eg. NaCl , $CaCl_2$ etc and
an electrolyte that ionizes partially in solution is weak electrolyte eg CH_3COOH , NH_4OH etc.

  (b) Faraday's Laws of electrolysis
First Law: The amount of chemical reaction which occurs at any electrode during electrolysis by a
current is proportional to the quantity of electricity passed through the electrolyte.
Second Law: The amount of different substances liberated by the same quantity of electricity
passing through the electrolytic solution is proportional to their chemical equivalent weights.
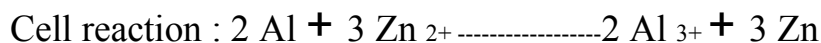 (c)2.417 g of silver.

OR

(a) Factors affecting electrode potential values are –
a) Concentration of electrolyte b) Temperature.
(b) The Nernst equation for a Al-ZnSO₄ cell:

Al | Al ₃₊ || Zn ₂₊ | Zn

Anode reaction : Al ------------Al₃₊ 3 + e -] x 2

Cathode reaction : Zn ₂₊ + 2 e - ---------------Zn] x 3

Cell reaction : 2 Al + 3 Zn ₂₊ -----------------2 Al ₃₊ + 3 Zn

E = E₀ -0.059/6log[Al₃₊]₂/[Zn₂₊]₃
36.)CaF₂+ Conc. H₂SO₄ ----------------- CaSO₄ + 2HF
2KCl+ Conc. H₂SO₄ ----------------------2HCl + K₂SO₄
C₁₂H₂₂O₁₁ + Conc. H₂SO₄ ------------------12 C + 11H₂O
Cu + Conc. 2 H₂SO₄---------------------- CuSO₄ + SO₂ + 2H₂O
3S + Conc. 2 H₂SO₄ ----------------------3SO₂ + 2H₂O
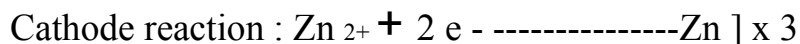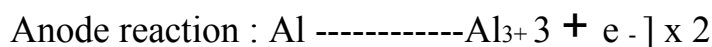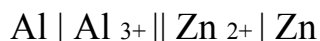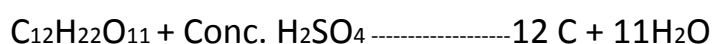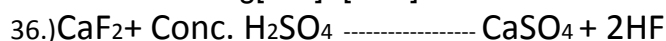
OR

a) Bond dissociation enthalpy of HF is more than HI

b)Presence of vacant d- orbitals in Xe

c)O=O is stronger than S=S

d)Because H_2SO_4 oxidisesHBr to Br_2

e)Presence of intermolecular H- bonding in HF.

37a).(a) When –CN and –OH groups are attached to the same carbon atom it is called cyanohydrin. e.g. $CH_3CH(OH)(CN)$.

Tetrahedral intermediate

Cyanohydrin
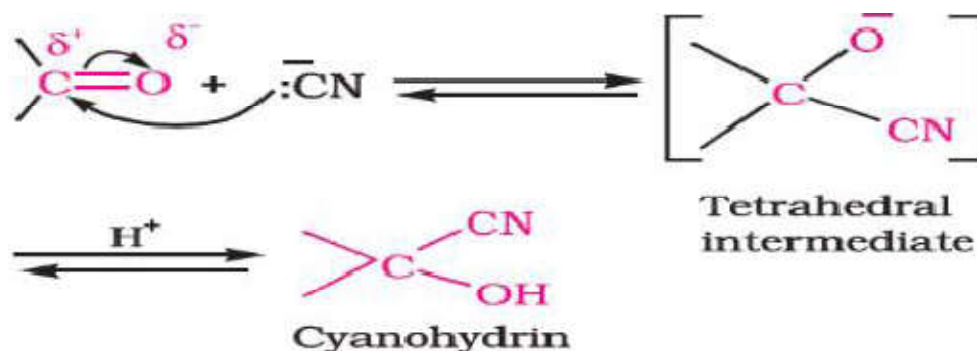
(b) When aldehyde or ketone react with semicarbazide the product formed is semicarbazone. E.g. $H_3CCH=N- NHCONH_2$

(c) When aldehyde reacts with one mole of alcohol in presence HCl gas Hemiacetal is formed. E.g. $H_3CCH(OH)-OCH_3$

Hemiacetal
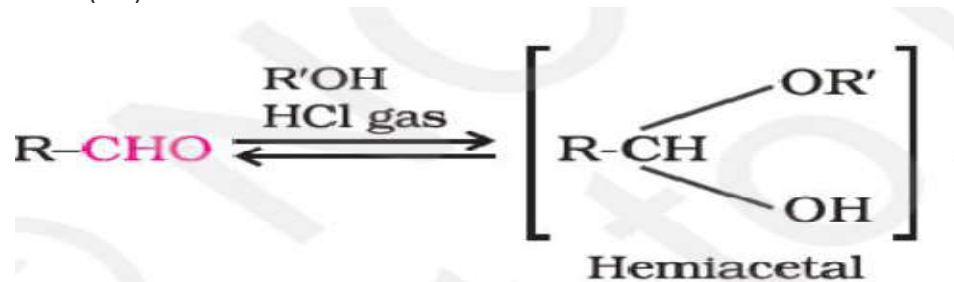
(d) When ketones react with two moles of alcohol /; Ethylene glycol in presence of HCl gas Ketal is formed. e.g.

Ethylene glycol ketal
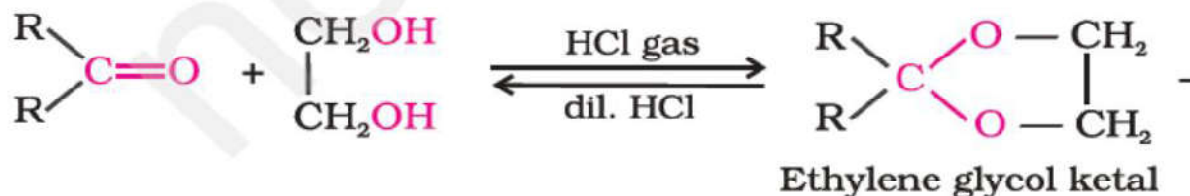
(e)When aldehyde or ketone reacts with 2,4-DNP orange precipitate is formed.e.g.
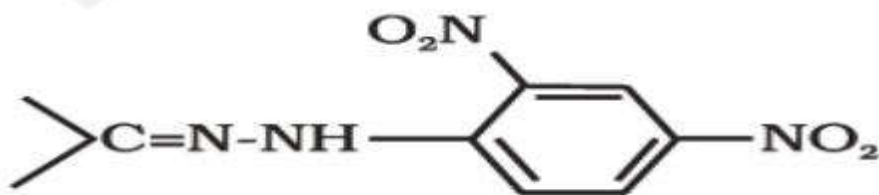
OR

(A) forms 2,4-DNP derivative. Therefore, it is an aldehyde or a ketone. Since it does not reduce
Tollens' or Fehling reagent, (A) must be a ketone. (A) Responds to iodoform test. Therefore, it should be
a methyl ketone. The molecular formula of (A) indicates high degree of unsaturation, yet it does not decolourise bromine water or Baeyer's reagent. This indicates
The presence of unsaturation due to an aromatic ring. Compound (B), being an oxidation product of a
ketone should be a carboxylic acid. The molecular formula of (B) indicates that it should be benzoic acid
and compound (A) should, therefore, be a mono substituted aromatic methyl ketone. The molecular formula of (A) indicates that it should be phenyl methyl ketone (acetophenone).
Reactions are as follows:
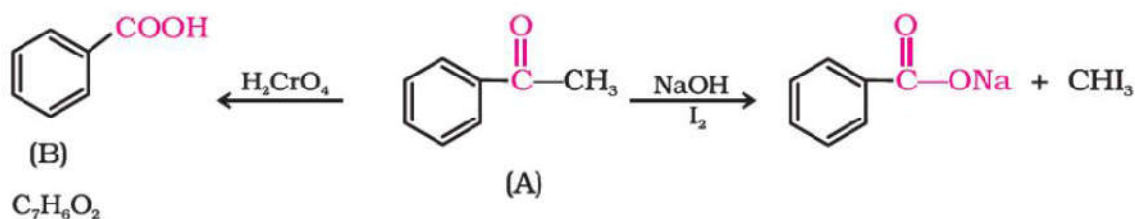
CLASS : XII

SUBJECT : CHEMISTRY

Time allowed: 3 hours   M.Marks : 70

General Instruction:-

(1) All questions are compulsory.

(2) Question no. 1 to 20 are VSA / objective type questions and carry 1 mark each.

(3) Question no. 21 to 27 are short answer questions and carry 2 marks each.

(4) Question no 28 to 34 are also short answer questions and carry 3 marks each.

(5) Question no. 35 to 37 are long answer questions and carry 5 marks each.

(6) Use log tables if necessary. Use of calculators not allowed.

Q.No.1 The amount of solute required to prepare 10 litres of decimolar solution is

    (a) 0.01 mole   (b) 0.2 mole

    (c) 0.05 mole   (d) 1.0 mole   (1)

Q.No. 2 In the extraction of copper from its sulphide ore, the metal is formed by the reduction of Cu_2O with

 (a) FeS (b) CO (c) Cu_2S (d) SO_2(1)

Q.No.3 Name the isomerism exhibited by the compounds [Co(SO$_4$)(NH$_3$)$_5$}Br and [Co(Br)(NH$_3$)$_5$]SO$_4$. (1)

Q.No.4 Which of the following polymer is stored in the liver of animals?

 (a) Amylose (ib) Cellulose (c) Amylopectin (d) Glycogen   (1)

Q.No.5 Maximum amount of a solid solute that can be dissolved in a specified amount of a given liquid solvent does not depend upon _____.

(a) Temperature (b) Nature of solute (c) Pressure (d) Nature of solventQ.No.6 Hot conc. H2SO4 acts as moderately strong oxidising agent. It oxidises both metals and nonmetals. Which of the following element is oxidised by conc. H2SO4 into two gaseous products?

 (a) Cu (b) S (c) C (d) Zn(1)

Q.No.7 Arrange the following: (i) In decreasing order of the pKb values: $C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$(1)

Q.No.8 Sucrose (cane sugar) is a disaccharide. One molecule of sucrose on hydrolysis gives _____.

(a) 2 molecules of glucose (b) 2 molecules of glucose + 1 molecule of fructose (c) 1 molecule of glucose + 1 molecule of fructose (d) 2 molecules of fructose(1)

Q.No.9 Nucleic acids are the polymers of _____.

(a) Nucleosides (b) Nucleotides (c) Bases (d) Sugars (1)

Q.No.10 The correct order of increasing acidic strength is _____.

 (a) Phenol < Ethanol < Chloroacetic acid < Acetic acid

(b) Ethanol < Phenol < Chloroacetic acid < Acetic acid

(c) Ethanol < Phenol < Acetic acid < Chloroacetic acid

(d) Chloroacetic acid < Acetic acid < Phenol < Ethanol(1)

Q.No.11 Amongst the following, the strongest base in aqueous medium is _____.

(a) CH_3NH_2 (b) $NCCH_2NH_2$ (c) $(CH3)_2$ NH (d) $C_6H5NHCH_3$(i)

Q.No.12 Arrange the compounds in order of increasing boiling point:-

Bromomethane, Bromoforus, Chloromethane, Dibromomethane   (1)

Q.No.13 Out of o-nitrophenol, o-cresol which is more acidic and why?   (1)

Q.No.14 SF_4 is easily hydrolysed whereas SF_6 is not easily hydrolysed.Why?   (1)

Q.No.15 Which compound in each of the following pairs will react faster in SN^1 reaction with OH^- ?

(a) CH_3Br & CH_3I (b) $(CH_3)_3CCl$ & CH_3Cl (1)

Q.NO.16 Which of the statements about solutions of electrolytes is not correct?

(a) Conductivity of solution depends upon size of ions.

 (b) Conductivity depends upon viscosiy of solution.

 (c) Conductivity does not depend upon solvation of ions present in solution.

 (d) Conductivity of solution increases with temperature. (1)

Q.No.17 In a reaction 2A--->Products , the concentration of A decreases from 0.5 mol L^{-1} to

        0.4molL^{-1}in 10 minutes. Calculate the rate during this time interval.   (1)

QNo.18 What do you mean by peptisation ?(1)

Q.No.19 Two liquids A and B boil at 145^0C and 190^0c respectively. Which of them has higher vapour

pressure at 80^0C ?(1)

Q.No.20Extent of physisorption of a gas increases with _____.

I(a) increase in temperature. (b) decrease in temperature. (c) decrease in surface area of adsorbent.
(d) decrease in strength of van der Waals forces. (1)

Q.No.21 A reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the

reaction will be completed.   (2)

Q.No.22 How is leaching carried out in case of low grade Copper ores ?

Or//   Write the principles involved in the following methods of refining of metals:-

        (a) Zone refining

        (b) Electrolytic refining   (2)

Q.No.23$[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic although both are tetrahedral.

Why ?   (2)

Q.No.24 Give reasons-:

   (a) Haloalkanes react with potassium cyanide to give alkyl cyanide but gives alkyl isocyanide with silver cyanide.

   (b) Grignard reagent should be prepared under anhydrous conditions.   (2)

Q.No.25 Write the structure of the monomers of the following polymers:-

(i) Dacron   (ii) Neoprene   (2)

Q.No.26 Explain the following:-

   (a) Although $-NH_2$ group is ortho and para directing group, nitration of aniline meta derivative also in addition to ortho and para derivative.

   (b) Aniline does not undergo Friedal Crafts alkylation.   (2)

Q.No.27 (i) Explain Cationic detergents.

   (ii) What are artificial sweetening agents? Give examples.   (2)

Q.No.28 30 gm of urea (molecular mass = 60g mol^{-1}) is dissolved in 846gm of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 k is 23.8 mm Hg.   (3)

Q.No.29The rate constant of a first order reaction increases by four times when the temperature changes from 293k to 313k. Calculate the energy of activation.   (3)

Q.No.30What is the difference between multimolecular and macromolecular colloids? Give one example of each.How are associated colloidsdifferent from these two types of colloids?   (3)

Q.No.31 How Glucose-D reacts with

   1. HI

   2. HCN

   3. Conc. HNO_3

Q.No.32 How will you account for the following:-

   (a) Oxygen is gas but sulphur is solid at room temperature.

   (b) Noble gases form compounds with fluorine and oxygen only.

   (c) Fluorine exhibits only -1 oxidation state whereas other halogens show +1,+3,+5 oxidation states also.   (3)

Q.No.33 Give chemical tests to distinguish between the following pair of Organic compounds:-

(i)   Propan-1-ol and Propan-2-ol.

(ii)   Phenol and Benzyl alcohol.

(iii)   Ethanol and Phenol.

Or

Write short notes on:-

(i)   Reimer Tiemann reaction.

(ii)   Hell VolhardZelinsky reaction.

(iii)   Rosenmund reaction.   (3)

Q.No.34 Complete the following reactions:-

(i)   NaOH + Cl$_2$----$\rightarrow$
      (hot&conc)

(ii)   I$_2$ + HNO$_3$----$\rightarrow$

(iii) CaF$_2$ + H$_2$SO$_4$----$\rightarrow$

Or

Arrange the following in the order of property indicated against each set:-

(i)   H$_2$O ,H$_2$S , H$_2$Se ,H$_2$Te   (increasing boiling point)

(ii)   HClO$_3$, HClO, HClO$_2$, HClO$_4$ (increasing acid strength)

(iii) HF, HCl, HI, HBr   (decreasing reducing character)   (3)

Q.No.35 (a)The cell in which the following reaction occurs:-

$$2Fe^{3+}(aq) + 2I^- (aq)----\rightarrow 2Fe^{2+}(aq) + I_2(s)$$
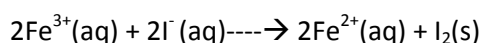
has E^0= 0.236 V at 298k. Calculate the standard Gibb's energy and

the equilibrium constant of the cell reaction.   (3)

(b) The resistance of a conductivity cell containing 0.001M KCl solution at 298 k is 1500 Ω. What is the cell constant if conductivity of 0.001M KCl solution at 298k is 0.146 x 10^{-3}S cm^1?   (2)

or

(a) Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging.   (3)

(b) A solution of Ni(NO$_3$)$_2$is electrolysed between platinum electrodes using a current a current of 5.0 ampere for 20 minutes. What mass of nickel will be deposited at the cathode?   (2)

Q.No. 36 (a) Describe the preparation of Potassium dichromate from iron chromite ore. What is the effect of increasing p^H on a solution of potassium dichromate? (3)

(b) Complete and balance the following equations:-

(i) $Cr_2O_7^{2-}(aq) + H^+ + H_2S$ ----→

(ii) $MnO_4^-(aq) + H^+ + Fe^{2+}$ ----→   (2)
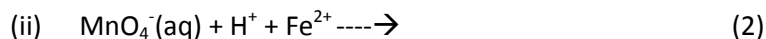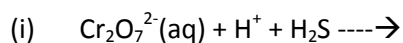
Or

(a) Give reasons for the following:-

(i)   Transition metals and many of their compounds show paramagnetic behaviour.
(ii) The enthalpies of atomization of the transition metals are high.
(iii) The transition metals generally form coloured Compounds.   (3)

(b)   What is lanthanoid contraction? Write its consequences   (2)

Q.No.37 (a) Give reasons for the following:-

(i)   Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.
(ii)   There are two $-NH_2$ groups in semicarbazide, however only one is involved in the formation of semicarbazone.
(iii) During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester formed should be removed as soon as it is formed. (3)

(b) How will you bring the following conversions:-

(i) Propanone to Propene.

(ii) Ethanol to 3-Hydroxybutanal   (2)

Or

(a)   An organic compound (A) has molecular formula($C_5H_{10}O$).It does not reduce Tollen's reagent but forms an orange precipitate with 2,4-DNPreagent. It forms a carboxylic acid(B) with molecular formula($C_3H_6O_2$) when heated with alkaline $KMnO_4$, yellow precipitate on treatment with NaOH and I_2,under vigorous conditions. On oxidation it gives ethanoic acid and propanoic acid. Sodium salt of (B) gave a hydrocarbon (C) in Kolbe's electrolytic reduction. Identify (A),(B) and (C) and write the reactions involved. (3)

(b) Write notes on:-

(i)   Aldol condensation.

(ii)   Clemmensen's reduction.   (2)

MARKING SCHEME

Class XII

Subject: Chemistry

Q.No.1   d   (1)

Q.No.2   c   (1)

Q.No.3   Ionisation isomerism
                (1)

Q No.4 d   (1)

Q.No.5   c   (1)

Q.No.6   c   (1)

Q.No.7   correct order   (1)

Q.No.8   b   (1)

Q.No.9   b   (1)

Q.No.10 c   (1)

Q.No.11 N – ethyl – N-methyl ethanamine   (1)

Q.No. 12 Chloromethane<Bromomethane<Dibromomethane<Bromoform   (1)

Q.No.13 O-nitropehenol because nitro group is electron withdrawing group and increases

acidic strength.   (1)

Q.No.14 In SF_6, sulphur atom is stearically protected by six F atoms & hence does not allow H_2O molecules to attack the S atom whereas in SF_4, Sulphur atom is surrounded by four f atoms. So, attack of H_2O molecule on sulphur atom can take place.   (1)

Q.No 15 (a) CH_3I, because I^- ion is better leaving group than Br^-

        (b) CH_3Cl , because of stearic hinderance in case of $(CH_3)_3CCl$.   (1/2 +1/2)

Q.No.16 c   (1)

Q.No.17 Rate = -1/2 Δ[A]/Δt =-1/2 (0.4-0.5)mol L^{-1}/10 min = 5x10^{-3}mol L^{-1} min^{-1} (1)

Q.No 18 correct definition   (1)

Q.No 19 A   (1)

Q.No 20 b   (1)

Q No 21 t= 20 minutes   let[a]=100

a-x=100-25=>75

$k=\dfrac{2.303}{t}\log\dfrac{a}{a-x}$ --1/2

$k=\dfrac{2.303}{20}\log\dfrac{100}{75}=\dfrac{2.303}{20}\log\dfrac{4}{3}$

=0.0143/min
(1/2)

Now, a-x=100-75=>25

$T=\dfrac{2.303}{k}\log\dfrac{a}{a-x}$
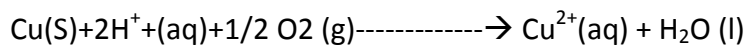
$=\dfrac{2.303}{0.0143}\log\dfrac{100}{25}$ (1/2)

$=\dfrac{2.303}{0.0143}\log 4$

=96.96 minutes(1/2)

Q No 22   Copper is leached out from low grade copper by using acid in the presence of

Air, when copper goes into the solution of Cu^{2+} (1)

$Cu(S)+2H^{+}+(aq)+1/2\ O2\ (g)\text{-------------}\rightarrow Cu^{2+}(aq) + H_2O\ (l)$

The solution containing Cu^{2+} ions is treated which scrap iron or H_2

$Cu^{2+}(aq)+ H_2\ (g)\text{--------------}\rightarrow Cu\ (S)+ 2H^{+}\ (aq)$ (-1)
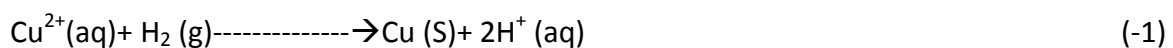
Or

Zone Refining-

 This method is based on the principal that impurities are more soluble in the melt than

In the solid state of the metal.
(1)

 Electrolytic refining-

This method is based on the phenomenon of electrolysis. In this method, impure metal

Is made to act as anode. A strip of the same metal in pure form is used as cathode
(1)

Q.No 23 $[NiCl_4]^{2-}$ has two unpaired electrons and is paramagnetic while $[Ni(CO)_4]$ has all

paired electron and hence is diamagnetic   (1+1)

Q No 24(a) Cyanide ion is an ambidentnucleophile.KCN are predominantly ionic. So attack

occurs through carbon atom, hence Cyanide is formed. WhereasAgCN is

Covalent. So, bond between Ag &CN does not breakand attack occurs through

Nitrogen(1)

(b)Grignard reagents are very reactive. They react with moisture present in the

apparatus or the starting material.

   R---MgX + H---OH------- $\rightarrow$ R---H + Mg(OH)X
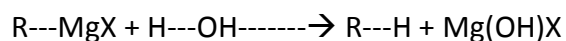
Therefore Grignard reagents must be prepared under anhydrous conditions.   (1)

Q No. 25 (a) Dacron:-Ethylene Glycol &Terephthalic acid.
(1)

        (b) Chloroprene   (1)

(Q No 26.(a) The reason of formation of larger amount of unexpected m-nitroaniline is that

under strongly acidic conditions of nitration, most of the Aniline is converted into

anilinium ion which is am-directing group therefore an unexpected m-nitroaniline is

obtained.   (1)

(b)Aniline is a lewis base while $AlCl_3$ is a lewis acid. They combine with each other toform
salt. Due to the presence of a positive charge on N-atom in the salt, the group $-N^+H_2AlCl_3^-$
acts as a strong electron withdrawing group. As a result, it reduces the electron density in
the benzene ring and hence aniline does not undergoes Friedel –Crafts reactions.
(1)

Q No 27 (i) Cationic detergents :- These are so called because large part in their molecules
are cations which is involved in the cleansing action. Cationic detergents are quaternary
ammonium salts of amines with chlorides or bromides as anion .Cetyltrimethylammonium
bromide is a cationic detergent and is used in hair conditioners.
(1)

(ii)Artificial sweetening agent:- These are chemical substances which are sweet in taste but do not add any calories to our body. For example,,saccharin, alitame, aspartame etc.
(1)

Q No 28 W_A=30g, M_A=60g, W_B=846g, M_B=18g, $p_A{}^0$=23.8mm Hg, p_s=?

Now, $\dfrac{p_A^0-P_S}{P_A^0} = \dfrac{W_B}{W_A} \times \dfrac{M_B}{M_A}$

(1)

$\dfrac{23.8-P_S}{23.8} = \dfrac{30/60}{846/18}$ (1)

$\dfrac{23.8 - P_S}{23.8} = \dfrac{30 \times 18}{846 \times 60}$

$\dfrac{23.8 - P_S}{23.8} = 0.0106$

23.8 – P_S =0.2531

P_S = 0.2531 -23.8 =23.54 mm Hg   (1)

Q No 29.

K_2 = 4k_1 =>$\dfrac{k_2}{k_1}$ = 4

$\qquad$ Log$\dfrac{k_2}{k_1} = \dfrac{E_a}{2.303R}\left(\dfrac{T_2-T_1}{T_1 T_2}\right)$(1)

Log 4=$\dfrac{E_a}{2.303\times8.34}\left(\dfrac{313-293}{293\times313}\right)$ (1)

2×Log2=$\dfrac{E_a}{19.147}\left(\dfrac{20}{91709}\right)$

E_a=$\dfrac{2\times0.3010\times19.147\times91709}{20}$= **52.85 KJ/mol**

(1)

Q.No.30 The important difference between multimolecular& macromolecular colloids are:-

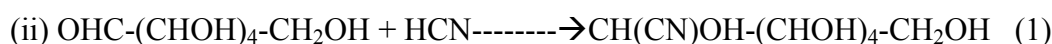| Multimolecular colloids	Macromolecular colloids
The colloidal particles consist of aggregate of a large no. of atoms or molecules having diameter less than 1 nm	The colloidal particles are macromolecules having very large molecular mass.
Particles are held by weak van der waals forces.	Particles are held by chemical bonds.

The common example of multimolecular colloid is sulphur sol, which consists of particles of S_8 molecules. The common example of macromolecular colloid is starch.

The associated colloids differ from multimolecular and macromolecular colloids in the sense that they behave as normal electrolytes at low concentrations but exhibit colloidal state properties at higher concentrations due to the formation of aggregated particles called micelles.   (1+1+1)

Q No 31

    (i)   OHC-----(CHOH)$_4$----CH$_2$OH + HI(excess) ----------$\rightarrow$CH$_3$(CH$_2$)$_4$CH$_3$
        (1)

                                        n-Hexane

(ii) OHC-(CHOH)$_4$-CH$_2$OH + HCN--------$\rightarrow$CH(CN)OH-(CHOH)$_4$-CH$_2$OH   (1)

(iii) OHC-(CHOH)$_4$-CH$_2$OH + Con. HNO$_3$-------$\rightarrow$HOOC-(CHOH)$_4$-COOH   (1)
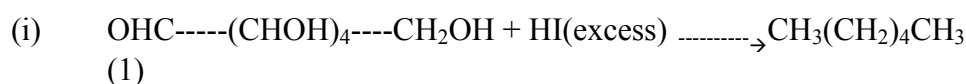
Q No 32.

(a) Due to small size and high electronegativity, oxygen exists as diatomic molecule. These molecules are held together by weak van der Waal's forces. Hence O_2 is gas at room temperature.

Sulphur, Because of its bigger size and lower electronegativity prefers to form S-S single bond and Greater tendency for catenation than oxygen.
(1)

(b) Fluorine and Oxygen are the most electronegative elements and hence are very reactive.

So, they form compounds with noble gases, particularly Xenon.
(1)

(c) Fluorine is the most electronegative element and cannot exhibit any positive oxidation states.

Other halogens have d-orbitals and therefore can expand their octet and show +1, +3, +5 and +7

Oxidation states
(1)

Q.No.33 (i) Luca's test or victor meyer's test or iodoform test   (1)
        (ii) Neutral FeCl$_3$ test or Bromine water testor any other test.   (1)
        (iii)Luca's test or Neutral FeCl$_3$ test or any other test.   (1)
                  Or
        Correct reactions   (1+1+1)
Q.No 34   (i) 6NaOH + 3Cl$_2$----$\rightarrow$ 5NaCl + NaClO$_3$+ 3H$_2$O
        (hot&conc)
        (ii) I$_2$ +10 HNO$_3$----$\rightarrow$2HIO$_3$+10NO$_2$+ 4H$_2$O
        (iii)CaF$_2$ + H$_2$SO$_4$----$\rightarrow$CaSO$_4$+2HF   (1+1+1)
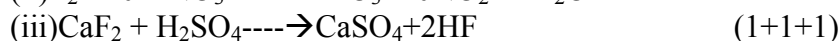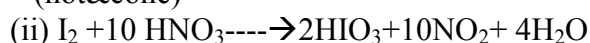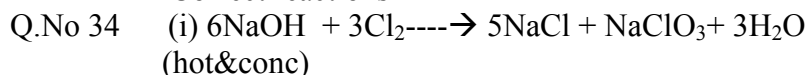
Or
(i) $H_2S < H_2Se < H_2Te < H_2O$
(ii) $HClO < HClO_2 < HClO_3 < HClO_4$
(iii) $HI > HBr > HCl > HF$ (1+1+1)

Q.No.35(a) $2Fe^{3+} + 2e^- \longrightarrow 2Fe^{2+}$ & $2I^- \longrightarrow I_2 + 2e^-$
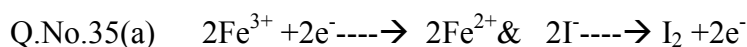
Thus, for the given cell reaction, n = 2.

$\Delta G^0 = -nFE^0cell = 2 \times 96500 \times 0.236$ J $= -45548$ J mol$^-$
    $= -45.55$kJ mol$^-$ (1)
$\Delta G^0 = -2.303$ RT log K_c (1)
Log$K_c = -\Delta G^0/2.303RT = 7.983$
    K_C = Antilog (7.983) = 9.166 x 10^7 (1)

(b)   Conductivity (k) =Cell constant/Resistance   (1/2)

        0.146×10^{-3} =cellconstant/1500   (1/2)
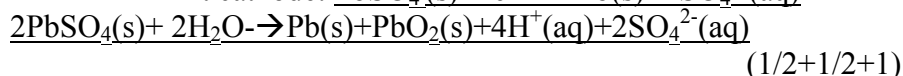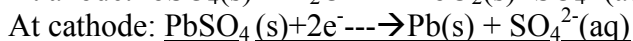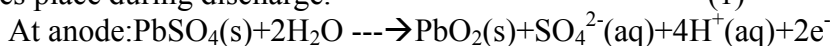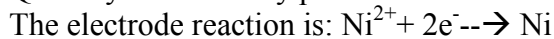   cellconstant=$0.146 \times 10^{-3} \times 1500 = 0.219$cm^{-1} (1)
                    Or
(a)   During recharging, electrical energy is supplied to the cell from
an external source. The reactions are reversed of those that
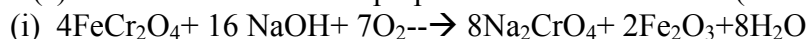takes place during discharge.   (1)
        At anode:$PbSO_4(s) + 2H_2O \longrightarrow PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^-$
        At cathode: $\underline{PbSO_4(s) + 2e^- \longrightarrow Pb(s) + SO_4^{2-}(aq)}$
$\underline{2PbSO_4(s) + 2H_2O \longrightarrow Pb(s) + PbO_2(s) + 4H^+(aq) + 2SO_4^{2-}(aq)}$
                                                    (1/2+1/2+1)
(b)   Quantity of electricity passed= Ixt =5X20X60s=6000C   (1)
        The electrode reaction is: $Ni^{2+} + 2e^- \longrightarrow Ni$
        2x96500 C deposit Ni =58.7g
        6000Cwill deposit Ni = 58.7x6000/2x96500 =1.825g   (1)

Q.No.36 (a) Potassium dicrimate is prepared from chromite ore ($FeCr_2O_4$)
        (i) $4FeCr_2O_4 + 16NaOH + 7O_2 \longrightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8H_2O$
                    Or
$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \longrightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$ (1)
(ii)$Na_2CrO_4 + H_2SO_4 \longrightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$ (1)
(iii) $Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2NaCl$ (1)
(b)
        (i)$Cr_2O_7^{2-}(aq) + 8H^+ + 3H_2S \longrightarrow 2Cr^{3+} + 3S + 7H_2O$ (1)
        (ii)$MnO_4^-(aq) + 8H^+ + 5Fe^{2+} \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$ (1)
                    Or
(a)   (i) Transition metals and their compound show paramagnetic behavior due
        to presence of unpaired electrons in them.   (1)
        (ii)Transition metals exhibits high enthalpies of atomization because they have
large number of unpaired electrons in their atoms. Due to this, they have stronger
interatomic interactions.   (1)
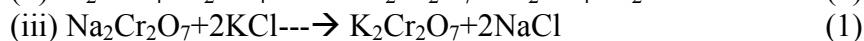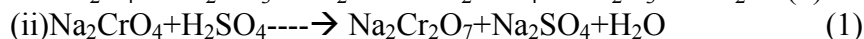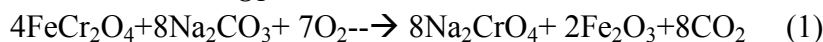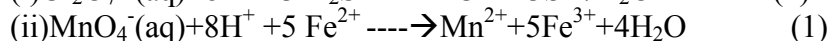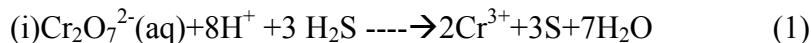
        (iii)Due to d-d transition   (1)

(b)   The steady decrease in atomic and ionic sizes of lanthanoid elements with increasing atomic numbers is called lanthanoid contractions.

(1/2)

Following are the consequences of lanthanoid contractions

(i)   The size of second and third row of transition elements are nearly same.   (1/2)

(ii)   Basic strength decreases from $La(OH)_3$ to $Lu(OH)_3$ (1/2)

(iii)   Lanthanoid contraction makes separation of lanthanoids possible

(1/2)

Q.No.37 (a)(i) Because of presence of three methyl groups in 2,2,6-trimethylcyclohexanone, the nucleophilic attack by the CN^- ion does not occur due to steric hindrance. Since there is no steric hindrance in cyclohexanone, therefore nucleophilic attack by the CN^-ion occurs readily and hence cyclohexanone syanohydrin is obtained in good yield.   (1)

(ii)Although semicarbazide has to $-NH_2$ groups, but one of them (which is directly attached to C=O) is involved in resonance.
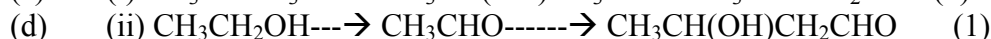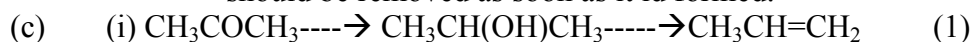As a result, electron density on this$-NH_2$ group decreases and hence it does not act as nucleophile. In constrast, the lone pair of electrons on the other $-NH_2$ group is not involved in resonance and hence is available for nucleophilic attack on the C=O group of carbonyl compounds.   (1)

(iv)   The formation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst is a reversible reaction. To shift the equilibrium in the forward direction, the water or ester formed should be removed as soon as it id formed.   (1)

(c)   (i) CH_3COCH_3----$\rightarrow$ $CH_3CH(OH)CH_3$-----$\rightarrow CH_3CH=CH_2$ (1)

(d)   (ii) CH_3CH_2OH---$\rightarrow$ CH_3CHO------$\rightarrow$ $CH_3CH(OH)CH_2CHO$ (1)

Or

(a)   A is $CH_3COCH_2CH_2CH_3$
B is CH_3CH_2COOH
C is $CH_3CH_2CH_2CH_3$

Reactions involved:-

$\overset{\text{alk KMnO4}}{CH_3COCH_2CH_2CH_3------.> CH_3CH_2COOH}$ (1)
(A)   (B)

$CH_3COCH_2CH_2CH_3 +I_2+ 4NaOH$--$\rightarrow$ $CHI_3+ CH_3CH_2CH_2COONa+$
(A) $3NaI+2H_2O$

$\overset{\text{K2Cr2O7/H}}{CH_3COCH_2CH_2CH_3------\rightarrow CH_3CH_2COOH + CH_3COOH}$ (1)
(A)

$\overset{\text{kolbe}}{\underset{\text{electrolysis}}{2CH_3COONa+2H_2O--\rightarrow CH_3CH_2CH_2CH_3+ CO_2+H_2+2NaOH}}$ (1)

(c)
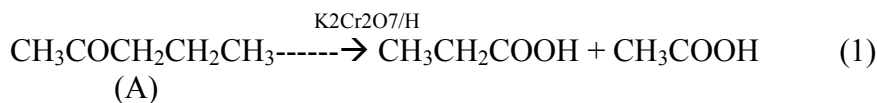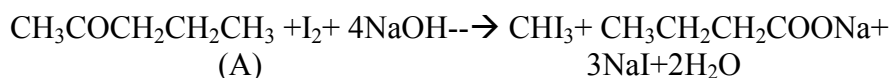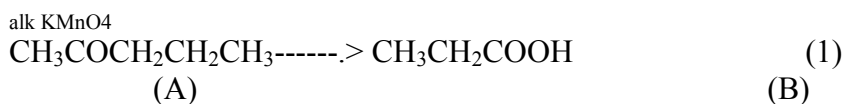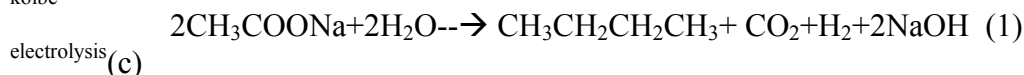
(b) Correct reactions   (1+1)

_____

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Class XII

Subject: Chemistry

Unit No.	Title/ chapter	VSA (1mark)	SA-I (2marks)	SA-II (3marks)	Long answer questions (5)	Total
1	Solutions	3(1)	-	1(3)	-	6
2	Electro Chemistry	1(1)	-	-	1(5)	6
3	Chemical Kinetics	1(1)	1(2)	1(3)	-	6
4	Surface Chemistry	1(2)	-	1(3)	-	5
5	Principles And processes of Isolation of elements	1(1)	1(2)	-	-	3

6	p-block elements	2(1)	-	2(3)	-	8
7	d and f block elements	-	-	-	1(5)	5
8	Coordination compounds	1(1)	1(2)	-	-	3
9	Haloalkanes and Haloarenes	2(1)	1(2)	-	-	4
10	Alcohols, Phenols and Ethers	1(1)	-	1(3)	-	4
11	Aldehydes, ketones and carboxylic acids	1(1)	-	-	1(5)	6
12	Organic compounds containing nitrogen	2(1)	1(2)	-	-	4
13	Biomolecules	1(1)	-	1(3)	-	4
14	Polymers	1(1)	1(2)	-	-	3
15	Chemistry in everyday Life	1(1)	1(2)	-	-	3
		20(1)	7(2)	7(3)	3(5)	70

PAPER NO 04

XII-Chemistry   MARKS - 70
TIME – 3 HRS

GENERAL INSTRUCTIONS:

(i) All questions are compulsory.

(ii)Questions no 1 to 20 are very short-answer questions and carry 1 mark each.

(iii)Questions no21 to27 are short-answer questions and carry 2 marks each.

(iv) Questions no 28 to 34 are also short-answer questions and carry 3 marks each.

(v) Question no 35 to 37 are long answer type question and carry 5 markseach .

(vii) Use Log Tables, if necessary. Use of calculators is not allowed

1 Which of thefollowing units is useful in relating concentration of solution with its vapour pressure?

(i) mole fraction (ii) parts per million (iii) mass percentage (iv) molality

2 Which of the statements about solutions of electrolytes is not correct?

(i) Conductivity of solution depends upon size of ions.

(ii) Conductivity depends upon viscosiy of solution.

(iii) Conductivity does not depend upon solvation of ions present in solution.

(iv) Conductivity of solution increases with temperature.

3 Activation energy of a chemical reaction can be determined by _____.

(i) determining the rate constant at standard temperature.
(ii) determining the rate constants at two temperatures.
(iii) determining probability of collision.
(iv) using catalyst.

4 At high concentration of soap in water, soap behaves as _____.

(i) molecular colloid (ii) associated colloid
(iii) macromolecular colloid (iv) lyophilic colloid

5 In the extraction of copper from its sulphide ore, the metal is formed by the reduction of Cu_2O with

(i) FeS (ii) CO (iii) Cu_2S (iv) SO_2

6 Which of the following pairs of ions are isoelectronic and isostructural?

(i) CO_3^{2-}, NO_3^- (ii) ClO_3^-, CO_3^{2-}
(iii) SO_3^{2-}, NO_3^- (iv) ClO_3^-, SO_3^{2-}

7 The magnetic nature of elements depends on the presence of unpaired electrons. Identify theconfiguration of transition element, which shows highest magnetic moment.

(i) 3d7 (ii) 3d5 (iii) 3d8 (iv) 3d2

8 The correct IUPAC name of [Pt(NH3)2Cl2] is

(i) Diamminedichloridoplatinum (II)
(ii) Diamminedichloridoplatinum (IV)
(iii) Diamminedichloridoplatinum (0)
(iv) Dichloridodiammineplatinum (IV)

9 Which of the following alkyl halides will undergo SN1 reaction most readily?

(i) (CH3)3C—F (ii) (CH3)3C—Cl (iii) (CH3)3C—Br (iv) (CH3)3C—I

10 Which of the following is most acidic?

(i) Benzyl alcohol (ii) Cyclohexanol (iii) Phenol (iv) m-Chlorophenol

11 In Clemmensen Reduction carbonyl compound is treated with _____.

(i) Zinc amalgam + HCl (ii) Sodium amalgam + HCl
(iii) Zinc amalgam + nitric acid (iv) Sodium amalgam + HNO3

12 Amongst the following, the strongest base in aqueous medium is _____.

(i) CH3NH2 (ii) NCCH2NH2 (iii) (CH3)2 NH (iv) C6H5NHCH3

13 Nucleic acids are the polymers of _____.
   (i) Nucleosides (ii) Nucleotides (iii) Bases (iv) Sugars

14 Which of the following polymers of glucose is stored by animals?
   (i) Cellulose (ii) Amylose (iii) Amylopectin (iv) Glycogen

15 Polyethyleneglycols are used in the preparation of which type of detergents?
   (i) Cationic detergents(ii) Anionic detergents
   (iii) Non-ionic detergents (iv) Soaps

16 Which of the following will show Tyndall effect?
   (i) Aqueous solution of soap below critical micelle concentration.
   (ii) Aqueous solution of soap above critical micelle concentration.
   (iii) Aqueous solution of sodium chloride.
   (iv) Aqueous solution of sugar.

17 Which of the following are peroxoacids of sulphur?
   (i) H_2SO_5 and $H_2S_2O_8$ (ii) H_2SO_5 and $H_2S_2O_7$
   (iii) $H_2S_2O_7$ and $H_2S_2O_8$ (iv) $H_2S_2O_6$ and $H_2S_2O_7$

18 Electronic configuration of a transition element X in +3 oxidation state is [Ar]3d 5. What is its atomic number?
   (i) 25 (ii) 26 (iii) 27 (iv) 24

19 A primary alkyl halide would prefer to undergo _____.
   (i) SN1 reaction (ii) SN2 reaction (iii) α–Elimination (iv) Racemisation

20 Hoffmann Bromamide Degradation reaction is shown by _____.
   (i) $ArNH_2$ (ii) $ArCONH_2$ (iii) $ArNO_2$ (iv) $ArCH_2NH_2$

21 A solution of glycerol (m.M=92 g/mol) in water was prepared by dissolving some glycerol

   in 500g of water. This solution has a boiling point of 100.420C. What mass of glycerol

   was dissolved to make this solution? Kb for water=0.5121kkg/mol.

   22 Write the Nernst Equation & Determine the emf of cell in which the following reaction
       takes place:

Ni(s) + 2Ag+(0.002M) (aq) ---→ Ni2+ (0.16M)(aq) + 2Ag(s), E0=1.05V (IF = 96500 coulomb,

value of Ni = - 0.23V and of Ag is 0.80V)

23 Describe the role of following: (i) NaCN in extraction of Silver from silver ore.

 (ii) Iodine in refining of Titanium

24 (a) Why haloarenes are less reactive than the haloalkanes towards nucleophilic substitution?
(b) Why Grignard reagent should be prepared under anhydrous conditions?

25 . Write a short note on the following (ii) Carbyl amine reaction   (iii)Ammonolysis

26 . a) Where does the water present in the egg go after boiling the egg?   (b) What is invert sugar?

27 Write the names and structures of monomers of the following polymers: (i) Bakelite

 (ii) Nylon-6,6

28 Density of 1 M soln of glucose 1.18 g/cm3. Kf for H2O is 1.86 Km–1. Find freezing point

of solution.

29 . For the standard cell: Cu(s)/Cu+(aq)|| Ag+(aq)/Ag(s)   E0 cell 2+/Cu = +0.34 V
E0 cell 2+ =+0.34 V   E0 Ag+/Ag =+0.80 V i. identify the cathode and the anode as the current
is drawn from the cell. ii. Write the reaction taking place at the electrodes. iii. Calculate the standard
cell potential.

30 a)What is the role of depressant in froath flotation process?

b) Outline the principle of refining of metal by following method:

i) Zone refining   ii) Monds process

31 (i) What is lanthanoid contraction? Explain its causes.

(ii) Out of Fe2+ and Fe3+ , which is more paramagnetic and why?

(iii) Why do transition metals form coloured compound?

32 Write the IUPAC name and geometry of following complexes:

   [CoCl4]2- , [NiCN4]2- ,

 [Cr (H2O)2(C2O4)2]   (At. No. : Co= 27, Ni=28, Cr=24)
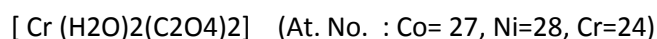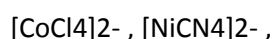
33 . Explain the following observations:

a) The boiling point of ethanol is higher than methoxy methane.

b) Primary alcohol is more acidic than secondary or tertiary alcohol.

    c)Ortho nitro phenol is steam volatile whereas para nitro phenol is not.

.34 Write a short note on: a)Anti fertility drugs b) tranquillizers c) Disinfectant

35 The rate constant for first order reaction is 60/s. How much time will it take to reduce the
concentration of the reaction to 1/10 of its initial value

     B What is difference between molecularity and order of reaction?

36 An organic compound (A) (molecular formula C8H16O2) was hydrolyzed with dilute sulphuric

   acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced
(B).(C) on dehydration gives but-1-ene. Write equations for the reactions involved

37   (A) F2 is better oxidizing agent than Cl2. Why?

     (B) In aqueous solution HI is stronger acid than HCl.

     (C) Noble gases have low boiling point.

(D) The reaction of Cl2 with hot and concentrated NaOH.

(E) Why BiH3 is stronger reducing agent

MARKING SCHEME

Q no	Answers	Marks
1	1	1
2	III	1
3	II	1
4	II	1
5	III	1
6	I	1
7	II	1
8	I	1
9	IV	1
10	IV	1
11	I	1
12	III	1
13	II	1
14	IV	1
15	III	1
16	II	1
17	I	1
18	II	1
19	II	1
20	II	1
21	(b) Tb=0.42K Formula used Wb = 37.7G	1+1=2

22	Formula used
	        n=2
	         substituting the values Ecell=0.9142 V
		1.5*4=2

23	Role of each OR Principle involved	1*2=2
24	(a) (i) In haloarenes, there is double bond character between the carbon and hydrogen due to resonance effect which makes them less reactive. (b) Grignard reagent react with water to form alkanes, therefore they are prepared under anhydrous conditions	2
25	Aliphatic and aromatic primary amines on heating with chloroform and ethanolic potassium hydroxide form isocyanides or carbylamines 3) This reaction yields a mixture of primary, secondary and tertiary amines and quaternary ammonium salt on reaction of alkyl halide with ammonia	2
26	a) On boiling during denaturation process water gets adsorbed/absorbed in the denatured proteins. b) An equimolar aqueous solution of glucose and fructose is called invert sugar	2
27	(a)(I) Phenol(C6H5OH) and Formaldehyde (HCHO) (ii) Hexamethylenediammine (H2N-(CH2)6-NH2) &Adipicacid(HOOC-(CH2)4-COOH)	2
28	Mass of solution =volume x density =1000 x 1.18 =1180g	3

	Mass of water =1180 - 180 =1000g	
	1 M =C2H5OH =1m	
	= = 0 – 1.86 = −1.86°C	
29	29 From the cell representation Ag/Ag+ electrode is cathode and Cu/Cu+ electrode is anode . 1 1. At anode :	3
	Cu(s)→ Cu2+ (aq)+2e-→Ag(s)	
	At anode	
	2Ag (s) →2 Ag+ + 2e-	
	E0 cell = E0 cathode – E0 anode	
	= E0 Ag+/Ag – E0 Cu2+ /Cu	
	= +.80 V – (+0.34V)	
	= +0.80V-0.34V	
	= 0.46V	
30	a) The role of depressant is to separate ZnS and PbS 1 mark	3
	b) (i) Basic principle 1 mark	
	(ii) vapour phase equation/explanation 1 mark	
31	Almost same size of II and III transition series elements, Poor shielding effect of forbital electrons.	1
		1
	. Fe3+	1
	Due to d-d transition.	
32	(i) [CoCl4]2-⬛ sp3 , tetrahedral, paramagnetic	1
		1
		1
	(ii) [NiCN4]2-⬛dsp2, square planar, diamagnetic	
	(iii) [CrF6]3-⬛ sp3d2, octahedral, paramagnetic	
33	a. Due to intermolecular hydrogen bonding.	1+1+1
	b.Due to less electron releasing group.	
	c.Due intra molecular hydrogen bonding in o- nitro phenol.	
34	a)Anti fertility drugs-These is the chemical substances used to control the pregnancy. They are also called oral contraceptives or birth control pills. Eg- Mifepristone, norethindrone.	1
	b) Tranquilizers' -The class of chemical compounds used for the treatment of stress, mild or even severe mental diseases. Eg-idardil, iproniagid, luminal, second equaqnil .	1
	c) Disinfectant - are applied to inanimate objects such as floors, drainage, system.	
	Eg- 0.2% solution of phenol is an antiseptic while 1% solution is an disinfectant.	1
35	t = 2.303 log [R0] K [R] t= 2.303 log [R0]	1 1
	1/10[R] t = 2.303 log10 60 t = 2.303 = 3.38X 10-2s-1 60	1 1 1
36	H3C-H2C-H2C -O-C4H9 dil. H2SO4 C3H7COOH + C4H9-OH	1
	A B C	1
	dehydration oxidation with chromic acid	1
	C2H5-CH=CH2C3H7COOH	1
	But-1-ene B	1
37	(A) Due to lone pair-lone pair repulsion in F atoms as F has smaller size.	1
	(B) Bond dissociation enthalpy of HI is smaller than HCl	1
	(C) Due to weak Vanderwaal force of attraction in noble gases.	1
	(D) Cl2 +NaOH (hot & conc.) → NaCl + NaClO3 + H2O	1
	(E)Because BiH3 is less stable	1

PAPER NO 05

(THEORY)

Blue Print

S.No	Unit	VSA 1 Mark	SA I 2 Marks	SA II 3 Marks	LA 5 Marks	Total
1	Solutions	1(1)	2(1)	3(1)	-	
2	Electrochemistry	1(1)	2(1)	3(1)	-	
3	Chemical Kinetics	1(1)	-	-	5(1)	23(11)
4	Surface Chemistry	2(2)	-	3(1)	-	
5	General Principles and Processes of extraction of elements	-	-	3(1)	-	
6	p-Block Elements	3(3)	2(1)	3(1)	-	19(10)
7	d- and f-Block Elements		-	-	5(1)	
8	Co-ordination compounds	3(3)	-		-	
9	Haloalkanes and Haloarenes	1(1)	-	3(1)	-	28(16)
10	Alcohols, Phenols and Ethers	1(1)	-	3(1)	-	
11	Aldehydes, Ketones and Carboxylic Acids	1(1)	-	-	5(1)	
12	Organic Compounds Containing Nitrogen	-	4(2)	-	-	
13	Biomolecules	-	4(2)	-	-	
14	Polymers	3(3)	-		-	
15	Chemistry in everyday life	3(3)	-		-	
	Total	20(20)	14(7)	21(7)	15(3)	70(37)

CHEMISTRY (THEORY)
## CLASS XII

Time allowed: 3 Hours   **Maximum Marks: 70**

General instructions:

1.   All questions are compulsory.

2.   Marks for each question are indicated against it.

3.   Question numbers 1 to 20are very short answer question and carries 1 mark each.

4.   Question numbers 21 to 27 are short answer question and carry 2 marks each.

5.   Question numbers 28 to 34 are also short answer question and carries 3mark each.

6.   Question numbers 35 to 37 are long answer questions and carries 5marks each.

7.   Use log tables, if necessary. Use of calculators is **not** allowed.

1.   Colligative properties depend on _____.

(i) the nature of the solute particles dissolved in solution.

(ii) the number of solute particles in solution.

(iii) the physical properties of the solute particles dissolved in solution.

(iv) the nature of solvent particles.

2.   Give example of shape selective catalyst?

3.   In Clemmensen Reduction carbonyl compound is treated with _____.

(i) Zinc amalgam + HCl

(ii) Sodium amalgam + HCl

 (iii) Zinc amalgam + nitric acid

(iv) Sodium amalgam + HNO3

4. Although Carboxylic acids have carbonyl group yet do not show the properties of carbonyl compounds. Why?

5.What is the correct order of reactivity of alcohols in the following reaction?

$$R—OH + HCl(ZnCl_2) \longrightarrow R—Cl + H_2O$$
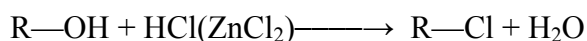
(i) 1° > 2° > 3° (ii) 1° < 2° > 3° (iii) 3° > 2° > 1° (iv) 3° > 1° > 2°

6. *Suggest a metal which can be used for cathodic protection of iron ?*

7. The role of a catalyst is to change _____.

(i) gibbs energy of reaction. (ii) enthalpy of reaction. (iii) activation energy of reaction. (iv) equilibrium constant.

8. What is the cause of Brownian movement among colloidal particles?

9 .Arrange the following in the order of property indicated :

F_2, Cl_2, Br_2, I_2 - increasing bond dissociation enthalpy.

10.   : Which of the hydrides is the most acidic :

(i) H_2O

(ii) H_2S

(iii) H_2Se

(iv) H_2Te

11.   The tendency to show -2 oxidation states diminishes from sulphur to polonium. Why?

12 .Which of the following fibres is made of polyamides ?

    (a) Dacron   (b) Orlon

    (c) Nylon   (d) Rayon

13. Which of the following is not a semisynthetic polymer?

(i) cis-polyisoprene (ii) Cellulose nitrate (iii) Cellulose acetate (iv) Vulcanised rubber

14. -------------------- **is the example of biodegradable polymers?**

15   **Which statement about aspirin is not true**

(i) Aspirin belongs to narcotic analgesics. (ii) It is effective in relieving pain. (iii) It has antiblood clotting action. (iv) It is a neurologically active drug.

16. Give an example of a substance that can act as a disinfectant as well as antiseptic depending upon its concentration. (Specify concentration)

17   A narrow spectrum antibiotic is active against _____.

(i) gram positive or gram negative bacteria. (ii) gram negative bacteria only. (iii) single organism or one disease. (iv) both gram positive and gram negative bacteria.

18. Write the IUPAC name of the ionisation isomer of the coordination compound [Co(NH_3)_5Br]SO_4

19. Describe the type of hybridisation for the complex ion $[Fe(H_2O)_6]^{2+}$.

20. Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type $[Pd(C_6H_5)_2(SCN)_2]$ and $[Pd(C_6H_5)_2(NCS)_2]$ are
(i) linkage isomers (ii) coordination isomers (iii) ionisation isomers (iv) geometrical isomers

21. Will the elevation in boiling point be same if 0.1 mol of Sodium chloride or 0.1 mol of sugar is dissolved in 1L of water? Explain.

22. The following curve is obtained when molar conductivity (Λ_m) is plotted against the square root of concentration, $c^{1/2}$ for two electrolytes A and B
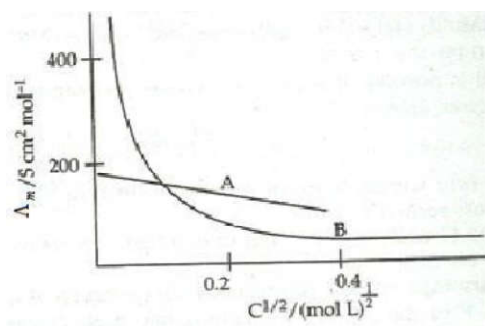
(a) How will you account for the increase in the molar conductivity of the electrolyte A on dilution.

(b) As seen from the graph, the value of limiting molar conductivity (Λ_m°) for electrolyte B cannot be obtained graphically. How can this value be obtained?

23. (a) Give two examples of water soluble vitamins.

(b) Why should vitamin C included in our diet regularly

24(i) Give one structural difference between amylose and amylopectin.

(ii)Name the protein and its shape present in oxygen carrier in human body.

25Write short notes on the following:

(i) Carbylamine reaction (ii) Diazotisation

Or

Write a short note on followings:

(a) Hoffmann Bromamide reaction

(b) Gabriel Phthalimide reaction

26. Assign reasons for the following:

(a) pK_b value of methyl amine is lower than that of ammonia.

(b) Ethylamine is soluble in water whereas Aniline is not.

<div align="center">OR</div>

Aniline do not give Friedel Craft's Reaction Explain.

27. Write balanced equations for the following:

(a) NaCl is heated with sulphuric acid in the presence of MnO_2.

(b)Chlorine gas is passed into a solution of NaI in water.

28. Calculate the boiling point of a 1M aqueous solution (density 1.04 g mL^{-1}) of Potassium chloride (K_b for water = 0.52 K kg mol^{-1}, Atomic masses: K=39u, Cl=39.9u) Assume, Potassium chloride is completely dissociated in solution

29. A galvanic cell consists of a metallic zinc plate immersed in 0.1M $Zn(NO_3)_2$ solution and metallic plate of lead in 0.02M $Pb(NO_3)_2$ solution. Calculate the emf of the cell. Write the chemical equation for the electrode reactions and represent the cell. (Given: $E^o_{Zn/Zn2+}$= -0.76 V ;$E^o_{Pb/Pb2+}$= - 0.13 V)

30. Answer the following questions:

(a) What happens when a freshly precipitated Fe $(OH)_3$ is shaken with a little amountof dilute solution of $FeCl_3$?

(b) Why are lyophilic colloidal sols more stable than lyophobic colloidal sols?

(c) What form Freundlich adsorption equation will take at high pressure?

31. Write a short note on following with one example each:

(a) Vapour Phase refining   (b) Roasting   (c) Leaching

<div align="center">OR</div>

Account for the following facts:

(a) The reduction of a metal oxide is easier if the metal formed is in the liquid state at the temperature of reduction.

(b) Limestone is used in the manufacture of pig iron from haematite.

(c) Pine oil is used in the froth floatation process used to concentrate sulphide ores.

32. (a) Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain.

(b) An optically active compound having molecular formula $C_7H_{15}Br$ reacts with aqueous KOH to give a racemic mixture of products. Write the mechanism involved in this reaction.

33. Draw the structure of following:

(a) ClF_3 (b) $XeOF_4$ (c) $H_2S_2O_7$

34. The following is not an appropriate reaction for the preparation of tert.-butyl ethylether:

$C_2H_5ONa + (CH_3)_3C\text{-}Cl$ ----------$\rightarrow$ $(CH_3)_3C\text{-}OC_2H_5$
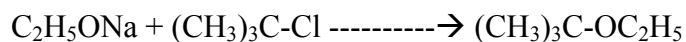
(i) What would be the major product of the given reaction?

(ii) Write a suitable reaction for the preparation of tert.-butyl ethyl ether, specifying

the   names of reagents used.Justify your answer in both cases.

35. (a) Give a plausible explanation for each one of the following:

(i) Although phenoxide ion has more number of resonating structures thancarboxylate ion, carboxylic acid is a stronger acid than phenol.

(ii) There are two $-NH_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazones.

(b) Carry out the following conversions in not more than two steps:

(i) Phenyl magnesium bromide to benzoic acid.

(ii) Acetaldehyde to But-2-enal.

(iii) Benzene to m-Nitroacetophenone

OR

(a) Give a simple chemical test to distinguish between the pair of organic compounds:

Ethanal and Propanal

(b) Name and complete the following chemical reaction:

(i)X_2/red P (ii) H_2O

RCH_2COOH --$\rightarrow$
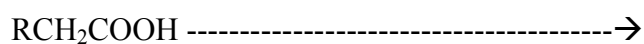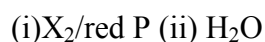
(c) Draw the structures of the following derivatives:

(i) The 2,4-Dinitrophenylhydrazone of benzaldehyde

(ii) Acetaldehydedimethylacetal

(iii) Cyclopropanoneoxime

36. (a) Write the rate law for a first order reaction. Justify the statement that half- life for a first order reaction is independent of the initial concentration of the reactant.

(b) For a first order reaction, show that the time required for 99% completion of a first order reaction is twice the time required for the completion of 90%.

OR

(a) For the reaction A→B, the rate of reaction becomes twenty seven times when the concentration of A is increased three times. What is the order of the reaction?

(b) The activation energy of a reaction is 75.2 kJmol^{-1} in the absence of a catalyst and it lowers to 50.14 kJmol^{-1} with a catalyst. How many times will the rate of reaction grow in the presence of a catalyst if the reaction proceeds at 25°C?

37. (a) What is lanthanoid contraction? What is the cause and consequences of lanthanoid contraction?

(b) Describe the preparation of KMnO$_4$ from pyrolusite ore.

OR
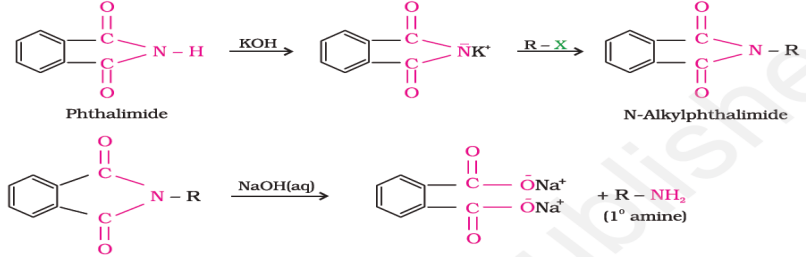
Assign the reasons for the following:

(i) Transition elements exhibit high enthalpy of atomization.

(ii) Transition elements and their compounds are found to be good catalyst.

(iii) La^{3+}(Z =57) and Lu^{3+} (Z = 71) do not show any colouring solutions.

(iv) Of the d^{4}species,Cr^{2+} is strongly reducing while Mn(III) is strongly oxdising.

(v) The E^0 (M^{2+}/M) value for copper is positive (+ 0.34).

MARKING SCHEME
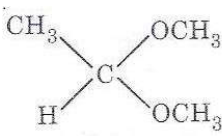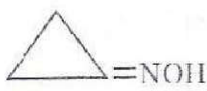
Q.No.	Key Points	Marks
1	ii	1
2	Zeolites/ZSM5/or any other suitable example.	1
3	(i)	1
4	Because of partial double bond character in carboxylic acids.	1
5	iii	1
6	Zinc	1
7	iii	1
8	Due to collision between particles.	1

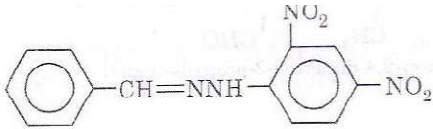| 9	Bond dissociation energy usually decreases on moving down a group as the atomic size increases. However, the bond dissociation energy of F_2 is lower than that of Cl_2 and Br2. This is due to the small atomic size of fluorine. Thus, the increasing order for bond dissociation energy among halogens is as follows: $I_2 < F_2 < Br_2 < Cl_2$	1
10	iv	1
11	As we move down the group from sulphur to polonium the electro negativity decreases.	1
12	c	1
13	i	1
14	Any correct example	1
15	i . .	1
16	0.2% solution of phenol acts as antiseptic whereas 1% solution of phenol acts as disinfectant	1
17	i	1
18	The ionisation isomer is $[Co(NH_3)_5SO_4]Br$. The IUPAC name is Pentaamminesulphatocobalt(III)bromide.	1
19	Fe exists as Fe^{2+}. There are 4 unpaired electrons. Water is a weak ligand. Thus the hybridisation involved is sp_3d_2. It is an octahedral outer orbital complex. (marks to be granted if hybridisation is depicted diagrammatically)	1
20	i	1
21	No, the elevation in boiling point is not the same. Elevation in boiling point is a colligative property which depends on the number of particles. NaCl is an ionic compound which dissociates in solution to give more number of particles whereas sugar is made up of molecules and thus does not dissociate.	½ 1½

22.	(a)As seen from the graph, electrolyte A is a strong electrolyte which is completely ionised in solution. With dilution, the ions are far apart from each other and hence the molar conductivity increases. (b) To determine the value of limiting molar conductivity for electrolyte B, indirect method based upon Kohlrausch law of independent migration of ions is used.	1 1
23	(a) Vitamin B & C (b) It is excreted through urine	
24	.(i) Amylose is a long unbranched chain polymers of α-D(+)glucose.Amylopectin is a branched chain polymer of α-D glucose. (ii) globular protein and its shape is spherical	
25	Correct reactions Or (a) This is a method for preparation of primary amines bytreating an amide with bromine in an aqueous or ethanolicsolutionofsodium hydroxide. $$R - \overset{\overset{O}{\|}}{C} - NH_2 + Br_2 + 4NaOH \longrightarrow R - NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$ (b) This method is used for the preparation of primary amines from phthalimide. 	1 1
26	(a) +I effect (b) H-bonding in ethylamine whereas no H-bonding in Aniline due to large Hydrophobic C_6H_5- OR AlCl3 is used as Lewis Acid in Friedel Craft's Reaction reacts with aniline which is also a strong base to form salt.	1 1 2
27	(a) Chlorine gas is produced. $2NaCl + MnO_2 + 2H_2SO_4$ (conc.)$Na_2SO_4 + MnSO_4 + 2H_2O + Cl_2$ (b) Iodine is liberated $2NaI + Cl_2 \; 2NaCl + I_2$	1+1 ↑
28	Molar mass of KCl = 39+35.5 = 74.5 g mol^{-1} As KCl dissociates completely, number of ions produced are 2. Therefore, van't Hoff factor, i=2 Mass of KCl solution = 1000 × 1.04 = 1040 g Mass of solvent = 1040 – 74.5 = 965.5 g = 0.9655 kg Molality of the solution = (No. of moles of solute)/(Mass of solvent in kg) = 1 mol/0.9655 kg	 ½ ½

		= 1.0357 m	½
			½
		$\Delta T_b = i \times K_b \times m$	1
		$\quad = 2 \times 0.52 \times 1.0357 = 1.078\ ^0C$	
		Therefore, boiling point of solution = 100 + 1.078 = 101.078 ^0C	
29		Anode reaction: $Zn(s) \longrightarrow Zn^{2+}(aq) + 2e^-$	½
		Cathode reaction: $Pb^{2+}(aq) + 2e^- \longrightarrow Pb(s)$	½
		Cell representation: $Zn(s)/Zn^{2+}(aq)// Pb^{2+}(aq)/Pb(s)$	½
		According to Nernst equation:	
		$E_{cell} = E^0_{cell} - (0.059/n)\log([Zn^{2+}]/[Pb^{2+}])$	½
		$E_{cell} = [-0.13-(-0.76)]-(0.059/2)\log(0.1/0.02)$	½
		$\quad = 0.63 - 0.02955 \times \log 5$	
		$\quad = 0.63 - 0.0206 = 0.6094V$	½
30		(a) A reddish brown coloured colloidal solution is obtained.	1
		(b) Stability of lyophilic sols is due to:	
		(i) same charge on all the colloidal particles.	½
		(ii) solvation of the colloidal particles.	½
		(c) At high pressures, amount of gas adsorbed (x/m) becomes independent of	
		pressure (P)	1
		$(x/m) = k \times P^0$	
31		**(a) Vapour phase refining:** Vapour phase refining is the process of refining metal by converting it into its volatile compound and then, decomposing it to obtain a pure metal. Any example	1
			1
		(b) Leaching is often used if the ore is soluble in some suitable solvent. Any example	
			1
		(c) *Roasting*: The sulphide ore is heated in a regular supply of air in a furnace at a	
		temperature below the melting point of the metal. Any example	
		OR	
		(a)Entropy is higher when a metal is in the liquid state than when it is in the solid state. Thus TΔS increases, thus ΔG^0 becomes more negative and the reduction becomes easier. ($\Delta G = \Delta H - T\Delta S$)	1
		(b) Limestone provides the flux (CaO) which combines with the impurities (SiO^2) to form slag ($CaSiO_3$). Thus it helps in the removal of impurities.	1
		(c) Pine oil (Collector) enhances the non wettability of the ore particles, which become lighter and hence rise to the surface along with the froth.	1
32		(a) KCN is predominantly ionic and provides cyanide ions in solution. Although both carbon and nitrogen atoms are in a position to donate electron pairs, the attack takes place mainly through carbon atom and not through nitrogen atom since C—C bond is more stable than C—N bond. However, AgCN is mainly covalent in nature and nitrogen is free to donate electron pair forming isocyanide as the main product.	1½
		(b)Since the alkyl halide reacts with KOH to form a racemic mixture, it must be a 3o alkyl halide and the reaction will follow SN1 mechanism.	1½

33	(a) T – Shaped (b) Square pyramidal (c) Pyrosulphuric acid (Oleum) $(H_2S_2O_7)$	1 1 1
34	(i) Since the alkyl halide is a 3° halide and C_2H_5ONa is a strong base, therefore elimination occurs preferably. The product obtained is 2-Methylprop-1-ene. $CH_3-C(CH_3)=CH_2$ (ii) To prepare t-Butyl ethyl ether, the alkyl halide should be 1° i.e. chloroethane and the nucleophile should be sodium t-butoxide because the 3° nucleophile is able to attack 1° alkyl halide. $(CH_3)_3C\text{-}O^-Na^+ + CH_3CH_2\text{-}Cl \longrightarrow (CH_3)_3C\text{-}OCH_2CH_3$	1 ½ + ½ 1
35	(a) (i) The delocalisation of benzene electrons contributes little towards the stability of phenoxide ion. The carboxylate ion is much more resonance stabilized than phenoxide ion. (ii) Semicarbazide has two $-NH_2$ groups. One of them, which is directly attached to C=O is involved in resonance. Thus electron density on this group decreases and it does not act as a nucleophile. In contrast, the lone pair of electrons on the other $-NH_2$ group is available for nucleophilic attack. $\qquad\qquad\qquad\qquad\qquad\qquad H_2O$ (b) (i) $PhMgBr + O=C=O \rightarrow PhCOOMgBr \text{-----------------}\rightarrow PhCOOH$ (ii) $\qquad\qquad OH^-heat$ $2CH_3CHO \text{ ----------}\rightarrow CH_3CH(OH)\text{-}CH_2CHO\text{-------------------}\rightarrow CH_3CH=$ CH- CHO (iii) $\qquad (CH_3CO)_2O, \text{ anh } AlCl_3 \qquad\qquad\qquad conc.H_2SO_4 + conc.$ HNO_3 $C_6H_6 \text{ ------------------------------------}\rightarrow PhCOCH_3 \text{ ------------------------------}$ $\text{-------}\rightarrow m\text{-}NO_2C_6H_4COCH_3$ $\qquad Or \ CH_3COCl/AlCl_3$	1 1 1 1 1 1

	OR	
	(a) Ethanal and propanal can be distinguished by Iodoform test. Ethanal gives a yellow precipitate of iodoform with an alkaline solution of NaOH. Propanal does not give this test. $CH_3CHO + 4NaOH + 3I_2 \xrightarrow{} CHI_3 + HCOONa + 3H_2O + 3NaI$	1
	(i)X_2, red P (ii) H_2O (b) $RCH_2COOH \xrightarrow{\hspace{4cm}} RCH(X)COOH$ The name of the reaction is Hell VohlardZelinsky reaction	½ ½
	(b) (i) 	1
	(ii) 	1
	(iii) 	1
36	(a) For a first order reaction $K = (2.303/t)\log([R]_o/[R])$, where $[R]_o$ = initial concentration, $[R]$ = conc. After time t When half of the reaction is completed, $[R] = [R]_o/2$. Representing, the time taken for half of the reaction to be completed, by $t_{1/2}$, equation becomes: $K = (2.303/t_{1/2})\log([R]_o/[R]_o/2)$ $t_{1/2}= (2.303/k)\log2$ $t_{1/2} = 0.693/k$ The above equation shows that half life first order reaction is independent of the initial concentration of the reactant.	1 ½ ½ 1
	(c) For a first order reaction, $t = (2.303/k)\log[a/(a-x)]$ $\quad\quad\quad\quad\quad t_{99\%} = (2.303/k)\log[a/(a-0.99a)]$ $\quad\quad\quad\quad\quad t_{90\%} = (2.303/k)\log[a/(a-0.90a)]$ $\quad\quad t_{99\%}/t_{90\%} = (2 \times 2.303/k) / (2.303/k) = 2$ $\quad\quad t_{99\%} = t_{90\%} \times 2$	½ ½ 1
	OR	
	(a) $r = k[R]^n$ When concentration is increased three times, $[R] = 3a$ $27r = k(3a)^n$ $(27r/r) = k(3a)^n/ka^n$ or $27 = 3^n$ or $33 = 3^n$, $n = 3$ (b)According to Arrhenius equation, $Logk = \log A – (E_a/2.303RT)$ For uncatalysed reaction $Logk_1 = \log A – (E_a(1)/2.303RT)……(i)$ For catalysed reaction $Logk_2 = \log A – (E_a(2)/2.303RT)……..(ii)$ A is equal for both the reactions.	 ½ ½ 1 ½

	Subtracting equation(i) from equation(ii)	
	$\log(k_2/k_1) = [E_a(1)-E_a(2)]/2.303RT$	½
	$\log(k_2/k_1) = [75.2-50.14]kJmol^{-1}/(2.303 \times 8.314 JK^{-1}mol^{-1} \times 298)$	
	$\log(k_2/k_1) = 4.39$	1
	$(k_2/k_1) = $ antilog (4.39)	
	$= 2.45 \times 104$	1
	Rate of reaction increases by 2.45×104 times.	
37	Ans.(a)The steady decrese in atomic size (from 183 pm to 173 pm)and in ionic radii(from 103pm to 85 pm) of lanthaniod elements with increasing atomic number is called lnthanoid contraction.	1
	Reason:-1)On moving left to right in lanthanoid series 1)nuclear charge increases by 1 unit.2)one electron is added in4f, However 4f electrons shield each other from nuclear charge poorly due to highly diffused shape of f-orbital therefore nuclear charge becomes more effective and causes very gradual decrese in size.	1
	Consequences:- 1.Resemblence of 2nd and 3rd transition series. 2.Similarity among lanthanoids. 3.Bascity difference.	1
	(b) 1) $2MnO_2 + 2K_2CO_3 + O_2 \rightarrow 2K_2MnO_4 + 2CO_2$	1
	2) $3K_2MnO_4 + 2CO_2 \rightarrow 2K_2CO_3 + 2MnO_2 + 2KMnO_4$	1
	OR	
	Ans.(i) Enthalpy of atomisation is the amount of heat required to break the metal lattice to get free atoms.As transition metals contain a large number of unpaired electrons,they have strong interatomic attractions (metallic bonds).Hence,they have high enthalpies of atomisation.	1

	(ii) Transition elements act as good catalysts:
	   (a) Due their variable oxidation states, they form intermediate complexes, thereby providing a new path for the reaction with lower oxidation state,
	   (b) They provide a surface for the reaction, to occur.
		1

	(iii) Since they do not have any unpaired electrons in their configuration.	1
	(iv) Cr^{2+} is strongly reducing because its configuration changes from 3d4 to 3d3 which is stable because of half filled t2g subshell.On the other hand Mn(III) is strongly oxdising because of half filled 3d5 configuration.	1
	(v) $E^0 (M^{2+}/ M)$ for any metal is the sum of the enthalpy changes taking place in the following steps: $M_{(s)} + \Delta_a H \rightarrow M_{(g)}$, Δ_aH = enthalpy of atomization	1
	$M_{(g)} + \Delta_i H \rightarrow M^{2+}_{(g)}$, Δ_iH = ionization enthalpy $M^{2+}_{(g)} + aq \rightarrow M^{2+}_{(aq)} + \Delta_{hyd}H$, $\Delta_{hyd}H$ = hydration enthalpy Copper has high enthalpy of atomization and low enthalpy of hydration so $E^0 (Cu^{2+}/ Cu)$ is positive.	

PAPER NO 06

QUESTION PAPER
CLASS 12
SUBJECT CHEMISTRY

MM 70   **TIME 3 Hrs**

Q. 1	Which of the following aqueous solutions should have the highest boiling point? (i) 1.0 M NaOH (ii) 1.0 M Na_2SO_4 (iii) 1.0 M NH_4NO_3 (iv) 1.0 M KNO_3	1 MARK
Q. 2	The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is _____. (i) 1F (ii) 6F (iii) 3F (iv) 2F	1 MARK
Q. 3	The role of a catalyst is to change _____. (i) gibbs energy of reaction. (ii) enthalpy of reaction. (iii) activation energy of reaction. (iv) equilibrium constant.	1 MARK
Q. 4	Which of the following interface cannot be obtained? (i) liquid-liquid (ii) solid-liquid (iii) liquid-gas (iv) gas-gas	1 MARK

Q. 5	Zone refining is based on the principle that _____.
	   (i) impurities of low boiling metals can be separated by distillation.
	   (ii) impurities are more soluble in molten metal than in solid metal.
	   (iii) different components of a mixture are differently adsorbed on an adosrbent. (iv) vapours of volatile compound can be decomposed in pure met
		1 MARK

Q. 6	Affinity for hydrogen decreases in the group from fluorine to iodine. Which of the halogen acids should have highest bond dissociation enthalpy? (i) HF (ii) HCl (iii) HBr (iv) HI	1 MARK
Q. 7	Electronic configuration of a transition element X in +3 oxidation state is $[Ar]3d^5$. What is its atomic number? (i) 25 (ii) 26 (iii) 27 (iv) 24	1 MARK
Q. 8	The correct IUPAC name of $[Pt(NH_3)_2Cl_2]$ is (i) Diamminedichloridoplatinum (II) (ii) Diamminedichloridoplatinum (IV) (iii) Diamminedichloridoplatinum (0) (iv) Dichloridodiammineplatinum (IV)	1 MARK
Q. 9	The position of –Br in the compound in $CH_3CH=CHC(Br)(CH_3)_2$ can be classified as _____. (i) Allyl (ii) Aryl (iii) Vinyl (iv) Secondary	1 MARK
Q. 10	The process of converting alkyl halides into alcohols involves_____. (i) addition reaction (ii) substitution reaction (iii) dehydrohalogenation reaction (iv) rearrangement reaction	1 MARK
Q. 11	The correct order of increasing acidic strength is _____. (i) Phenol < Ethanol < Chloroacetic acid < Acetic acid (ii) Ethanol < Phenol < Chloroacetic acid < Acetic acid (iii) Ethanol < Phenol < Acetic acid < Chloroacetic acid (iv) Chloroacetic acid < Acetic acid < Phenol < Ethanol	1 MARK
Q. 12	The correct decreasing order of basic strength of the H_2O, NH_3 , OH^- , NH_2^- is _____. (i)NH_2^-> OH^-> NH_3> H_2O (ii) OH^->NH_2^-> H_2O > NH_3	1 MARK

	iii) $NH_3 > H_2O > NH_2^- > OH^-$ (iv) $H_2O > NH_3 > OH^- > NH_2^-$	
Q. 13	Which of the following B group vitamins can be stored in our body? (i) Vitamin B_1 (ii) Vitamin B_2 (iii) Vitamin B_6 (iv) Vitamin B_{12}	1 MARK
Q. 14	Which of the following statements is not true about low density polythene? (i) Tough (ii) Hard (iii) Poor conductor of electricity (iv) Highly branched structure	1 MARK
Q. 15	17. Freshly prepared precipitate sometimes gets converted to colloidal solution by _____. (i) coagulation (ii) electrolysis (iii) diffusion (iv) peptisation	1 MARK
Q. 16	Which of the following polymer is stored in the liver of animals? (i) Amylose (ii) Cellulose (iii) Amylopectin (iv) Glycogen	1 MARK
Q. 17	Amongst the following, the strongest base in aqueous medium is _____. (i) CH_3NH_2 (ii) $NCCH_2NH_2$ (iii) $(CH_3)_2 NH$ (iv) $C_6H_5NHCH_3$	1 MARK
Q. 18	Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is (i) Electrophilic elimination reaction (ii) Electrophilic substitution reaction (iii) Free radical addition reaction (iv) Nucleophilic substitution reaction	1 MARK
Q. 19	The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct? (i) Cu(II) is more stable (ii) Cu(II) is less stable (iii) Cu(I) and Cu(II) are equally stable (iv) Stability of Cu(I) and Cu(II) depends on nature of copper salts	1 MARK
Q. 20	Which of the following elements can be involved in $p\pi–d\pi$ bonding? (i) Carbon (ii) Nitrogen (iii) Phosphorus (iv) Boron	1 MARK
Q. 21	The conductivity of 0.20 M solution of KCl at 298 K is 0.025 S cm−1. Calculate its molar conductivity.	2 MARKS
Q. 22	Describe the principle controlling each of the following processes: (i) Preparation of cast iron from pig iron. (ii) Preparation of pure alumina (Al2O3) from bauxite ore.	2 MARKS
Q. 23	Explain as to why haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions. OR Which compound in each of the following pairs will react faster in SN^2 reaction with —OH? Why? (i) CH_3 Br or CH_3 I (ii) $(CH_3)_3$ CCl or CH_3 Cl	2 MARKS
Q. 24	List the reactions of glucose which cannot be explained by its open chain structure.	2 MARKS
Q. 25	Mention two important uses of each of the following: (i) Bakelite (ii) Nylon-6	2 MARKS
Q. 26	Explain the following giving a reason in each case: (i) Why is an alkylamine more basic than ammonia? (ii) Why do primary amines have higher boiling points than the tertiary amines?	2 MARKS
Q. 27	State Henry's law correlating the pressure of a gas and its solubility in a solvent and mention two applications of the law.	2 MARKS
Q. 28	(a) Define any two of the following terms: (i) van't Hoff factor (ii) Mole fraction (iii) Ebullioscopic constant (b) State Raoult's law. OR The density of water of a lake is 1.25 g $(mL)^{-1}$ and one kg of this water contains 92 g of Na^+ ions. what is the molarity of Na^+ ions in the water of the lake? (Atomic mass of Na = 23.00 u)	3 MARKS
Q. 29	Formulate the galvanic cell in which the following reaction takes place:	3 MARKS

	Zn(s) + 2Ag$^+$ (aq) →Zn^{2+} (aq) + 2Ag(s) State: (i) Which one of its electrodes is negatively charged? (ii) The reaction taking place at each of its electrode. (iii) The carriers of current within this cell.	
Q. 30	What happens in the following activities and why? 3 (i) An electrolyte is added to a hydrated ferric oxide sol in water. (ii) A beam of light is passed through a colloidal solution. (iii) An electric current is passed through a colloidal solution.	3 MARKS
Q. 31	How would you account for the following: (i) Among lanthanoids, Ln (III) compounds are predominant. However, occasionally in solutions or in solid compounds, +2 and +4 ions are also obtained. (ii) The E^o$_{M /M2+}$ for copper is positive (0.34 V). Copper is the only metal in the first series of transition elements showing this behaviour. (iii) The metallic radii of the third (5d) series of transition metals are nearly the same as those of the corresponding members of the second series.	3 MARKS
Q. 32	Explain the following: (i) Low spin octahedral complexes of nickel are not known. (ii) The p-complexes are known for transition elements only. (iii) CO is a stronger ligand than NH$_3$ for many metals. OR Compare the following complexes with respect to structural shapes of units, magnetic behaviour and hybrid orbitals involved in units: (i) [Ni(CN)$_4$]$^{2-}$(ii) [NiCl$_4$]$^{2-}$ (iii) [CoF$_6$]$^{3-}$[At. Nos,: Ni = 28; Co = 27]	3 MARKS
Q. 33	Illustrate the following name reactions giving chemical equations: (i) Reimer-Tiemann reaction (ii) Williamson synthesis	3 MARKS
Q. 34	Describe the following substances with one suitable example of each type: 3 (i) Non-ionic detergents (ii) Food preservatives (iii) Disinfectants	3 MARKS
Q. 35	(a) A reaction is second order in A and first order in B. (i) Write the differential rate equation. (ii) How is the rate affected on increasing the concentration of A three times? (iii) How is the rate affected when the concentrations of both A and B are doubled? (b) A first order reaction takes 40 minutes for 30% decomposition. Calculate t$_{1/2}$ for this reaction. (Given log 1.428 = 0.1548) OR (a) For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction. (b) Rate constant 'k' of a reaction varies with temperature 'T' according to the equation: $$\log k = \log A - \frac{E_a}{2.303\ R}\left(\frac{1}{T}\right)$$ Where E$_a$ is the activation energy. When a graph is plotted for log k vs. 1/ T , a straight line with a slope of – 4250 K is obtained. Calculate 'Ea' for the reaction. (R = 8.314 JK^{-1} mol^{-1})	5 MARKS
Q. 36	(a) Give reasons for the following: (i) Bond enthalpy of F$_2$ is lower than that of Cl$_2$. (ii) PH$_3$ has lower boiling point than NH$_3$. (b) Draw the structures of the following molecules: (i) BrF$_3$ (ii) (HPO$_3$)$_3$ (iii) XeF$_4$ OR (a) Account for the following: (i) Helium is used in diving apparatus. (ii) Fluorine does not exhibit positive oxidation state. (iii) Oxygen shows catenation behaviour less than sulphur.	5 MARKS

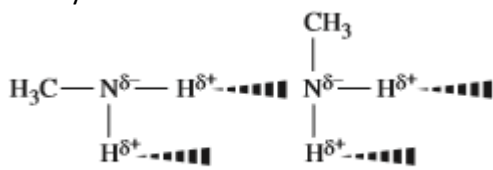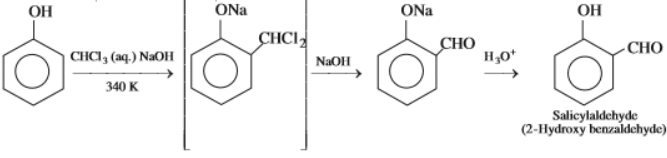|		
	(b) Draw the structures of the following molecules: (i) XeF_2 (ii) $H_2S_2O_8$	
Q. 37	(a) Describe the mechanism of the addition of Grignard reagent to the carbonyl group of a compound to form an adduct which on hydrolysis yields an alcohol. (b) Draw the structures of the following compounds: (i) 3-Methylbutanal (ii) Hexane-1,6-diotic acid (iii) p-Nitropropiophenone OR (a) Illustrate the following reactions giving a suitable chemical equation for each: (i) Cannizzaro reaction (ii) Hell-Volhard-Zelinsky reaction (b) How would you bring about the following conversions? Write the complete equation in each case. (i) Ethanol to 3-hydroxybutanal (ii) Benzoic acid to m-nitrobenzyl alcohol (iii) Benzaldehyde to benzophenone	5 MARKS

MARKING SCHEME
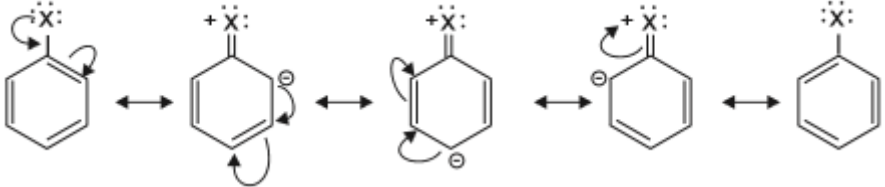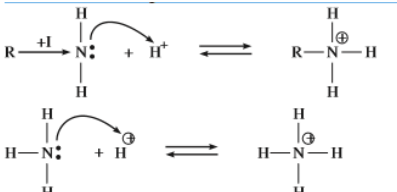
CLASS 12

SUBJECT CHEMISTRY
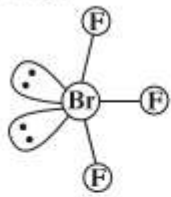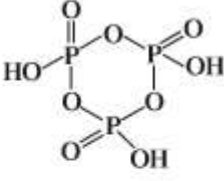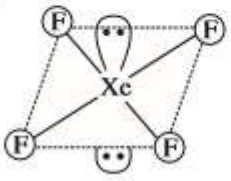
MM 70   **TIME 3 Hrs**

Q. 1	(ii) 1.0 M Na_2SO_4	1 MARK
Q. 2	(iii)3F	1 MARK
Q. 3	(iii)activation energy of reaction.	1 MARK
Q. 4	(iv) gas-gas	1 MARK
Q. 5	(ii) impurities are more soluble in molten metal than in solid metal.	1 MARK
Q. 6	(i) HF	1 MARK
Q. 7	(ii) 26	1 MARK
Q. 8	(i) Diamminedichloridoplatinum	1 MARK
Q. 9	(i) Allyl	1 MARK
Q. 10	(ii) substitution reaction	1 MARK
Q. 11	(iii) Ethanol < Phenol < Acetic acid < Chloroacetic acid	1 MARK
Q. 12	(i)NH_2^- > OH⁻> NH_3> H_2O	1 MARK
Q. 13	(iv) Vitamin B_{12}	1 MARK
Q. 14	(iii) Poor conductor of electricity	1 MARK
Q. 15	(iv) peptisation	1 MARK
Q. 16	(iv) Glycogen	1 MARK
Q. 17	(iii) $(CH_3)_2$ NH	1 MARK
Q. 18	(ii) Electrophilic substitution reaction	1 MARK
Q. 19	(i) Cu(II) is more stable	1 MARK
Q. 20	(iii) Phosphorus	1 MARK
Q. 21	$$\Lambda_m = \frac{k \times 1000}{c} = \frac{0.025 \text{ S cm}^{-1} \times 1000 \text{ cm}^3 \text{ L}^{-1}}{0.20 \text{ mol L}^{-1}} = 125 \text{ S cm}^2 \text{ mol}^{-1}$$	2 MARKS

Q. 22	i) Pig iron is melt with scrap iron and coke using hot air blast. Due to this, impurities such as C, S and P present in the pig iron are removed as CO_2, SO_2 and P_2O_5 and carbon content reduced to about 3%.	1
	(ii) Bauxite is soluble in concentrated NaOH solution whereas impurities are not	1
Q. 23	In haloarenes C—X bond acquires a partial double bond character due to resonance. As a result the bond cleavage in haloarenes is difficult than haloalkanes and therefore, they are less reactive towards nucleophilic substitution reaction.	1
		1
	OR	
	(i) CH_3–I reacts faster than CH_3–Br as iodine is a better leaving group because of its larger size.	1
	(ii) CH_3–Cl (1° halide) reacts faster than $(CH_3)_3CCl$ (3° halide) since in case tertiary butyl chloride three bulky methyl group hinder the approaching nucleophile.	1
Q. 24	The following reactions of glucose cannot be explained by its open chain structure. (i) Despite having the aldehyde group glucose does not give 2, 4-DNP test, Schiffs test and it does not form the hydrogen sulphite addition product with $NaHSO_3$.	1
	(ii) The pentacetate of glucose does not react with hydroxylamine indicating the absence of free —CHO group.	
	(iii) When D-glucose is treated with methanol in the presence of dry hydrogen chloride gas, it gives two isomeric mono methyl derivatives known as a-D glucoside and methyl b-D glucoside. These glucosides do not react with hydrogen cyanide or with hydroxylamine.	1
Q. 25	(i) Bakelite is used for making combs, electrical switches, handles of various utensils and phonograph records.	1
	(ii) Nylon-6 is used for making tyre cords, ropes and fabrics	1
Q. 26	(i) Alkylamine is more basic than ammonia because in aliphatic amines, the electron releasing alkyl group stabilize their ammonium cations by dispersing the positive charge and in parent amine make the nitrogen unshared electrons more available for sharing with a proton.	1
	(ii) The boiling points of primary amine are higher than the tertiary amines because strong intermolecular hydrogen bonding takes place between the molecules of primary amine.	
		1
Q. 27	It states that at constant temperature the mass of a gas(m) dissolved in a given volume of the liquid is directly proportional to the pressure of the gas ( ) P present in equilibrium with the liquid.	1

	Mathematically, $m \propto \mu$ or $m = K_H \mu =$ where K_H is the Henry's law constant. Applications of Henry's law are (i) To increase the solubility of CO_2 in soft drinks and soda water, the bottle is sealed under high pressure. (ii) To minimize the painful effects accompanying the decompression of deep sea divers, oxygen diluted with less soluble helium gas is used as breathing gas.	1
Q. 28	(a) Van't Hoff factor: (i) May be defined as the ratio of normal molecular mass to observed molecular mass or the ratio of observed colligative property to calculated colligative property.	1
	(ii) Mole fraction may be defined as the ratio of number of moles of one component to the sum of moles all the components present in a solution.	1
	(iii) Ebuthoscopic constant may be defined as the elevation in boiling point when one mole of a non-volatile solute is added to 1000 grams of solvent.	
	(b) It states that for a solution of volatile liquids the partial vapour pressure of each component in the solution is directly proportional to its mole faction. OR	1
	Number of moles of solute, Na^+ ions = 92g /23g mol^{-1}= 4 mol Volume of solution = Mass of solution/ Density of solution g g mL = 1000 /1. 25 1 .	1
	=800mL = 800/ 1000 L = 0.8 L Molarity = Number of moles Na^+ ions Volume of solution in liter =4 mol /0.8 L	1
	= 5 mol L^{-1} or 5 m.	1
Q. 29	Zn/ Zn^{2+} (conc.) $//Ag$ (conc)$/ Ag^{2+}$ (i) Zn electrode is negatively charged.	1
	(ii) At anode $Zn \rightarrow Zn^{2+} + 2e^-$ At cathode $2Ag^+ + 2e- \rightarrow 2Ag$	1
	(iii) Current carriers of cell are electrons in external wire. Zn^{2+} ions in anodic half cell. Ag^+ ions in cathodic half cell. Ions of salt bridge, i.e., K^+ and Cl^-.	1
Q. 30	(i) The positively charged colloidal particles of $Fe(OH)_3$ get coagulated by the negatively charged ions provided by electrolyte.	1
	(ii) The path of light becomes visible due to scattering of light by colloidal particles (Tyndall effect).	1
	(iii) Electrophoresis takes place in which colloidal particles move towards the oppositely charged electrode where they lose their charge and get coagulated.	1
Q. 31	(i) Lanthanoid metals show +2 and +4 oxidation states to attain extra stable f^0 and f^7 configurations.	1
	(ii) The main reason for positive E°(0.34 V) value for copper is that the sum of enthalpies for sublimation and ionisation is not balanced by hydration enthalpy.	1
	(iii) This is due to lanthanoid contraction which arises due to filling of 4 f-orbitals which have poor shielding effect.	1
Q. 32	(i) Ni in its atomic ionic state can not afford two vacant 3d orbitals hence d sp 2 3 hybridisation is not possible.	1
	(ii) Transition metals have vacant d orbitals in their atoms or ions into which the electron pairs can be donated by ligands containing p electrons, e.g., C_6H_6, $CH_2=CH_2$, etc. Thus $d\pi p\pi$ bonding is possible.	1
	(iii) Because in case of CO back bonding takes place in which the central metal uses	1

	its filled d orbital with empty anti bonding p* molecular orbital of CO. OR		

Complex ion	Central metal ion	Configuration of metal ion	Hybridisation of metal ion involved	Geometry of complex ion	Number of unpaired electrons	Mag beha	
$[Ni(CN)_4]^{2-}$	Ni^{2+}	d^8	dsp^2	Square planar	0	Diam	1
$[Ni(Cl)_4]^{2-}$	Ni^{2+}	d^8	sp^3	Tetrahedral	2	Para ic	1
$[CoF_6]^{3-}$	Co^{3+}	d^6	sp^3d^2	Octahedral	4	Para ic	1

Q. 33	(i) **Reimer-Tiemann reaction** (ii) Williamson synthesis $C_2H_5ONa + ICH_3 \rightarrow C_2H_5OCH_3 + NaI$ Sodium ethoxide Methyl-ethyl ether	2 1
Q. 34	(i) Non-ionic detergents: These are the esters of high molecular mass alcohols with fatty acids. These are named so because they do not contain any ion in their constitution, e.g., polyethylene glycol stearate. (ii) Food preservatives: These are the substances which prevent spoilage of food due to microbial growth, e.g., sodium benzoate, potassium metabisulphite, salts of sorbic acid and propanoic acid, etc. (iii) Disinfectants: These are the chemical substances which kill micro-organisms or stop their growth but are harmful to human tissues, e.g., phenol (1%), chlorine in concentration of 0.2 to 0.4 pm in aqueous solution, SO2, etc.	1 1 1
Q. 35	(a) (i) Rate $= -\dfrac{d[R]}{dt} = k[A]^2[B]$ (ii) When concentration of A is tripled Rate $= k[3A]^2[B] = 9k[A]^2[B]$ i.e., Rate of reaction will become 9 times. (ii) When concentration of both A and B is doubled Rate $= k[2A]^2[2B] = 8k[A]^2[B]$ i.e., Rate of reaction will become 8 times. (b) For a first order reaction $$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$$ when $t = 40$ minutes, $\dfrac{[R]_0}{[R]} = \dfrac{100}{100-30} = \dfrac{10}{7}$ $$k = \frac{2.303}{40} \log \frac{10}{7} = \frac{2.303}{40} \log 1.428$$ $$k = \frac{2.303}{40} \times 0.1548$$	1 1 1 1 1 1

$$k = 8.91 \times 10^{-3} \text{ min}^{-1}$$

$$t_{1/2} = \frac{0.693}{k} = \frac{0.693}{8.91 \times 10^{-3}}$$

$$t_{1/2} = 77.78 \text{ min.}$$

OR

(a) As $t = \dfrac{2.303}{k} \log \dfrac{[R]_0}{[R]}$

$$\therefore \quad \frac{t_{99\%}}{t_{90\%}} = \frac{\dfrac{2.303}{k} \log \dfrac{100}{1}}{\dfrac{2.303}{k} \log \dfrac{100}{10}} = \frac{\log 100}{\log 10} = 2$$

Hence $t_{99\%} = 2t_{90\%}$

(b) Slope $= -\dfrac{E_a}{2.303 \times R} = -4250\text{ K}$

$$E_a = -4250 \times 2.303 \times 8.314$$
$$= 81375 \text{ J mol}^{-1}$$
$$= 81.375 \text{ kJ mol}^{-1}$$

Q. 36	(a) (i) Bond dissociation enthalpy decreases as the bond distance increases from F_2 to I_2 because of the corresponding increase in the size of the atom as we move from F to I. The F—F bond dissociation enthalpy is, however, smaller than that of Cl—Cl and even smaller than that of Br—Br. This is because F atom is very small and hence the three lone pairs of electrons on each F atom repel the bond pair holding the F-atoms in F2 molecule. Hence, the bond dissociation enthalpy increases in the order: I_2 F_2 Br_2 Cl_2 . (ii) Unlike NH_3 , PH_3 molecules are not associated through hydrogen bonding in liquid state. That is why the boiling point of PH_3 is lower than NH_3 . (b) (i) BrF₃ Slightly bent "T" (ii) (HPO₃)₃ (iii) XeF₄ Square planar OR (a) (i) Helium is used as a diluent for oxygen in modern diving apparatus because of its very low solubility in blood. (ii) This is because fluorine is the most electronegative element. (iii) Because O—O single bond is weaker than S—S single bond.	1 1 1,1 1

Marks column (right): 1, 1, 1, 1, 1

	(ii) $H_2S_2O_8$ Peroxodisulphuric acid $(H_2S_2O_8)$		
Q. 37	(a) Mechanism: (i) Nucleophilic addition of Grignard reagent to carbonyl group to form an adduct. (ii) Hydrolysis of the adduct to alcohol. (b) Name of compound Structure (i) S–Methyl butanal (ii) Hexane–1, 6–dioic acid $HOOC—CH_2—CH_2—CH_2—CH_2—COOH$ (iii) P–Nitropropiophenone OR (a) (i) Cannizzaro reaction: Aldehydes which do not have an–a hydrogen atom, undergo disproportionation reaction on treatment with concentrated alkali. In this reaction, one molecule of the aldehyde is reduced to alcohol while another is oxidised to salt of carboxylic acid. (ii) Hell-Volhard-Zelinsky reaction: Carbosylic acids having an a-hydrogen are halogenated at the a-position on treatment with chlorine or bromine in the presence of small amount of red phosphurs to give a-halocarboxylic acids. 	1 1 1 1 1 1 1 1 1 1 1	

(b) (i) CH_3CHO $\xrightarrow{\text{dil NaOH}}$ $CH_3 - \overset{\displaystyle CH_3}{\underset{\displaystyle |}{CH}} - CH_2 - CHO$

Ethanol 3–Hydroxybutanol

(ii) Benzoic acid $\xrightarrow[\text{H}_2\text{SO}_4(\text{conc.}) ; \Delta]{\text{HNO}_3 (\text{conc.})}$ (COOH, NO$_2$) $\xrightarrow[\Delta]{+NH_3}$ (CONH$_2$, NO$_2$) $\xdownarrow{\text{LiAlH}_4}$ (CH$_2$—NH$_2$, NO$_2$) $\xrightarrow{\text{HNO}_2}$ (CH$_2$OH, NO$_2$) p–Nitro benzyl alcohol

(iii) Benzaldehyde (CHO) $\xrightarrow[\text{(O)}]{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4}$ Benzoic acid (COOH) $\xrightarrow{\text{SOCl}_2}$ (COCl) $\xrightarrow[\text{AlCl}_3 (\text{anhyd.})]{+ \text{C}_6\text{H}_6}$ Benzophenone

1

BLUE-PRINT
XII-CHEMISTRY

S.N.	CHAPTER	MCQ(1M)	SQ(2M)	SQ(3M)	LQ(5M)	Total	TOTAL
1	SOLUTIONS	1(1)	2(1)	3(1)		6	23(11)
2	ELECTROCHEMISTRY	1(1)	2(1)	3(1)		6	
3	CHEMICAL KINETICS	1(1)			5(1)	6	
4	SURFACE CHEMISTRY	2(2)		3(1)		5	
5	GENERAL PRINCIPLES & PROCESSES OF ISOLATION OF ELEMENTS	1(1)	2(1)			3	19(10)
6	P-BLOCK ELEMENTS	2(2)			5(1)	7	
7	d-AND f-BLOCK ELEMENTS	2(2)		3(1)		5	
8	COORDINATION COMPOUNDS	1(1)		3(1)		4	
9	HALOALKANES & HALOARENES	2(2)	2(1)			4	28(16)
10	ALCOHOLS, PHENOLS & ETHERS	1(1)		3(1)		4	
11	ALDEHYDES, KETONES & CARBOXYLIC ACIDS	1(1)			5(1)	6	
12	ORGANIC COMPOUNDS CONTAINING NITROGEN	2(2)	2(1)			4	
13	BIOMOLECULES	2(2)	2(1)			4	
14	POLYMERS	1(1)	2(1)			3	
15	CHEMISTRY IN EVERYDAY LIFE			3(1)		3	
	TOTAL	20(20)	14(7)	21(7)	15(3)		70(37)

PAPER NO 07

KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION
SESSION-2019-20
SUBJECT: - CHEMITSRY
CLASS XII

MM:- 70   **TIME:- 3 HOURS**

General Instructions :
(i) All questions are compulsory.
(ii) Section A: Question numbers 1 to 20 are MCQ and carrry 1 mark each.
(iii) Section B: Question numbers from 21 to 27 are short answer questions and carry 2 marks each.
(iv) Section C: Question numbers 28 to 34 are also short answer questions and carry 3 marks each.
(v) Section D: Question numbers 35 to 37 are long answer questions and carry 5 marks each.
(vi) There is no overall choice. However an internal choice has been provided in two questions of one mark, two questions of two marks, two questions of three marks and one question of five marks weightage. You have to attempt only one of the choices in such questions.
(vii) Use log table, if necessary. Use of calculator is prohibited.

Section-A

Multiple choice Questions:-

Q-1	Which of the following aqueous solution should have the highest boiling point? (a) 1.0 M NaOH (b) 1.0 M Na_2SO_4 (c) 1.0 M NH_4NO_3 (d) 1.0 M KNO_3	1
Q-2-	The cell constant of conductivity cell_____ (a) Changes with change of electrolyte (b) Changes with change of concentration of electrolyte (c) Changes with temperature of electrolyte	1

	(d) Remains constant for a cell	
Q-3-	Rate law for the reaction A + 2B $\longrightarrow$ C is found to be $$\text{Rate} = k\,[A]\,[B]$$ Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of rate constant will be _____ (a) The same (b) Doubled (c) Quadrupled (d) halved	1
Q-4-	On the basis of data given below predict which of the following gases shows least adsorption on a definite amount of charcoal? 	Gas	CO_2	SO_2	CH_4	H_2	 |---|---|---|---|---| 	Critical Temp./K	304	630	190	33	 (a) CO_2 (b) SO_2 (c) CH_4 (d) H_2	1
Q-5-	Which of the following electrolytes will have maximum coagulation value for Ag/Ag^+ sol? (a) Na_2S (b) Na_3PO_4 (c) Na_2SO_4 (d) NaCl	1
Q-6-	In the extraction of chlorine by electrolysis of brine _____ (a) Oxidation of Cl^- ion to chlorine gas occurs (b) Reduction of Cl^- ion to chlorine gas occurs (c) For overall reaction ΔG^o has negative value (d) a displacement reaction takes place.	1
Q-7-	A black compound of manganese reacts with a halogen acid to give greenish yellow gas. When excess of this gas reacts with NH_3 an unstable trihalide is formed. In this process the oxidation state of nitrogen changes from _____ (a) -3 to $+3$ (b) -3 to 0 (c) -3 to $+5$ (d) 0 to -3	1
Q-8-	Which of the following is isoelectronic pair ? (a) ICl_2 , ClO_2 (b) BrO_2^- , BrF_2^+ (c) ClO_2 , BrF (d) CN^- , O_3	1
Q-9-	Electronic configuration of a transition element X in +3 oxidation state is [Ar] $3d^5$. What is its atomic number? (a) 25 (b) 26 (c) 27 (d) 24	1
Q-10-	The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is (a) 2.87 BM (b) 3.87 BM (c) 3.47 BM (d) 3.57 BM	1
Q-11-	The stabilization of coordination compounds due to chelation is called the	1

	chelate effect. Which of the following is the most stable complex species? (a) $[Fe(CO)_5]$ (b) $[Fe(CN)_6]^{3-}$ (C) $[Fe(C_2O_4)_3]^{3-}$ (d) $[Fe(H_2O)_6]^{3+}$	

Q-12-	Which of the following alkyl halides will undergo SN1 reaction most readily?
	    (a) (CH3)3C—F
	    (b) (CH3)3C—Cl
	    (c) (CH3)3C—Br
	    (d) (CH3)3C—I
		1

Q-13-	Which is the correct increasing order of boiling points of the followingcompounds?
	        1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, Butane
	    (a) Butane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane
	    (b) 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < Butane
	    (c) Butane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane
	    (d) Butane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane
		1

Q-14-	The process of converting alkyl halides into alcohols involves_____.
	    (a) addition reaction
	    (b) substitution reaction
	    (c) dehydrohalogenation reaction
	    (d) rearrangement reaction
		1

Q-15-	In Clemmensen Reduction carbonyl compound is treated with _____
	    (a) Zinc amalgam + HCl
	    (b) Sodium amalgam + HCl
	    (c) Zinc amalgam + nitric acid
	    (d) Sodium amalgam + HNO_3
		1

Q-16-	Reduction of aromatic nitro compounds using Fe and HCl gives _____.
	    (a) aromatic oxime
	    (b) aromatic hydrocarbon
	    (c) aromatic primary amine
	    (d) aromatic amide
		1

Q-17-	Best method for preparing primary amines from alkyl halides withoutchanging the number of carbon atoms in the chain is
	    (a) Gabriel phthalimide synthesis
	    (b) Gabriel phthalimide synthesis
	    (c) Sandmeyer reaction
	    (d) Reaction with NH3
		1

Q-18-	Which of the following acids is a vitamin?
	    (a) Aspartic acid
	    (b) Ascorbic acid
	    (c) Adipic acid
	    (d) Saccharic acid
		1

Q-19-	Which of the following statements is not true about glucose?
	    (a) It is an aldohexose
	    (b) On heating with HI it forms n-hexane
	    (c) It is present in furanose form
		1

	(d) It does not give 2,4-DNP test	
Q-20-	Which of the following statements is not true about low density ploythene? (a) Tough (b) Hard (c) Poor conductor of electricity (d) Highly branched structure	1

Section :- B

Q-21-	State Raoult's law for solution containing volatile liquids. Write main cause of positive deviation.	2
Q-22-	Explain with chemical reactions, how rusting of iron is an electrochemical process?	2
Q-23-	Write the chemical reactions taking place in the extraction of zinc from zinc blende.	2
Q-24-	Which compound in each of the following pairs will react faster in S_N^2 reaction with OH^- and why? (i) CH_3Br or CH_3I (ii) $(CH_3)_3CCl$ or CH_3Cl	2

Q-25-	.(i) Arrange the following in decreasing order of their basic strength:
	    C6H5NH2, C2H5NH2,(C2H5)2NH, NH3
	(ii) How will you distinguish between ethylamine and aniline chemically?
	 OR Write following reactions
	    (i) Hoffmann bromamide reaction (ii) Carbylamine reaction
		2

Q-26-	What is glycogen ? How is it different from starch?	2
Q-27-	Distinguish between the terms homopolymer and copolymer. Give one example of each. Or How can you differentiate between addition and condensation polymerization ?	2

SECTION-C

Q-28-	Q.14. A solution prepared by dissolving 1.25 g of oil of winter green (methyl salicylate) in 99.0 g of benzene has a boiling point of 80.31°C. Determine the molar mass of this compound. (B.P. of pure benzene =80.10oC , Kb for benzene= 2.53 °C kg $〚mol〛^{(-1)}$). OR What mass of ethylene glycol (molar mass = 62.0 g $〚mol〛^{(-1)}$) must be added to 5.50 kg of water to lower the freezing point of water from 0 °C to -10.0 °C ? (kf for water= 1.86 K kg $〚mol〛^{(-1)}$)?	3
Q-29	14) Calculate cell potential of the following cell at 298 K Mg(s)/Mg2+(0.01 M)||Ag+(.0001M)/Ag(s) , E0cell =3.17 V	3
Q-30	Q.16. Explain the following terms:	3

	(i) Peptization (ii) Lyophobic colloids (iii) Dialysis OR Give reasons for the following : (i) Leather gets hardened after tanning. (ii) Lyophilic sol is more stable than lyophobic sol. (iii) It is necessary to remove CO when ammonia is prepared by Haber's process.	
Q-31	(a) Predict the magnetic property of [NiCl4]2- on the basis of Valence theory. (b) Give an example of a compound in which synergic bond is present. Write its IUPAC name. (c) Mention any two factors which can affect the stability of coordination compounds.	3

Q-32	Explain the following
	i) n-butyl bromide has higher boiling point than t-butyl bromide.
	  ii)Racemic mixtures are optically inactive.
	  iii)Alkyl halides are more reactive than aryl halide towards nucleophilic substitution.
		3

Q-33	Give reason for the following i) Boiling point of ethanol is higher in comparison to methoxy methane. ii) o-nitrophenol is more acidic than o-methoxy phenol. iii) Relative ease of dehydration of alcohol is $3^o > 2^o > 1^o$	3
Q-34	Explain the following terms with suitable example for each: (i) Disinfectants (ii) Antacids (iii) Food preservatives	3
SECTION-D		

Q-35	Q.25.(A)An aqueous solution of copper sulphate, CuSO4 was electrolyzed between platinum electrodes using a current of 0.1287 A for 50 min.
	(Given : atomic mass of Cu = 63.5 g/mol)
	(i) Write the cathodic reaction
	(ii) Calculate
	(a) Electric charge passed during electrolysis
	(b) Mass of copper deposited at the cathode
	(Given : 1 F= 96500 C/mol)
	(B) State the following laws-
	(i) Faraday first law of electrolysis.
	(ii) Kohlrausch's law of independent migration of ions.
	OR
	
	(a) Write the anode and cathode reactions and the overall reaction
	    occurring in a lead storage battery during discharging.
	(b) A Copper-Silver cell is set up. The copper ion concentration is
	    0.10M. The concentration of silver ion is not known. The cell
	    potential when measured was 0.422 V.
	    Determine the concentration of silver ions in the cell.
		5

	(given $E^°_{(Ag^+/Ag)} = +0.80V$, $E^°_{(Cu^{2+}/Cu)} = 0.34V$)	
Q-36	(a) Draw the structures of the following : (i) HClO3 (ii) H2S2O7 (b) Explain the following observations : (i) In the structures of HNO3 , the N-O bond (121pm) is shorter than the N-OH bond. (ii) Sulphur has greater tendency for catenation than oxygen. (iii) The negative value of electron gain enthalpy of fluorine is less than that of chlorine.	5
Q-37	(a) Two moles of organic compound 'A' on treatment with a strong base gives two compounds 'B' and 'C'. Compounds 'B' on dehydrogenation with Cu gives 'A' while acidification of 'C' yields carboxylic acid 'D' with molecular formula of CH_2O_2. Identify the compounds A, B, C and D and write all chemical reactions involved. (b) Account for the following CH_3CHO is more reactive than CH_3COCH_3 towards reaction with HCN.	5

BLUE-PRINT
XII-CHEMISTRY

S.N.	CHAPTER	MCQ(1M)	SQ(2M)	SQ(3M)	LQ(5M)	Total	TOTAL
1	SOLUTIONS	1(1)	2(1)	3(1)		6	23(11)
2	ELECTROCHEMISTRY	1(1)	2(1)	3(1)		6	
3	CHEMICAL KINETICS	1(1)			5(1)	6	
4	SURFACE CHEMISTRY	2(2)		3(1)		5	
5	GENERAL PRINCIPLES & PROCESSES OF ISOLATION OF ELEMENTS	1(1)	2(1)			3	19(10)
6	P-BLOCK ELEMENTS	2(2)			5(1)	7	
7	d-AND f-BLOCK ELEMENTS	2(2)		3(1)		5	
8	COORDINATION COMPOUNDS	1(1)		3(1)		4	
9	HALOALKANES & HALOARENES	2(2)	2(1)			4	28(16)
10	ALCOHOLS, PHENOLS & ETHERS	1(1)		3(1)		4	
11	ALDEHYDES, KETONES & CARBOXYLIC ACIDS	1(1)			5(1)	6	
12	ORGANIC COMPOUNDS CONTAINING NITROGEN	2(2)	2(1)			4	
13	BIOMOLECULES	2(2)	2(1)			4	
14	POLYMERS	1(1)	2(1)			3	
15	CHEMISTRY IN EVERYDAY LIFE			3(1)		3	
	TOTAL	20(20)	14(7)	21(7)	15(3)		70(37)

MARKING SCHEME

SL. NO.	IDEAL ANSWERS	MARKS
ANS :- 1	B	1
Ans:- 2	d	1
ANS:-3	b	1
ANS:-4	d	1
ANS:- 5	b	1
ANS:- 6	a	1
ANS:- 7	a	1
ANS:- 8	b	1
ANS:- 9	b	1
ANS:- 10	b	1
ANS:- 11	b	1
ANS:- 12	C	1
ANS:- 13	d	1
ANS:- 14	a	1
ANS:- 15	b	1
ANS:- 16	a	1
ANS:- 17	B	1
ANS:- 18	b	1
ANS:- 19	C	1
ANS:- 20	d	1
ANS:- 21	Correct statement. Weak inter-molecular forces between solute-solvent than solute-solute and solvent-solvent.	1+1
ANS:- 22	Equation at cathode Equation at anode. Overall Equation	½ ½ 1
ANS:- 23	$2ZnS + 3 O_2 \longrightarrow 2ZnO + 2 SO_2$ $ZnO + C \longrightarrow Zn + CO$	1+1
Ans:- 24	(1)CH3I will react faster in the first reaction because the I- ion can be easily removed. (2)In the second reaction,CH3Cl will react faster as it is a primary substrate.	1+1
Ans:-25	.(i) (C2H5)2NH2> C2H5NH2 > NH3 > C6H5NH2 (ii) Dye test- Aniline gives yellow colour with Benzene diazonium chloride but ethylamine does not give any colour. OR Corrrect chemical equation in each part	1+1 1+1
Ans:- 26	Sarch contains 20-25% amylase and 75-80% amylopectin molecules. ... While both are polymers of glucose, glycogen is produced by animals and is known as animal starch while starch is produced by plants. 3. Glycogen has a branched structure while starch has both chain and branched components	1+1
Ans:- 27	The main difference between homopolymer and copolymer is that homopolymers are produced by using a single type of monomer, whereas copolymers are formed by using two different types of monomers. Because of this difference, both homopolymers and copolymers gain their unique set of properties. OR	1+1

The process of joining small molecules to form a large molecule is known as polymerization. The building blocks of polymers are monomers. Based on the chemical reaction involved, polymerisation is divided into two groups known as addition polymerization and condensation polymerization. Addition polymerization is the process of repeated addition of monomers that posses double or triple bonds to form polymers. A condensation polymerization is a process that involves repeated condensation reactions between two different bi-functional or tri-functional monomers. Give below in a tabular column is the difference between addition and condensation polymerization.

Addition Polymerization	Condensation Polymerization
Monomers must have either a double bond or triple bond	Monomers must have two similar or different functional groups
Produces no by-products	By-products such as ammonia, water and HCl are produced
Addition of monomers results in polymers	Condensation of monomers result in polymers
The molecular weight of the resultant polymers is a multiple of monomer's molecular weight	The molecular weight of the resultant polymer is not a multiple of monomer's molecular weight
Lewis acids or bases, radical initiators are catalysts in addition polymerization	The catalysts in condensation polymerization are catalysts in condensation polymerization.
Common examples of addition polymerization are PVC, polyethene, Teflon etc.	Common examples of condensation polymerization are nylon, bakelite, silicon, etc.

The main difference between addition and condensation polymerization is that in addition polymerization the polymers are formed by the addition of monomers with no by-products while in condensation polymerization polymers are formed due to the condensation of two different monomers resulting in the formation of small molecules such as HCl, water, ammonia, etc., as by-products. At BYJU'S, read more differences like the difference between Enantiomers and Diastereomers

Ans:- 28	Given : W2 = 1.25 g , W1 = 99 g ΔTb = 80.31 − 80.10 ◻C = 0.21 ◻C Kb = 2.53 ◻C Kg mol-1 According to the formula: M2 = 1000 Kb W2	1

	W1 ⊠Tb Substituting these values in formula , we get M2 =1000 x 2.53 x 1.25 = 3162.5 99 x 0.21 20.79 = 152 g mol-1 OR According to the formula: M2 = 1000 x Kf xW2 W1 x⊠Tf W2 = 62 x 5.50 x 10 x 1000 = 3410 1.86 x 1000 1.86 = 1833 gm = 1.833 Kg	1 1 1 1 1
Ans:- 29	Mg(s) →Mg2+ + 2e- 2Ag+ (aq) +2e-→ 2Ag(s) Mg(s) + 2 Ag+ (aq)→ Mg2+ + 2Ag(s) E0cell=3.17 V n=2 EMF=E0cell-0.059/n log [Mg2+]/ [Ag+] 2 EMF=3.17-0.059/2log (0.01)/ (0.0001)2 EMF=2.993 V	½ ½ ½ ½ 1
Ans:- 30	(i)(ii)(iii) Correct Definitions OR (i) This is due to mutual coagulation of positively charged particles of animal hides and negatively charged particles of tannin . (ii)because lyophilic colloids are extensively solvated. (iii)because CO acts as a poison for the catalyst by lowering their activity.	[1+1+1] 1 1 1
Ans:- 31	(a) Paramagnetic (b) Example [Ni(CO)₄] IUPAC name is tetracarbonylnickel(0) (c) Factors affecting stability of complexes are a) charge on the central atom, b) nature of metal ion c) basic nature of ligands d) chelation effect of ligand (any two reasons)	1 1 1
Ans:- 32	i)n-butyl bromide is a straight chain molecule having larger surface area and therefore has stronger intermolecular forces.on the other hand t-butyl bromide is a branched molecule having smaller surface area and weak intermolecular forces. ii) The two enantiomers rotates the plane polarized light in opposite direction ,the rotation cancels as they are present in equal amount.	1 1

	iii)In aryl halide delocalisation of electron of C-X bond and a partial double bond character develop in the bond which results the attack of nucleophile difficult./or any other correct reason	1
Ans:- 33	i) Due to intermolecular H-bonding in ethanol. ii) NO2 group is electronwithdrawing in nature which increase the acidic character. iii) Stability of carbocation decrease in the order 30>2o>10	1 1 1

Ans:- 34	(i) Disinfectants : These are the chemical substances which are used for killing or preventing the growth of micro-
	organisms but they are not safe for living tissues.
	      Example: 1% Phenol.
	(ii) Antacid : Those substances which neutralize the excess acid and raise the pH to an appropriate level in
	stomach are called Antacid.
	    Example: Mg(OH)2.
	(iii) Food Preservatives : They are used to prevent spoilage of food due to microbial growth.
	   Example: Sodium Benzoate.
		[½+½]
		
		[½+½]
		
		[½+½]

Ans:- 35	25. A) Cu^{+2} + $2e^-$ ------- $Cu(s)$
	      $Q= It$
	        = .1287x3000=386.1 C
	      $W=ZIt$
	= 63.5x386.1/2x96500
	      = 0.127g
	
	 B) Correct Definitions
	          Or
	(a) <u>At anode:</u>
	$Pb + SO_4^{2-} \rightarrow PbSO_4 + 2e^-$ (Oxidation)
	
	<u>At Cathode:</u>
	    $PbO_2 + SO_4^{2-} + 4H^+ + 2e^- \rightarrow PbSO_4 + 2H_2O$ (Reduction)
	                  Overall reaction:
	$Pb + PbO_2 + 4H^+ + 2 SO_4^{2-} \rightarrow 2PbSO_4 + 2H_2O$ b)
	 $\because E°_{Cell} = E°_{Cathode} - E°_{Anode}$
	$E°_{Cell} = 0.80 – 0.34 = 0.46 V$
	
	$E_{Cell} = E° - \underline{0.059} \log \underline{[Cu^{2+}(aq)]}$
	              2 $[Ag^+(aq)]^2$
	      0.422 = 0.46 – $\underline{0.059}$ log $\underline{0.1}$
	                  2 $[Ag^+]^2$
	      [Ag+] = 0.07 M
		1
		½
		
		½
		
		½
		½
		2
		
		[½]
		
		[½]
		
		[1]
		
		[1]
		
		[1]
		
		[½]
		
		[½]

Ans:- 36	(a) Correct Strucutre B (i) in the structure of HNO_3 , the double bond character of N-O bond shortens the bond length , whereas the N-OH bond has no such double bond character (ii) S-S bond is much more strong than O-O bond due to small size and greater repulsion	2 1

		between oxygen atoms, so S has more tendency of catenation (iii) Due to small size of F, strong repulsion of electrons is there which causes less negative electron gain enthalpy.	
			1
			1
Ans:-37	(a)[A]- Formaldehyde, [B]-methyl alcohol, [C] - Sodium formate, [D]- Formic acid Correct reaction (b) Due to smaller +I effect of one alkyl group in aldehydes as compared to large +I effect of two alkyl groups, the magnitude of positive charge on the carbonyl carbon is more in aldehydes than in ketones. As a result, nucleophilic addition reactions occur more readily in aldehydes than in ketones.	½ x4 ½ x4 1

PAPER NO 08

KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION
PRE BOARD EXAMINATIONS
CHEMISTRY- XII 2019-20

Blue print

S.No.	Unit	VSA (1 Mark)	SA (2 Marks)	LA-I (3 Marks)	LA-II (5 Marks)	Total
1	Solutions	1(1)	2(1)	3(1)		
2	Electrochemistry	1(1)			5(1)	23(12)
3	Chemical Kinetics	1(2)	2(2)			
4	Surface Chemistry	1(1)	2(2)			
5	General Principles and Processes of isolation of Elements	1(1)		3(1)		
6	The p-Block Elements	1(1)			5(1)	19(8)
7	The d and f-Block Elements		2(1)	3(1)		
8	Coordination Compounds	1(1)		3(1)		
9	Haloalkanes and Haloarenes	1(2)		3(1)		28(17)
10	Alcohols,Phenols and Ethers	1(1)		3(1)		

11	Aldehydes,Ketones and Carboxylic Acids	1(1)			5(1)	
12	Organic compound containing Nitrogen	1(1)		3(1)		
13	Biomolecules	1(3)				
14	Polymers	1(1)	2(1)			
15	Chemistry in everyday Life	1(3)				
	Total	20(20)	14(7)	21(7)	15(3)	70(37)

MM 70   Time 3hours

Instructions:
(i)   Answer all the questions.
(ii)   Questions 1 to 20 are very short answer type or MCQ and carry one mark each. Answer them in one word or in one sentence.
(iii)   Questions 21 to 27 are short answer type and carry 2 marks each. Answer them in 20 words.
(iv)   Questions 28 to 34 are short answer type and carry 3 marks each. Answer them in 30 words.
(v)   Questions 35 to 37 are long answer type and carry 5 marks each. Answer them in 50 to 60 words.
(vi)   There will be no overall choice in the question paper. However, 33 % internal choices will be given in all the sections.
(vii)   Use log table wherever needed. Use of calculator or any other electronic item is strictly prohibited.

1.   The correct order of increasing acidic strength is _____.
       (i) Phenol < Ethanol < Chloroacetic acid < Acetic acid
       (ii) Ethanol < Phenol < Chloroacetic acid < Acetic acid
       (iii) Ethanol < Phenol < Acetic acid < Chloroacetic acid
       (iv) Chloroacetic acid < Acetic acid < Phenol < Ethanol

2.   Which of the following complexes formed by Cu2+ ions is most stable?
       (i) Cu^{2+} + $4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$, logK = 11.6   (ii) Cu^{2+} + $4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}$, logK = 27.3
       (iii) Cu^{2+} + 2en $\rightleftharpoons [Cu(en)_2]^{2+}$, logK = 15.4   (iv) Cu^{2+} + $4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}$, logK = 8.9

3.   Glycogen is a branched chain polymer of α-D-glucose units in which chain is formed by C1-C4
       glycosidic linkage whereas branching occurs by theformation of C1-C6 glycosidic linkage.
       Structure of glycogen is similar to_____.
       (i) Amylose   (ii) Amylopectin
       (iii) Cellulose   (iv) Glucose

4.   Consider Fig. and mark the correct option.
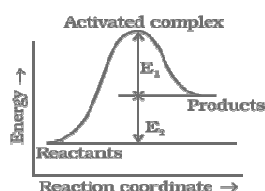
(i) Activation energy of forward reaction is E1 + E2 and product is less stable than reactant.
(ii) Activation energy of forward reaction is E1+E2 and product is more stable than reactant.
(iii) Activation energy of both forward and backward reaction is E1+E2 and reactant is more stable than product.
(iv) Activation energy of backward reaction is E1 and product is more stable than reactant.

5. The difference between the electrode potentials of two electrodes when no current is drawn through the cell is called _____.
    (i) Cell potential   (ii) Cell emf
    (iii) Potential difference   (iv) Cell voltage

6. Which of the following statements is not true about glucose?
    (i) It is an aldohexose.   (ii) On heating with HI it forms n-hexane.
    (iii) It is present in furanose form.   (iv) It does not give 2,4-DNP test.

7. Low concentration of oxygen in the blood and tissues of people living at high altitude is due to _____.
    (i) low temperature   (ii) low atmospheric pressure
    (iii) high atmospheric pressure   (iv) both low temperature and high atmospheric pressure

8. Polyethyleneglycols are used in the preparation of which type of detergents?
    (i) Cationic detergents   (ii) Anionic detergents
    (iii) Non-ionic detergents   (iv) Soaps

9. Match the items of Column I and Column II.
    Column I   Column II
    (i) Butter   (a) dispersion of liquid in liquid
    (ii) Pumice stone   (b) dispersion of solid in liquid
    (iii) Milk   (c) dispersion of gas in solid
    (iv) Paints   (d) dispersion of liquid in solid

10. Rate law for the reaction A + 2B $\longrightarrow$ C is found to be Rate = k [A][B] Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of rate constant will be_____.
    (i) the same   (ii) doubled
    (iii) quadrupled   (iv) halved

11. When copper ore is mixed with silica, in a reverberatory furnace copper matte is produced. The copper matte contains _____.
    (i) sulphides of copper (II) and iron (II)   (ii) sulphides of copper (II) and iron (III)
    (iii) sulphides of copper (I) and iron (II)   (iv) sulphides of copper (I) and iron (III)

12. On addition of conc. H_2SO_4 to a chloride salt, colourless fumes are evolved but in case of iodide salt, violet fumes come out. This is because
    (i) H_2SO_4 reduces HI to I_2 (ii) HI is of violet colour
    (iii) HI gets oxidised to I_2 (iv) HI changes to HIO_3

13. Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature?

(i) CH_3CH_2—CH_2—OH

(ii) CH_3CH_2—CH—OH
                 CH_3

(iii) CH_3CH_2—CH—CH_2OH
                  CH_3

                  CH_3
(iv) CH_3CH_2—C—OH
                  CH_3
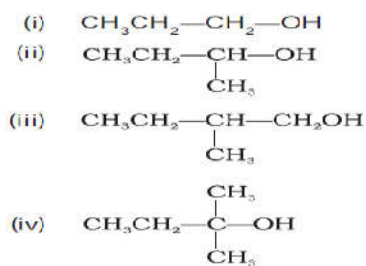
14. The correct IUPAC name for CH_2=$CHCH_2$ $NHCH_3$ is
(i) Allylmethylamine (ii) 2-amino-4-pentene
(iii) 4-aminopent-1-ene (iv) N-methylprop-2-en-1-amine

15. A narrow spectrum antibiotic is active against _____.
(i) gram positive or gram negative bacteria.
(ii) gram negative bacteria only.
(iii) single organism or one disease.
(iv) both gram positive and gram negative bacteria.

16. The process of converting alkyl halides into alcohols involves_____.
(i) addition reaction (ii) substitution reaction
(iii) dehydrohalogenation reaction (iv) rearrangement reaction

17. Which of the following polymer is stored in the liver of animals?
(i) Amylose (ii) Cellulose
(iii) Amylopectin (iv) Glycogen

18. Which of the following statements is not correct.
(i) Some antiseptics can be added to soaps.
(ii) Dilute solutions of some disinfectants can be used as antiseptic.
(iii) Disinfectants are antimicrobial drugs.
(iv) Antiseptic medicines can be ingested.

19. Which of the following polymer can be formed by using the following monomerunit?
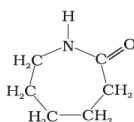
(i) Nylon 6, 6 (ii) Nylon 2–nylon 6
(iii) Melamine polymer (iv) Nylon-6

20. Identify the compound Y in the following reaction.
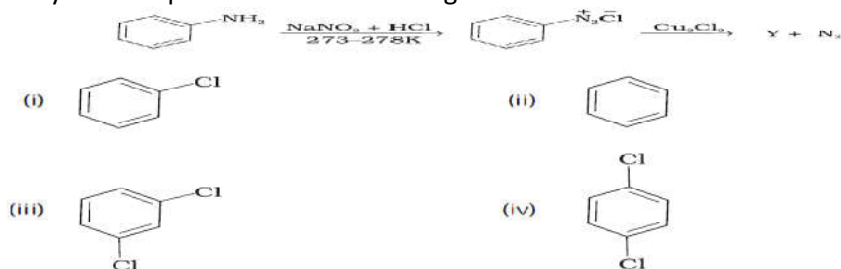
21. Write the monomers used for getting the following polymers.(i) Polyvinyl chloride (ii) Teflon
OR
What are the monomeric repeating units of Nylon-6 and Nylon-6, 6?

22. The initial concentration of N_2O_5 in the following first order reaction
$N_2O_5(g) \rightarrow 2\ NO_2(g) + 1/2O_2$ (g) was 1.24×10^{-2} mol L^{-1} at 318 K. Theconcentration of N_2O_5 after 60 minutes was 0.20×10^{-2} mol L^{-1}.Calculate the rate constant of the reaction at 318 K.

23. Which aqueous solution has higher concentration, 1 molar or 1 molal solution of the same solute. Give reasons.

OR

Derive the relationship between relative lowering in vapour pressure and mole fraction of the solute.

24. A colloidal solution of AgI is prepared by the following two methods :
(a) Adding AgNO3 to KI (aq) solution
(b) Adding Kl to AgNO3 (aq) solution.
(i) What is the charge of the colloidal particles in (a) and (b)
(ii) Give reason for the origin of charge.

25. Explain the following: (i) Of the d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing. (ii) Co(II) is stable in aqueous solution but in the presence of complexing reagent it is easily oxidized.

26. (a) Out of ammonia and carbon dioxide, which is adsorbed on activated charcoal to greater extent?
(b)What will happen if equimolar solutions of positively and negatively charged colloidal sols be mixed?

27. A first order reaction is found to have a rate constant, $k = 5.5 \times 10^{-14}$ s^{-1}. Find the half-life of the reaction.

28. (a)Give plausible explanation for each of the following:
(i) Why are primary amines higher boiling than tertiary amines?
(ii) Why are aliphatic amines stronger bases than aromatic amines?
(b) How will you convert p-toluidine into 2-bromo-4-methylaniline?

29. Give reasons:
(i) Among transition metals highest oxidation state exhibited in oxoanion of a metal
(ii) Ce^{4+} is used as an oxidizing agent in volumetric analysis.
(iii)Transition metals form a number of interstitial compounds.

OR

Compare the chemistry of actinoids with that of the lanthanoids with special reference to:
(i) electronic configuration (ii) oxidation state (iii) atomic and ionic sizes

30. Heptane and octane form an ideal solution at 373K, the vapour pressures of the pure liquids at this temperature are 105.2 kPa and 46.8 kPa respectively. If the solution contains 25g of heptane and 28.5 g of octane, calculate.

31. (a) Which will have a higher boiling point? 1-Chloroethane or 2-methyl-2-chlorobutane, give reason.
(b) p-nitrochlorobenzene undergoes nucleophilic substitution faster than chlorobenzene. Explain giving the resonance structures as well.

OR

How will you bring about the following conversions?
(i) Ethanol to but-1-yne (ii) Ethane to bromoethene (iii) Propene to1-nitropropane

32. (a) Explain these experimental results:Aqueous copper sulphate solution (blue in colour) gives: (i) a green precipitate with aqueous potassium fluoride and (ii) a bright green solution with aqueous potassium chloride.
(b) Draw geometrical and optical isomers of $[CoCl_2(en)_2]^+$.

33. Account for the following facts:
(a)The reduction of a metal oxide is easier if the metal formed is in liquid state at the temperature of reduction.
(b)The reduction of Cr2O3 with Al is thermodynamically feasible, yet it does not occur at room temperature.
(c)Pine oil is used in froth flotation method.

34. (a) Why is phenol acidic than ethanol.
(b)Give chemical test to distinguish between the following:
(i)1-Propanol and 2-Propanol   (ii)Phenol and cyclohexanol

35. (a) The e.m.f of a cell corresponding to the reaction
$Zn(s) +2H^+(aq) \rightarrow Zn^{2+}(.01M)+H_2(g,1atm)$ is 0.28 volt at 25^0C.Write the half cell reaction and calculate the pH of the solution at the hydrogen electrode.
(b) Write the product of electrolysis at each electrode in the following
(a)Aq sodium chloride (b) Aq silver nitrate using Pt electrode.

OR

(a)(i) What is the relationship between degree of dissociation and dissociation constant?
(ii)Why a mercury cell gives constant voltage throughout its life ?
(b)Calculate the cell potential of a cell having following cell representation-
$Mg(s)/Mg^{2+} (0.130M)$ // $Ag^+ (0.0001M) /Ag (s)$
Given : $E^0 Mg/Mg^{2+} =+2.37 V$; $E^0 Ag/Ag^+ =+ 0.80 V$

36. (i)H_2S is less acidic than H_2Te. Why?
(ii)Why does O_3 act as a powerful oxidising agent?
(iii) Which form of sulphur shows paramagnetic behaviour ?
(iv) How is the presence of SO_2 detected
(v) Draw the structure of peroxodisulphuric acid.

OR

(i)Although electron gain enthalpy of fluorine is less negative as comparedto chlorine, fluorine is a stronger oxidising agent than chlorine. Why?
(ii)Fluorine exhibits only −1 oxidation state whereas other halogensexhibit + 1, + 3, + 5 and + 7 oxidation states also. Explain.
(iii)When HCl reacts with finely powdered iron, it forms ferrous chlorideand not ferric chloride. Why?
(iv)Noble gases have very low boiling points. Why?
(v)Draw the structure of BrF_3

37. (a) An organic compound A with molecular formula C_8H_8O gives positive DNP and iodoform tests. It does not reduce Tollen's or Fehling's reagent and does not decolourises bromine water also. On oxidation with chromic acid (H_2CrO_4), it gives a carboxylic acid (B) with molecular formula $C_7H_6O_2$. Deduce the structure of A and B.
(b) Complete the following reactions by identifying A,B and C

$$\text{(i) A + H}_2\text{(g)} \xrightarrow{\text{Pd/BaSO}_4} \text{(CH}_3)_2\text{CHCHO}$$

(ii)
$$CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - \underset{\overset{||}{O}}{C} - CH_3 + NaOI \longrightarrow B + C$$

OR

(a) Give a simple chemical test to distinguish between the pair of organic compounds:
Ethanal and Propanal
(b) Name and complete the following chemical reaction:
    (i)X_2/red P (ii) H_2O
RCH_2COOH ------------------------------------$\rightarrow$
(c) Draw the structures of the following derivatives:
(i) The 2,4-Dinitrophenylhydrazone of benzaldehyde
(ii) Acetaldehydedimethyl acetal
(iii) Cyclopropanone oxime
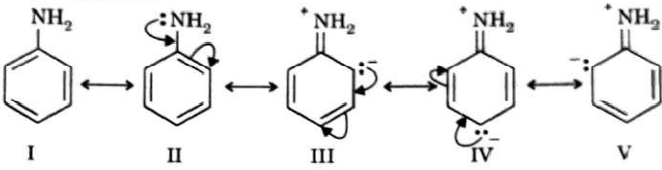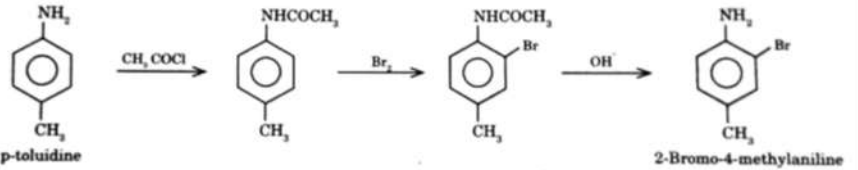
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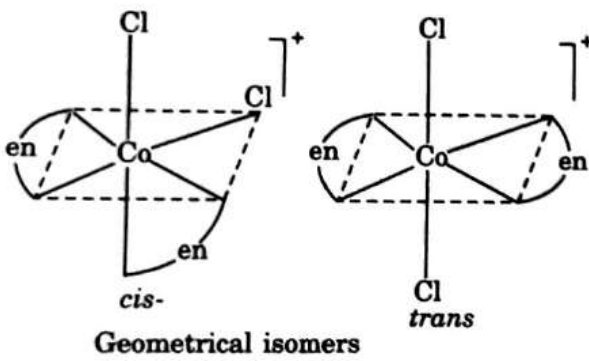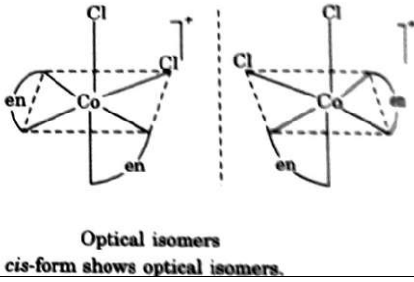
MM 70   Time 3hours

Q.No.	Answer	Marks
1.	(iii) Ethanol < Phenol < Acetic acid < Chloroacetic acid	1
2.	(ii) $Cu^{2+} + 4CN^- \rightleftharpoons [Cu(CN)_4]^{2-}$, logK = 27.3	1
3.	(ii) Amylopectin	1
4.	(i) Activation energy of forward reaction is E1 + E2 and product is less stable than reactant.	1
5.	(ii) Cell emf	1
6.	(iii) It is present in furanose form.	1
7.	(ii) low atmospheric pressure	1
8.	(iii) Non-ionic detergents	1
9.	(i) → (d) (ii) → (c) (iii) → (a) (iv) → (b)	1/2+1/2
10.	(ii) doubled	1
11.	(iii) sulphides of copper (I) and iron (II)	1
12.	(iii) HI gets oxidised to I_2	½+1/2
13.	(iv) $CH_3CH_2-\overset{\overset{\displaystyle CH_3}{\|}}{\underset{\underset{\displaystyle CH_3}{\|}}{C}}-OH$	1
14.	(ii) 2-amino-4-pentene	1
15.	(i) gram positive or gram negative bacteria.	1
16.	(ii) substitution reaction	1
17.	(iv) Glycogen	1
18.	(iv) Antiseptic medicines can be ingested.	1
19.	(iv)Nylon-6	1
20.	(i)	1
21.	(i) Vinyl chloride ($CH_2=CHCl$) (ii) Tetrafluoroethylene ($CF_2 = CF_2$) OR The monomeric repeating unit of nylon 6 is $$\left[NH-\left(CH_2\right)_5 -CO \right]$$, which is derived from Caprolactam. The monomeric repeating unit of nylon 6, 6 is $$\left[NH-\left(CH_2\right)_6 -NH-CO-\left(CH_2\right)_4 -CO \right]$$, whichis derived from hexamethylene diamine and adipic acid.	1+1

22.	For a first order reaction $$\log \frac{[R]_1}{[R]_2} = \frac{k(t_2 - t_1)}{2.303}$$ $$k = \frac{2.303}{(t_2 - t_1)} \log \frac{[R]_1}{[R]_2}$$ $$= \frac{2.303}{(60\,\text{min} - 0\,\text{min})} \log \frac{1.24 \times 10^{-2}\,\text{mol L}^{-1}}{0.20 \times 10^{-2}\,\text{mol L}^{-1}}$$ $$= \frac{2.303}{60} \log 6.2\,\text{min}^{-1}$$ $$k = 0.0304\ \text{min}^{-1}$$	2
23.	At room temperature density of water is slightly less than one so the volume corresponding to 1000 g will be greater than 1000 mL.So the volume of water containing one mole of solute will be more in case of molal solution.Therefore molar solution is more concentrated than molal solution. OR $$p_1 = x_1\,p_1^{\,0} \qquad (2.22)$$ The reduction in the vapour pressure of solvent (Δp_1) is given as: $$\Delta p_1 = p_1^{\,0} - p_1 = p_1^{\,0} - p_1^{\,0}\,x_1$$ $$= p_1^{\,0}\,(1 - x_1) \qquad (2.23)$$ Knowing that $x_2 = 1 - x_1$, equation (2.23) reduces to $$\Delta p_1 = x_2\,p_1^{\,0} \qquad (2.24)$$ In a solution containing several non-volatile solutes, the lowering of the vapour pressure depends on the sum of the mole fraction of different solutes. Equation (2.24) can be written as $$\frac{\Delta p_1}{p_1^{\,0}} = \frac{p_1^{\,0} - p_1}{p_1^{\,0}} = x_2 \qquad (2.25)$$	2 ½ ½ ½ ½
24.	(i)(a) negative sol (b) positive sol (ii) Due to preferential adsorption of ions	½ ½ 1
25.	(b) (i) $E^0(Cr^{3+}/Cr^{2+})$ = -0.41V and $E^0(Mn^{3+}/Mn2^+)$ = +1.57V (ii) In the presence of complexing agent cobalt is oxidized from +2 to +3 state because Co(III) is more stable than Co(II).	1 1
26.	(a) Ammonia is adsorbed to greater extent on the surface of charcoal because it is more polar and can be more easily liquefied as compared to carbon monoxide. (b)Coagulation will take place because the sols will mutually neutralise their charges.	1 1

27.	Half-life for a first order reaction is $$t_{1/2} = \frac{0.693}{k}$$	½
	$$t_{1/2} = \frac{0.693}{5.5 \times 10^{-14} s^{-1}} = 1.26 \times 10^{14} s$$	1+1/2
28.	(a) (i) Primary amines can form intermolecular hydrogen bonds but tertiary amines cannot.	1
	(ii) The less basic character of aniline can be explained on the basis of resonance in the aromatic ring.	1
	Due to positive charge on the nitrogen atom electron pairs are less available for protonation.	
	(b)	1
29.	(i) Because oxygen is highly electronegative and oxidizing element.	1
	(ii) Ce^{4+}/Ce^{3+} has E_o value 1.74V which suggests that it can act as an oxidizing agent.	1
	(iii) Because small atoms like H, B, C, N etc. fit into vacant spaces of lattices of transition metal atoms.	
	(iv) Zn^{2+} has $3d^{10}$ configuration and no unpaired electrons so there is no d-d transition while in Cu^{2+} configuration is $3d^9$ and one unpaired electron so d-d transition can take place.	1
	OR	
	(i) Electronic Configuration:The general electronic configuration of lanthanides is $[Xe]4f^{1-14}5d^{0-1}6s^2$ whereas that of actinoids is $[Rn]5f^{1-14}6d^{0-1}7s^2$	1
	(ii) Oxidation states: Actinoids show larger no. of oxidation states than lanthanoids.	1
	(iii) Atomic and ionic sizes: Both show gradual and small decrease in atomic sizes.In lanthanoids there is lanthanoid contraction in actinoids there is actinoid contraction.	1
30.	Moles of heptane = 25/100 = 0.25	
	Moles of octane = 28.5/114 = 0.25	
	$X_{(heptane)}$ = 0.25 / (0.25+0.25) = 0.5	
	$X_{(octane)}$ = 0.25/(0.25+0.25) = 0.5	
	(i) Vapour pressure of heptane in solution = 105.2 X 0.5 = 52.6 kPa	
	(ii) Vapour pressure of octane in solution = 46.8 X 0.5 = 23.4 kPa	
	Total pressure of solution = 52.6 + 23.4 76.0 kPa	

	(iii) M0le fraction of octane in vapour phase = 23.4 / 76.0 = 0.308	
31.	(a) 2-Methyl-2-chlorobutane has higher boiling point than 1-chloroethanebecause with increase in size of alkyl group, boiling point increases.	1
	(b) $-NO_2$ group is electron withdrawing group it activates the o- and p- positions to the halogen atom towards nucleophilic substitution reaction.	1
		1
	OR	
	(i) $CH_3CH_2OH \xrightarrow{SOCl_2} CH_3CH_2Cl \xrightarrow{HCCNa} CH_3CH_2CCH$ Ethanol But-1-yne	1
	(ii) $CH_3CH_3 \xrightarrow[h\nu]{Br_2} CH_3CH_2Br \xrightarrow{alc.\ KOH} CH_2=CH_2 \xrightarrow[CCl_4]{Br} BrCH_2CH_2Br \xrightarrow[\Delta]{alc.\ KOH} BrCH=CH_2$	1
	(III) $CH_3CH=CH_2 + HBr \xrightarrow{organic\ peroxide} CH_3CH_2CH_2Br \xrightarrow{AgNO_2} CH_3CH_2CH_2NO_2$	1
32.	(a) Aqueous copper sulphate solution exists as $[Cu(H_2O)_4]SO_4$ which has blue colour due to $[Cu(H_2O)_4]^{2+}$ ions.	
	(i) When KF is added, the weak water ligands are replaced by F^- ligands and forms $[CuF4]^{2-}$ ions which is a green precipitate.	½
	(ii) When KCl is added, the weak water ligands are replaced by Cl^- ions forming $[CuCl_4]^{2-}$	½
	(b) Geometrical isomers	1
	 Geometrical isomers	
	Optical isomers	
	 Optical isomers cis-form shows optical isomers.	1
33.	(a) The entropy is higher if the metal is in liquid state than when it is in solid state. The value of entropy change (ΔS) of the reduction process is more on +ve side when the metal formed is in liquid state and the metal oxide being reduced is in solid state. Thus the value of ΔG^0 becomes more on negative side and the reduction becomes easier.	1

|		
	(b) Because it require some activation to proceed. Heating is required to start the reaction.	1
	(c) to increase the non-wettability of the mineral particle	1
34.	(a)	½
	Due to the positive charge on oxygen atom it attracts the electron pair of O-H bond strongly toward itself and release of H^+ becomes easier. Moreover the phenoxide ion is resonance stabilized whereas there is no resonance in ethoxide ion.	½
		½
		½
	(b)(i) 2-Propanol gives iodoform test but 1-Propanol does not OR Lucas Test	½
	(ii) Phenol gives violet colouration with neutral $FeCl_3$ but cyclohexanol does not.	½
35.	(a)$Ecell=E^0cell-.0591/2 \log[Zn^{2+}/[H^+]^2$	1
	$0.028=0.76-0.0591/2\log(0.1/[H^+]^2$	1
	$pH=-\log[H^+]$	½
	$pH=8.6$	½
	(b) (i)At Anode Chlorine gas and at cathode Hydrogen gas	½+1/2
	(ii)At Anode Oxygen and at cathode silver	½+1/2
	OR	
	(a)(i) $K = C\alpha 2 / (1-\alpha)$	1
	(ii) Because overall reaction does not have any ion.	1
	(b)$E^0_{cell} = E^0 (cathode) - E^0 (anode)$	½
	$=0.80 – (-2.37) = 3.17$ Volt	½
	$E_{cell} = E^0_{cell} -0.0591 /n \log [Mg^{2+}] / [Ag^+] 2$	1
	$E_{cell} = E^0_{cell} -0.0591 /2 \log(0.130/ 10 -8$	
	$E_{cell} = 3.17 -0.21 = 2.96$ volt	1
36.	(i) Due to the decrease in bond (E–H) dissociationenthalpy down the group, acidic character increases.	1
	(ii)Due to the ease with which it liberates atoms of nascent oxygen ($O_3 \rightarrow O_2 + O$), it acts as a powerful oxidising agent.	1
	(iii)In vapour state sulphur partly exists as S_2 molecule which has twounpaired electrons in the antibonding $\pi *$ orbitals like O_2 and, hence,exhibits paramagnetism.	1
	(iv)Moist, sulphur dioxide behaves as a reducing agent and decolourisesacidified potassiumpermanganate(VII) solution; the latter reaction is aconvenient test for the gas.	1
	(v)	1
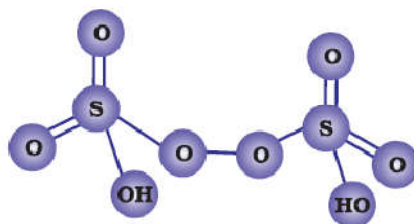
Peroxodisulphuric acid
($H_2S_2O_8$)

OR

(i) It is due to low enthalpy of dissociation of F-F bond and high hydration enthalpy of F^-.

(ii) Fluorine is the most electronegative element and cannot exhibit any positive oxidation state. Other halogens have d orbitals and therefore, can expand their octets and show + 1, + 3, + 5 and + 7 oxidation states also.

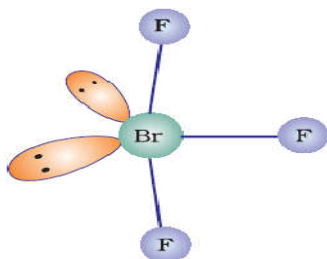(iii) Its reaction with iron produces H2.

Fe + 2HCl → $FeCl_2$ + H_2
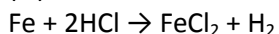
Liberation of hydrogen prevents the formation of ferric chloride.

(iv) Noble gases being monoatomic have no interatomic forces except weak dispersion forces and therefore, they are liquefied at very low temperatures. Hence, they have low boiling points.

(v)

1	
1	
1	
1	
1	

37. (a)

(b)

(i) $CH_3-\underset{\underset{Cl}{|}}{\underset{(A)}{CH}}-C=O \xrightarrow{Pd, BaSO_4} CH_3\overset{\overset{CH_3}{|}}{CH}C=O$ | 1+1

(ii) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\overset{\overset{O}{||}}{C}-CH_3 + NaOI \longrightarrow CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{O}{||}}{C}}-\overset{\overset{O}{||}}{C}-ONa + CHI_3$

OR

(a) Ethanal and propanal can be distinguished by Iodoform test. Ethanal gives a yellow precipitate of iodoform with an alkaline solution of NaOH. Propanal does not give this test. | ½

$CH_3CHO + 4NaOH + 3I_2 ----\rightarrow CHI_3 + HCOONa + 3H_2O + 3NaI$ | ½

(i)X_2, red P (ii) H_2O

(b) RCH_2COOH ----------------------------$\rightarrow$ $RCH(X)COOH$ | 1

The name of the reaction is Hell Vohlard Zelinsky reaction

(c) (i) | 1

(ii) | 1

(iii) | 1   1

PAPER NO 09

SUBJECT CHEMISTRY (043)

SESSION 2019-20

M.M.: 70   TIME : 3 HRS

BLUE PRINT

S.NO.	UNIT	VSA (1 MARK)	SA I (2MARKS)	LA-I (3 MARKS)	LA-II (5 MARKS)	TOTAL	
1	Solutions	1(1)	1(2)	1(3)		6	23
2	Electrochemistry	1(1)	1(2)	1(3)		6	
3	Chemical kinetics	1(1)			1(5)	6	
4	Surface chemistry	3(3)	1(2)			5	
5	General principles & processes of isolation of Elements			1(3)		3	19
6	p-block elements	3(3)	1(2)			5	
7	d-& f- block elements	1(1)			1(5)	6	

8	Coordination compounds	2(2)		1(3)		5	
9	Haloalkanes & Haloarenes	2(2)	1(2)			4	28
10	Alcohol, Phenols& ethers	1(1)		1(3)		4	
11	Aldehydes,Ketones & Carboxylic acids	1(1)			1(5)	6	
12	Amines	1(1)		1(3)		4	
13	Biomolecules	1(1)		1(3)		4	
14	Polymers	1(1)	1(2)			3	
15	Chemistry in everyday life	1(1)	1(2)			3	
	TOTAL	20(20)	7(14)	7(21)	3(15)	37(70)	70

PRE BOARD EXAMINATION

SUBJECT CHEMISTRY (043)

SESSION 2019-20

M.M.: 70   TIME : 3 HRS

General Instructions:-
(a) All questions are compulsory.
(b) Q.no. 1 to 20 are very short answer questions and carry 1 mark each.
(c) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
(d) Q.no. 28 to 34 are long answer questions and carry 3 marks each.
(e) Q.no. 35 to 37 are long answer questions and carry 5 marks each.
(f) Use log tables if necessary, use of calculators is not allowed.

Q1. A molal solution is one which contains one mole of a solute in
    (1) 1000g of the solvent
    (2) One litre of the solution
    (3) One litre of the solvent
    (4) 22.4 litres of the solution
Q2. PURPLE OF CASSIUS is
    (1) Colloidal solution of gold

(2) Colloidal solution of silver
(3) Colloidal solution of platinum
(4) Oxyacids of gold

Q3. Which cell will measure standard electrode potential of copper electrode?
(i) Pt (s)/ H_2 (g,0.1 bar) /H^+ (aq.,1 M)// Cu^{2+}(aq.,1M)/ Cu
(ii) Pt(s)/ H_2 (g, 1 bar) /H^+ (aq.,1 M) //Cu^{2+} (aq.,2 M)/ Cu
(iii) Pt(s) /H_2 (g, 1 bar)/H^+ (aq.,1 M)//Cu^{2+} (aq.,1 M)/ Cu
(iv) Pt(s)/ H_2 (g, 1 bar)/H^+ (aq.,0.1 M)//Cu^{2+} (aq.,1 M)/ Cu

Q4. The detergent action of soap is due to its
    (1) Alkalinity
    (2) Solubility in water
    (3) Emulsifying property
    (4) Ability to produce lather in water

Q5. At the equilibrium position in the process of adsorption (i) $\Delta H > 0$
(ii) $\Delta H = T\Delta S$
(iii) $\Delta H > T\Delta S$
(iv) $\Delta H < T\Delta S$

Q6. Which of the following can be used for purification of colloids
    (1) Coagulation
    (2) Dialysis
    (3) Flocuulation
    (4) All the above

Q7. When SO_2 is passed through acidified solution of $K_2Cr_2O_7$ solution
    (1) The solution is turned blue
    (2) The solution is decolourised
    (3) SO_2 is reduced
    (4) Green $Cr_2(SO_4)_3$

Q8. HI cannot be prepared by the action of conc. H_2SO_4 on KI because
    (1) HI is stronger acid than H_2SO_4
    (2) HI is more volatile than H_2SO_4
    (3) H_2SO_4 also oxidises HI so formed to I_2
    (4) H_2SO_4 form complex with HI

Q9. Solid PCl_5 exist as
    (1) PCl_5
    (2) PCl_4^+
    (3) PCl_6^-
    (4) $[PCl_4]^+[PCl_6]^-$

Q10. Highest oxidation state of manganese in fluoride is +4 (MnF_4) but highest oxidation state in oxides is +7 (Mn_2O_7) because _____.

(i) fluorine is more electronegative than oxygen.
(ii) fluorine does not possess *d*-orbitals.
(iii) fluorine stabilises lower oxidation state.
(iv) in covalent compounds fluorine can form single bond only while oxygen forms double bond.

Q11. When 1 mol $CrCl_3.6H_2O$ is treated with excess of $AgNO_3$, 3 mol of AgCl are obtained. The formula of the complex is :
(i) $[CrCl_3 (H_2O)_3].3H_2O$
(ii) $[CrCl_2(H_2O)_4]Cl.2H_2O$
(iii) $[CrCl(H_2O)_5]Cl_2.H_2O$
(iv) $[Cr(H_2O)_6]Cl_3$

Q12. The correct IUPAC name of $K_2[Zn(OH)_4]$ is
    (1) Potassiumtetrahydroxyzincate(II)
    (2) Potassiumtetrahydroxozincate(II)
    (3) Potassiumtetrahydroxyzincate(IV)
    (4) Potassiumtetrahydroxozinc(II)

Q13. When 3,3-dimethylbutan-2-ol is heated with conc. H2SO4 then the main product formed is
    1. 3,3-Dimethylbutene
    2. 2,3-dimethylbut-2-ene
    3. 2,3-Dimethylbutene
    4. Cis and trans isomers of the product obtained in (3)

Q14. Which reagent will you use for the following reaction?
$CH_3CH_2CH_2CH_3 \rightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$
(i) Cl_2/UV light
(ii) $NaCl + H_2SO_4$
(iii) Cl_2 gas in dark
(iv) Cl_2 gas in the presence of iron in dark

Q15. In order to get 2- hydroxybenzaldehyde from phenol which of the following reagent is required
    1. Chloroformic acid
    2. $CHCl_3$/NaOH
    3. CO_2,NaOH
    4. CCl_4/NaOH

Q16. Weakest acid among the following is
    1. $CHCl_2COOH$
    2. CH_3COOH
    3. $CH_2ClCOOH$
    4. CCl_3COOH

Q17. What is the IUPAC name of the compound $CH_3CH_2CH_2CH_2-N-(CH_3)_2$? (i) N, N-Dimethylaminobutane (ii) N, N-Dimethylbutan-1-amine (iii) N, N-Dimethylbutylamine (iv) N-methylpentan-2-amine

Q18. Which of the following polymer is stored in the liver of animals?
(i) Amylose
(ii) Cellulose
(iii) Amylopectin
(iv) Glycogen

Q19. Natural rubber is a polymer of
  1. Trans isoprene
  2. Cis isoprene
  3. Co-cis and trans isoprene
  4. None of these

Q20. Which of the following statements about vitamin B12 is false
  1. It has a cobalt atom
  2. It also occurs in plants
  3. It is present in rain water
  4. It is needed for human body in very small amount

Q21. From the following molar conductive at infinite dilution. Calculate λ^o_m for NH_4OH
λ^o_m for $Ba(OH)_2 = 457.6 \ \Omega^{-1} \ cm^2 mol^{-1}$
λ^o_m for $BaCl_2 = 240.6 \ \Omega^{-1} \ cm^2 mol^{-1}$
λ^o_m for $NH_4Cl = 129.8 \ \Omega^{-1} \ cm^2 mol^{-1}$

OR

What is meant by positive and negative deviations from Raoult's law and how is the sign of $\Delta_{mix}H$ related to positive and negative deviations from Raoult's law?

Q22. . From the given cells : Lead storage battery, mercury cell, fuel cell and dry cell.
Answer the foliowing :
(i) Which cell is used in hearing aids?
(ii) Which cell was used in Apollo Space Programme?   (iii) Which cell is used in automobiles and invertors?   (iv) Which cell does not have long life?

Q23. Give reasons
(I) A delta is formed at the meeting point of Sea water and river water.
(II) NH_3 gas absorbs more readily than N_2 gas on the surface of charcoal

Q24. How would you account for the following
I. Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7

II. Transition metal and their compound show catalytic properties.

Q25. . Write the product(s) formed when
(i) 2-Bromopropane undergoes dehydrohalogenation reaction.
(ii) Methylbromide is treated with KCN.

OR

Give reason:
(i) Dipole moment of chlorobenzene is lower than that of cyclohexyl chloride
(ii) Out of o-and p-dibromobenzene, the later one has higher melting point.

Q26. Write the structure of the monomer of each of the following polymers:
(*i*) nylon-6,6
(*ii*) Bakelite.

Q27. How do antiseptics differ from disinfectants? Name a substance that can be used as an antiseptic as well as a disinfectant.

Q28. i) State Kohlrausch law of independent migration of ions.

(ii) Calculate Λm^0 for acetic acid.

Given that Λm^0 (HCl) = 426 S cm^2 mol^{-1}

Λm^0 (NaCl) = 126 S cm^2 mol^{-1}

Λm^0 (CH3COONa) = 91 S cm^2 mol^{-1}

OR

Calculate the emf of the following cell at 298 K:

Fe(s) | Fe2+(0.001M) || H+(1M)|H2(g)(1bar) | Pt(s

Q29. Conductivity of 0.00241 M acetic acid is 7.896 × 10–5 S cm–1. Calculate its molar conductivity and if 0 Λ m for acetic acid is 390.5 S cm2 mol–1, what is its dissociation constant?

Q30. Give reasons:
(i) Why can't aluminum oxide be reduced by carbon ?
(ii) Why is zinc not extracted from zinc oxide through reduction using CO ?
(iii) Write the basic principle involved in the Zone refining

Q31. Explain the following:
(*i*) Low spin octahedral complexes of nickel are not known.

(*ii*) The p-complexes are known for transition elements only.
(*iii*) CO is a stronger ligand than NH3 for many metals.

Q32.
Explain the following observations:
(*i*) The boiling point of ethanol is higher than that of methoxymethane.
(*ii*) Phenol is more acidic than ethanol.
(*iii*) o-and p-nitrophenols are more acidic than phenol.

Q33. Arrange the following:
(i)Increasing order of their basic strength in aq. Solution
CH_3NH_2, $(CH_3)_2N$, $(CH_3)_2NH$
(ii)Decreasing order of the Pk_b values
$C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$
(iii)Increasing order of Boiling point
C_2H_5OH, $(CH_3)_2NH$, $C_2H_5NH_2$
.
OR
Illustrate the following reactions giving a chemical equation in each case:
(*i*) Gabriel phthalimide synthesis
(*ii*) A coupling reaction
(*iii*) Hoffmann's bromamide reaction

Q34.
. (i) Deficiency of which vitamin causes scurvy?
(ii) What type of linkage is responsible for the formation of Proteins?
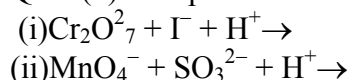(iii) Write the product form when glucose treated with HI.

Q35. (*a*) A reaction is of first order in A and of second order in B. Write the differential rate
equation for this reaction. How will its initial rate be affected if the concentration of both A
and B are together doubled?
(*b*) The rate constant k of a reaction increases four fold when the temperature changes from
300 K to 320 K. Calculate the activation energy for the reaction. ($R = 8.314$ J mol $^{-1}$ K $^{-1}$)
OR
(*a*) List the factor which affect the rate of a chemical reaction.
(*b*) The half-life for radioactive ^{14} C is 5730 years. The wooden part of an archaeological
artefact has only 80% of the ^{14} C activity found in fresh wood. Calculate the age of the
artefact.

Q36. (*a*) Complete the following reactions :
(i)$Cr_2O^2_7 + I^- + H^+ \rightarrow$
(ii)$MnO_4^- + SO_3^{2-} + H^+ \rightarrow$
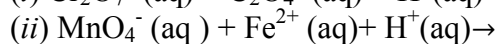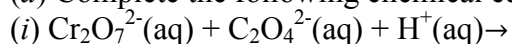(*b*) How would you account for the following
I. Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7
II. Transition metal and their compound show catalytic properties.
(*iii*) Among the 3*d* series of transition elements, the largest number of oxidation states are
exhibited by manganese.
OR

(*a*) Complete the following chemical equations:
(*i*) $Cr_2O_7^{2-}$(aq) + $C_2O_4^{2-}$(aq) + H^+(aq)→
(*ii*) MnO_4^- (aq) + Fe^{2+} (aq)+ H^+(aq)→
(*b*) Explain the following:
(*i*) Copper (I) ion is not stable in an aqueous solution.
(*ii*) With same (d^4) configuration Cr (II) is reducing whereas Mn (III) is oxidising.
(*iii*) Transition metals in general act as good catalysts.

Q37(A) Account for the following:

(i)Chloroacetic acid has lower pKa value than acetic acid.

(ii)Electrophilic substitution in benzoic acid takes place at meta position.

(iii)Carboxylic acids have higher boiling points than alcohols of comparable molecular masses.

(B) Explain thes Reactions:

(i) Clemensen Reduction

(ii) Etard Reaction

                    OR
(a) (A)Arrange the following in order of property indicated for each set:
(I)   (i) CH_3CHO, CH_3CH_2OH, CH_3OCH_3, $CH_3CH_2CH_3$ (increasing order of boiling point)
         (ii)CH_3CH_2OH, CH_3COOH, $ClCH_2COOH$, FCH_2COOH, C_6 (decreasing order of acidic character)
         (iii)Benzaldehyde, P-Toluaedehyde, P-Nitrobenzaldehyde, Acetophenone (increasing order of Reactivity towards Nucleophilic addition reaction)
(b) (B)Convert these: (Not more than Two steps)
(I)   (i)Benzoic acid to Benzaldehyde
         (ii)Ethanol to 3-Hydroxybutanol

MARKING SCHEME

Q.No.	ANSWER	MARKS
1.	(i)	1
2.	(i)	1
3.	(iii) Pt(s) /H$_2$ (g, 1 bar)/ H$^+$ (aq.,1 M)// Cu^{2+} (aq.,1 M)/ Cu	1
4.	(iii) emulsifying property	1
5.	(ii) $\Delta H = T\Delta S$	1
6.	(2) dialysis	1
7.	(Iv) Green Cr$_2$(SO$_4$)$_3$	1
8.	(iii) H$_2$SO$_4$ also oxidises HI so formed to I$_2$	1
9.	[PCl$_4$]$^+$[PCl$_6$]$^-$	1
10.	(iv) in covalent compounds fluorine can form single bond only while oxygen forms double bond.	1
11.	(iv) [Cr(H$_2$O)$_6$]Cl$_3$	1
12.	(ii) Potassiumtetrahydroxozincate(II)	1
13.	2,3-dimethylbut-2-ene	1
14.	(i) Cl$_2$/UV light	1
15.	CHCl$_3$/NaOH	1
16.	CH$_3$COOH	1
17.	(ii) N, N-Dimethylbutan-1-amine	1
18.	(iv) Glycogen	1
19.	Cis isoprene	1
20.	It is present in rain water	1

21.	$\lambda^o_{m(NH_4OH)} = \frac{1}{2}\lambda^o_{m\,Ba(OH)_2} + \lambda^o_{NH_4Cl} - \frac{1}{2}\lambda^o BaCl_2$ $\lambda^o_{m(NH_4OH)} = \frac{1}{2} \times 457.6 + 129.8 - \frac{1}{2} \times 240.6$ $\lambda^o_{m(NH_4OH)} = 238.3\,ohm^{-1}cm^2mol^{-1}$ $\lambda^o_{m(NH_4OH)} = \frac{1}{2}\lambda^o_{m\,Ba(OH)_2} + \lambda^o_{NH_4Cl} - \frac{1}{2}\lambda^o BaCl_2$ $\lambda^o_{m(NH_4OH)} = \frac{1}{2} \times 457.6 + 129.8 - \frac{1}{2} \times 240.6$ $\lambda^o_{m(NH_4OH)} = 238.3\,ohm^{-1}cm^2mol^{-1}$ OR Correct answer	1,1 ½,½,½,½
22.	(i) Mercury cell (ii) H2-O2 Fuel Cell (iii) Lead Storage Battery (iv) Dry Cell	½,½,½,½
23.	(I) due to coagulation (II) NH_3 has high critical temp. than N_2	1 1
24.	I. Tendency to form multiple Bond by oxygen II. Transition metal provide large surface area with free valencies.	1 1
25.	(i) Correct equation (ii) Correct equation OR (i) Correct reason (ii) Correct reason	1 1 1 1
26.	(i) hexamethyldiamine and adipic acid (ii) C6H5OH + HCHO	1 ½ + ½
27.	Difference between antiseptics and disinfectants. Antiseptics are chemical substances which prevent the growth of micro-organisms and may even kill them but are not harmful to living tissues. Antiseptics are generally applied to living tissues such as wounds, cuts, ulcers and diseased skin surfaces. eg.,Dettol, furacine, soframicine are antiseptics. Disinfectants are chemical substances which kill micro-organisms or stop their growth but are harmful to human tissues. Disinfectants are applied to inanimate objects such as floor, drainage system, instrument, etc .Eg., Chlorine in the concentration of 0.2 to 0.4 ppm in aqueous solution and SO_2 in very low concentration are disinfectants.	1 ½ 1 ½

28.	(i)The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the Anion and Cation of the electrolyte.	
	(ii) $\Lambda_m^0 CH3COOH = \Lambda_m^0 CH3COONa + \Lambda_m^0 HCl - \Lambda_m^0 NaCl$	
	$= (91 + 426 - 126)$ S cm2 mol-1	
	$= 391$ S cm2 mol-1	½
	Or	½
		1
	$$E_{cell} = E_{cell}^{\ominus} - \frac{0.0591}{n} \log \frac{\left[Fe^{2+} \right]}{\left[H^+ \right]^2}$$	½ , ½
	$$= \{0-(-0.44)\} - \frac{0.0591}{2} \log \frac{0.001}{1^2}$$	
	$$= 0.44 - 0.02955(-3)$$	
29.	Correct formula	
	Correct substitution of values	
	Correct calculations and answer	1
		½
		½
		½ , ½
30.	Aluminium is a stronger reducing agent than carbon.	1
	In Ellingham diagram the G^0 vs T plot representing CO , CO lies above to that of Zn,ZnO . Therefore CO cannot act as reducing agent for reduction of ZnO.	
	(iii) The impurities are more soluble in the melt than in the solid state of the metal.	1
		1
31.	(*i*) Ni in its atomic ionic state can not afford two vacant 3d orbitals hence *d* 2 *sp*3 hybridisation is not possible.	1
	(*ii*) Transition metals have vacant d orbitals in their atoms or ions into which the electron pairs can be donated by ligands containing p electrons, *e.g.*, C6H6, CH2 = CH2, etc. Thus *d*Π-*P*Πbonding is possible.	1
	(*iii*) Because in case of CO back bonding takes place in which the central metal uses its filled dorbital with empty anti bonding Π* molecular orbital of CO.	1

32.		1
	(*i*) Ethanol undergoes intermolecular hydrogen bonding due to the presence of a hydrogenattached to oxygen atom. As a result, ethanol exist as associated molecules and hence it has higher boiling point than methoxy ethane which does not form hydrogen bonds.	1
	(*ii*) Phenol is stronger acid than ethanol because the phenoxide ion left after the release of proton is stabilized by resonance but ethoxide ion is not. Moreover, ethoxide ion is destabilised by +I effect of ethyl group.	
	(*iii*) Due to –I effect or –R effect of –NO_2 group, the resulting phenolate ion is more stable than phenoxide ion. Therefore o- and p--nitrophenols are more acidic than phenol.	

33.	(i) $(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$
	(ii) $C_6H_5NH_2 > C_6H_5NHCH_3 > C_2H_5NH_2 > (C_2H_5)_2NH$
	(iii) $(CH_3)_2 < C_2H_5NH_2 < C_2H_5OH$
	
	OR
	    (i) Correct chemical equation.
	    (ii) Correct chemical equation.
	    (iii) Correct chemical equation.
		1
		
		1
		
		1
		
		1
		1
		1

34.	(i) Aspartame is unstable at cooking temperature. (ii) Soaps get precipitated as calcium and magnesium soap, which being insoluble in water stick to the clothes. 2RCOONa + $CaCl_2 \rightarrow$ (RCOO)$_2$Ca$\downarrow$ + 2NaCl (iii) Bithional acts as an antiseptic agent and reduces the odour produced by bacterial decomposition of organic matter on the skin.	

35.	(a) Rate =- $dx/dt = K[A][B]^2$	1
	If concentration of both A and B are doubled, then	
	Rate = $K[2A][2B]^2$	
	= $8K[A][B]^2$	
	i.e., the rate of reaction becomes 8 times.	1
	(b) Correct formula	½
	Substituting correct values	½
	Calculations	1
	Correct answer and units $Ea = 55.327$ kJ/mol	½, ½
	OR	
	(a) Rate of reaction depends on (Any four)	
	(i) Concentration	½ x 4 =
	(ii) Temperature	2
	(iii) Nature of reactant	
	(iv) Pressure of the gaseous reactant	
	(v) Surface area	
	(vi) Catalyst	
	(b) Correct formula	½
	Substituting correct values	½
	Calculations	1
	Correct answer and units t =1847.7 years	½, ½
36.	(a) (i) Correct balanced equation.	1
	(ii) Correct balanced equation.	1
	(b) (i) Correct reason.	1
	(ii) Correct reason.	1
	(iii) Correct reason.	1

37.	(A)	1
	(i)chloroacetic acid is stronger acid than acetic acid Due to -I effect of Cl.	1
		1
	ii) due to resonance in benzoic acid,there is comparatively higher electron density at meta position than at ortho and para position.	1
	iii) due to stronger intermolecular hydrogen bonding in carboxylic acid than alcohols.	1
	(B) Correct Reaction	
		1
		1
		1
	OR	1
		1
	(A)	
	(i) $CH_3CH_2CH_3 < CH_3OCH_3 < CH_3CHO < CH_3CH_2OH$	
	(ii) $FCH_2COOH > ClCH_2COOH > CH_3COOH > CH_3CH_2OH$	
	(iii)Acetophenone< P-Toluaedehyde<benzaldehyde< P-Nitrobenzaldehyde.	

COOH → (SOCl₂) → COCl → (Rosenmund's reduction Pd/BaSO₄) → CHO

Benzoic acid → Benzoyl chloride → Benzaldehyde

(B)
(i)

(ii)

CH_3CH_2OH → (Cu/573 K or PCC/CH_2Cl_2) → CH_3CHO → (Dil. NaOH, Aldol Condensation) → CH_3—$\overset{OH}{CH}$—CH_2CHO

Ethanol   Ethanal   3-hydroxybutanal
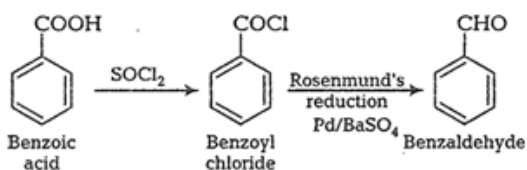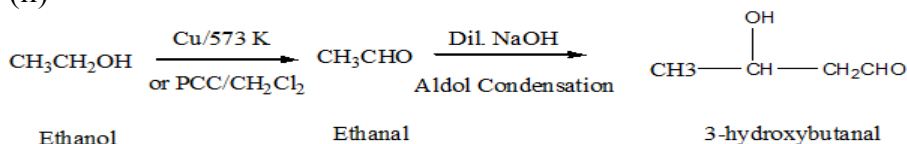
PAPER NO 10

S.NO.	UNIT	VSA (1 MARK)	SA I (2 MARKS)	SAII (3 MARKS)	LA II (5 MARKS)	TOTAL	MARKS
							23
1	Solutions	1(1)	1(2)	1(3)		6	
2	Electrochemistry	1(1)	1(2)	1(3)		6	
3	Chemical Kinetics	1(1)			1(5)	6	
4	Surface Chemistry	3(1)	1(2)			5	
5	General Principles & processes of isolation of Elements	3(1)				3	19
6	p-block elements		1(2)		1(5)	7	
7	d-& f- block elements	2(1)		1(3)		5	
8	Coordination compounds	1(1)		1(3)		4	
9	Haloalkanes & Haloarenes	2(2)	1(2)			4	28
10	Alcohols, Phenols & ethers	1(1)		1(3)		4	
11	Aldeydes,Ketones & Carboxylic acids	1(1)			1(5)	6	
12	Amines	1(1)		1(3)		4	
13	Biomolecules	1(1)		1(3)		4	
14	Polymers	1(1)	1(2)			3	
15	Chemistry in everyday life	1(1)	1(2)			3	
	TOTAL	20(20)	7(2)	7(3)	3(5)	70	70

Chemistry Question paper

Time: 3 hrs   **M Marks: 70**

General Instructions:

1) All questions are compulsory.
2) Q.no.1 to 20 are very short answer questions (MCQs) and carry 1 mark each.
3) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
4) Q.no.28 to 34 are short answer questions and carry 3 marks each.
5) Q.no.35 to 37 are long answer questions and carry 5 marks each.

SECTION-A

1. Which of the following solutions has the highest boiling point?   **1**
   (a)   5.85% solution of NaCl
   (b)   18.0% solution of glucose
   (c)   6.0% solution of urea
   (d)   all have same boiling point

2. The number of coulombs required to deposit 5.4g of Aluminium when the given   **1**
   electrodic reaction is represented as $Al^{3+}+3e^- \longrightarrow Al$
   (a)1.83×10^5 C   (b)57900 C   (c)5.86×10^{23}C   (d)3F

3. For a reaction having rate law expression :   **1**
   Rate = k $[A]^{3/2}[B]^{-1/2}$
   If the concentration of both A and B become four times the rate of reaction
       a. Becomes four times
       b. Becomes 16 times
       c. Decreases four times
       d. Remains same

4. The term 'sorption' stands for: **1**
       a. Absorption
       b. Adsorption
       c. both absorption and adsorption
       d. desorption

5.   **1**

   At the equilibrium position in the process of adsorption:
       a. $\Delta H > 0$
       b. $\Delta H = T\Delta S$
       c. $\Delta H < T\Delta S$
       d. $\Delta H > T\Delta S$

6. Which of the following interface cannot be obtained: **1**
       a. Liquid-liquid
       b. Solid-liquid
       c. Liquid-gas

       d. Gas-gas

7. During smelting of copper pyrites the reducing agent which reduces Cu_2O is   **1**
        d) FeO
        e) Cu_2S
        f) CuO
        g) CuS

8.
                                                           1

9.
Gold can be recovered from poatassium dicyanoaurate(I) by
        h) Complexing b) Oxidation c) Smelting d) Reduction   **1**

10. The following equation represents a method of refining of Ni by
        Ni + 4 CO $\underset{330K}{\longrightarrow}$ Ni(CO)$_4$ $\underset{450K}{\longrightarrow}$ Ni + 4 CO
        i)   Mond Process   **1**
        j)   Van Arkel method
11.   k) Zone refining   **1**
        l)   Electrolytic refining

12.   **1**
Which of the following is an electron configuration of Cr?
    A). [Ar] $3d^4\ 4s^2$ (B) [Ar] $3d^5 4s^2$
13.   C). [Ar] $3d^5\ 4s^1$ (D) [Ar] $3d^5\ 3s^1$ **1**

In modern periodic table, by which name d-block elements are known?

A) More electropositive elements   (C) Transition elements
B) Less electropositive elements   (D) Inner transition

                                                     1
14. Which of the following compounds can exhibit fac-mer isomerism?
  a) $[Cr(H_2O)_4Br_2]^+$ b) $[Fe(CO)_5ONO]^{2+}$ c) $[Fe(CO)_3(NH_3)_3]^{3+}$
  d) $[Cu(CO)_5Br]^+$
Which alkyl halide out of the following may follow both SN1 and SN2
mechanism?
15. a) CH_3-X   **1**
    b) $(CH_3)_2CH$-X
    c) $(CH_3)_3C$-X
    d) $(CH_3)_3C$-CH2-X

16.   **1**
Which C-X bond has the highest bond energy per mole?
    a)   C-Br
    b)   C-Cl
17. c)   C-F   **1**
    d)   C-I

18.   **1**
Lucas test is used to distinguish
a. Phenols
b. alcohols
19. c. ethers   **1**
d. alkyl halides

20. Aldol condensation will not take place in   1

        m) CH_3CHO
        n) CH_3COCH_3
        o) $HCHO$
        p) CH_3CH_2CHO

Byhydrolysisofwhichsubstance,weobtaintwomoleculesofglucose?
(a)sucrose(b)maltose (c)lactose (d)A&B

Which one of the following polymers is prepared by condensation polymerization?
    A) Teflon
    B) Rubber
    C) Styrene
    D) Nylon-6,6

Chloroxylenol is an important component of
(a) Dettol (b) Tincture of Iodine (c) Antibiotics (d) Detergents

Hinsberg test is used to differentiate:
    (a) Ethers (b) Amines (c) Alcohols (d) Haloarenes

SECTION-B

21. Explain the following observations-   2
(a) Lyophilic colloid is more stable than Lyophobic colloid.
(b) Coagulation takes place when sodium chloride is added to a colloidal solution of ferric hydroxide.

22. Why does Specific Conductance of CH_3COOH decrease on dilution?   2

23. Complete the following reactions: 2
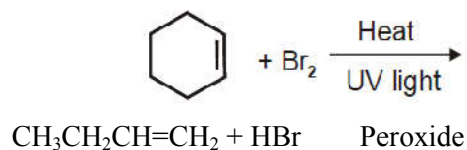
$CH_3CH_2CH{=}CH_2 + HBr$ Peroxide

OR

Give reason:
    i) Dipole moment of chlorobenzene is lower than that of cyclohexyl chloride
    ii) Out of o-and p-dibromobenzene, the later one has higher melting point.

24. Assign the reason for the following: 2
    i) XeF_6 is distorted octahedral.
    ii) ICl is more reactive than I_2.

OR

Give reasons:

(a) H_2O is a liquid whereas H_2S is a gas.

(b) F_2 is even more reactive than interhalogens.

25. Differentiate between Addition and Condensation Polymerisation.   **2**

26. Differentiate between Antiseptics and Disinfectants.   **2**

27. Define: **2**
(a) Molality (b) Abnormal Molecular Mass

28. Name the reagents which are used in the following conversions: **3**
(a) Butan-2-one to Butan-2-ol   (b) Phenol to 2,4,6,-tribromophenol
(c) Chlorobenzene to Phenol

29. Account for the following-   **3**
(a) Ethylamine is soluble in water whereas aniline is not.
(b) Aniline does not undergo Friedel-Craft's reaction.
(c) Gabriel phthalimide synthesis is preferred for synthesizing primary amines.

30. (a) Name the purines present in DNA.   **3**
(b) Give two examples of water soluble vitamins.

(c) Give the chemical name of vitamin B_{12}.

31. Henry's law constant for the molarity of methane in benzene at 298K is 4.27×10^5 mm Hg. Calculate the solubility of methane in benzene at 298K under 760mm Hg.   **3**

OR

15 g of an unknown molecular material is dissolved in 450 g of water. The resulting solution freezes at $-0.34°C$. What is the molar mass of the material? (K_f for water $= 1.86$ K kg mol^{-1})

32. By giving suitable examples for each, explain the following: **3**
(a) Linkage isomerism (b) Ambidentate ligand (c) fac-mer isomers

33. Give reasons: **3**
1. KMnO4 titrations should not be carried out with HCl
2. KMnO4 is purple in colour.
3. KmnO4 is a strong oxidising agent.

OR

Write the steps used in manufacture of Potassium Dichromate from Pyrolusite.

34. Calculate $\Lambda°$ m NH$_4$OH from the following values. $\Lambda°$ m for Ba(OH)$_2$, BaCl$_2$, NH$_4$Cl are 257.6, 240.6, 129.8 Scm^2 mol^{-1} respectively.   **3**

SECTION-D

35 (a) Give simple chemical tests to distinguish between the following pairs of Compounds-   **5**
(i) Propanal and Propanone
(ii) Phenol and benzoic acid
(iii) Benzoic acid and ethyl benzoate
(b)Draw the structures of the following-
(i) p-Nitropropiophenone
(ii) p-Methylbenzaldehyde

OR

An organic compound 'A' ($C_4H_6O_3$) on treatment with ethyl alcohol gives carboxylic acid 'B' ($C_2H_4O_2$)and compound 'C'($C_4H_8O_2$). Hydrolysis of 'C' under acidic conditions gives 'B' and 'D'(C_2H_6O). Oxidation of 'D' with $KMnO_4$ also gives 'B'. 'B' on heating with $Ca(OH)_2$ gives 'E' with molecular formula C_3H_6O. 'E' does not give Tollen's test or reduce fehling solution but forms 2,4-dinitrophenyl hydrazine. Identify A,B,C,D & E.

36. a) Complete the following chemical reactions-   **5**
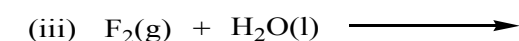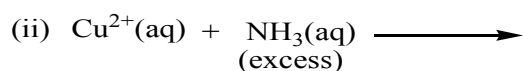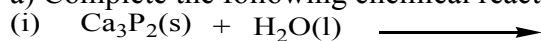
(i) $Ca_3P_2(s) + H_2O(l) \longrightarrow$

(ii) $Cu^{2+}(aq) + NH_3(aq) \longrightarrow$
                    (excess)

(iii) $F_2(g) + H_2O(l) \longrightarrow$

(b)Draw the structures of the following-

(i) BrF_3

(ii) XeF_4

OR

(a) Complete the following equations:

(i) $XeF_2 + PF_5 \longrightarrow$

(ii) $Cl_2 (g) + NaOH (aq) \longrightarrow$
        (hot and conc.)
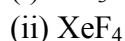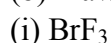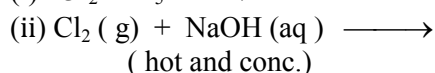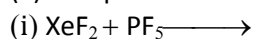
(b) Explain the following observations:

(i) +3 oxidation state becomes more and more stable from As to Bi in the group.

(ii) Sulphur in vapour state exhibits paramagnetism.

(iii) Fluorine does not exhibit any positive oxidation state.

37   **5**

(a) A first order gas reaction
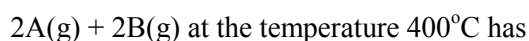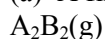
$A_2B_2(g) \qquad\qquad\qquad 2A(g) + 2B(g)$ at the temperature 400^oC has the rate constant K= 2.0×10^{-4} s-1. What percentage of A2B2is decomposed on heating for 900 seconds?

(b)For a chemical reaction variation in rate with concentration is shown below :
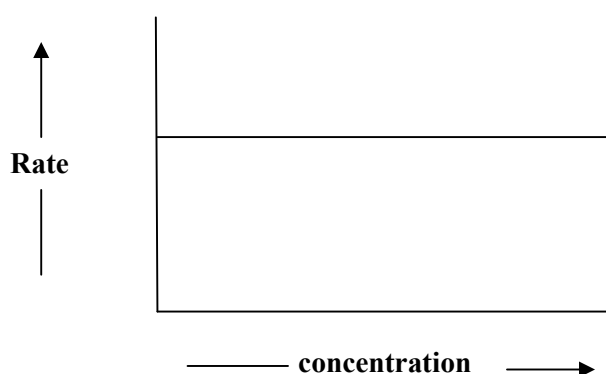
(i) What is order of the reaction?

(ii) What the units are of rate constant K for the reaction?

OR

(a)Define the following terms :

    (i) half life period

     (ii) Pseudo first order reactions

     (iii)Activation energy

b) The rate constant of a reaction w.r.t.the reactant A is 6 min^{-1}. If we start with

[A]=0.8 moL^{-1}, when would [A] reach the value of 0.08 molL^{-1}?

MARKING SCHEME:

1. d
2. b
3. a
4. c
5. b
6. d
7. b
8. d
9. a
10. d
11. c
12. c
13. b
14. c
15. b
16. c
17. b
18. d
19. a
20. b
21. (a) Lyophilic are reversible sols.
    (b) Due to neutralisation of charge of colloids.
22. No. of ions per unit volume decreases.
23. (a) Allylic bromide (b) 1-bromo butane

Or

   (a) Because of sp3 hybridised carbon in cyclohexyl chloride being less electronegative.
   (b) p- isomer has high mp because of symmetrical nature.

24. (a) 6 bp, 1 lp (b) Less BE for interhalogens.

OR

(a) Intermolecular H-bonding (b) Fluorine has least bond enthalpy

25.Correct points of differences

26. Correct points of differences
27. Correct definition.
28. (a) NaBH$_4$ (b) Br$_2$/H$_2$O (c) aq. KOH with 300 atm, 623 K.
29. (a) Because of presence of hydrophobic aromatic ring in Aniline.
(b) Lewis Acids make complex with lone pair of Aniline.
(c) Aromatic halides will not undergo nucleophilic substitution.
30. (a) Adenine, Guanine

(b) Vitamin B, C

(c) Cyanacobalamine

31. Solved numerical

32. (a) $[Co(NH_3)_5 NO_2]$ and $[Co(NH_3)_5 ONO]$

(b) SCN and NCS, ONO and NO_2.

(c) For MA_3B_3 type complexes.

33.   It takes place in two steps:

(i)Conversion of MnO2 into K2MnO4

(ii) Conversion of K2MnO4into KMnO4

Following reactions take place

$2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$

$3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO4^- + MnO_2 + 2H_2O$

OR

(i) Transition metals and their many compounds act as good catalyst It is due to

(a) partially filled(n☐1)d orbital (b) Variable oxidation state (c) Ability to change oxidation state frequently.

(ii) Transition metals have a strong tendency to form complexes .Most of transition elements form complex compounds due to -(a) small size (b) high charge (c) presence of vacant d-orbital of suitable energy.

PAPER NO 11

CLASS XII

TIME:-3 HRS   MM:-70

General Instructions:

1. All questions are compulsory.

2. Question No. 1-20 are very short answer questions and carry 1 mark each.

3. Question No. 21-27 are short answer questions and carry 2 marks each.

4. Question No. 28-34 are also short answer questions and carry 3 marks each.

5. Question No. 35-37 are long answer questions and carry 5 marks each.

6. Use log tables if necessary, use of calculators is not allowed.

Q1. .Low concentration of oxygen in the blood and tissues of people living at high altitude is due to
   (a) low temperature
   (b) low atmospheric pressure
   (c) high atmospheric pressure
   (d) both low temperature and high atmospheric pressure

Q2. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solutionof their salt are put under an electric field?
   (a) Na
   (b) K
   (c) Rb
   (d) Li

Q3. The activation energy of a reaction can be determined from the slope of which of the following graph?
   (a) In k vs 1/T
   (b) T/In k vs 1/T
   (c) In k vs T
   (d) In k /T vs T

Q4. Which of the following process does not occur at the interface of phases?
   (a) crystallisation
   (b) heterogenous catalysis
   (c) homogeneous catalysis
   (d) corrosion
.
Q5. Which of the following will show Tyndall effect?
(a) Aqueous solution of soap below critical micelle concentration.
(b) Aqueous solution of soap above critical micelle concentration.
(c) Aqueous solution of sodium chloride.
(d) Aqueous solution of sugar.
.
Q6. In Zone refining method , the molten zone:-
   (a) Contains impurities.
   (b) Contains purified metal only.
   (c) Contains more impurity than the original metal.
   (d) Moves to either side.

Q7. **Fluorine react with water to give :**
   (a)   Hydrogen fluoride and oxygen
   (b)   Hydrogen fluoride and ozone
   (c)   Hydrogen fluoride and oxygen fluoride
   (d)   Hydrogen fluoride, oxygen and ozone

Q8. In the preparation of compounds of Xe , Bartlett had taken $O_2^+ PtF_6^-$ as a base compound .this is because ?
   (a)   Both O_2 and Xe have same size.

(b) Both O_2 and Xe have almost same ionisation enthalpy.

(c) Both O_2 and Xe have almost same electron gain enthalpy.

(d) Both Xe and O_2 are gases

Q9. The catalytic activity of transition metals and their compounds is ascribed mainly to:-

(a) Their ability to adopt variable oxidation states.

(b) Their thermal reactivity.

(c) Their magnetic behaviour.

(d) None of the above.

Q10. A magnetic moment of 1.73 BM will be shown by one among the following :-

(a) $[Cu(NH_3)_4]^{2+}$.

(b) $[Ni(CN)_4]^{2-}$

(c) $TiCl_4$

(d) $[CoCl_6]^{4-}$

Q11 The molecular formula of DDT has how many chlorine atoms?

a) 5 chlorine atoms

b) 2 chlorine atoms

c) 3 chlorine atoms

d) 4 chlorine atoms

Q12 by hydrolysis of which substance, we obtain two molecules of glucose?

(A)sucrose   (B) maltose   (C) lactose   (D)A&B

Q13 which is non-reducingsugar?

(B) glucose   (B)fructose   (C)sucrose   (D) A&Bboth

Q14. whatistheproportionofhydrogenandoxygeninmoleculeofallmemberofcarbohydrate?

(C) 2:1   (B)1:1   (C) 1:2   (D) no certainratio

Q15. Which one is not a addition polymer:

A)Terylene,   B)Buna-S,

    C) polyvinyl chloride,   D)polythene

Q16These polymers can not berecycled:

(a)Thermoplasts   (b) Thermosets

(c)Elastomers   (d) Allpolymers

Q17. Which of the followings monomers gives the polymer neoprene on polymerization?

A) $CH_2 = CHCl$

B) $CCl_2 = Cl_2$

C) $CH_2C(Cl)CH=CH_2$

D) $CF_2 = CF_2$

Q18. _____ is neurologically active drug.

(a) Analgesic
(b) Antiseptic
(c) Agonist
(d) None of these

Q19. _____ is stable at cooking temperature.

(a) Aspartame
(b) Alitame
(c) Sucralose
(d) Sachharin

Q20. Mixture of Chloroxylenol and terpineol act as

(a) Antiseptic
(b) Analgesic
(c) Antibiotic
(d) Antipyretic

Q21 What is the molar concentration of solute particles in human blood if the osmotic pressure is 7.2atm at normal body temperature, i.e. 370 C?

OR

What is meant by positive deviations from Raoult's law? Give an example. What is the sign of ΔmixH for positive deviation?

Q 22. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

OR

   A) State a condition under which a bimolecular reaction is kinetically first order reaction.
   B) Why can't molecularity of any reaction be equal to zero ?

Q23. Out of molten NaCl and aqueous NaCl, which is used for the extraction of sodium and why?

Q24. Explain giving reason:
(i) Transition metals and their many compounds act as good catalyst.
(ii)Transition metals have a strong tendency to form complexes.

Q25 Explain on the basis of valence bond theory that $[Ni(CN)_4]^{2-}$ ion with square planar structure is diamagnetic and the $[NiCl_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.

Q26.Account for the following:
(a) Propanol has higher boiling point than butane
(b) O-nitrophenol is more acidic than o- methoxyphenol

Q27. Arrange the following
(i)NH_3, $C_2H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$ (Decreasing order of basicity in gaseousphase)
(ii) $CH_3CH_2CH_3$, $CH_3CH_2NH_2$, CH_3CH_2OH (Increasing order of Boiling Point)

Q28. Define Azeotropes? What are maximum and minimum boiling azeotropes ? Explain with example.

OR

The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatilesolute was dissolved in 90 g of benzene, the boiling point is raised to354.11 K. Calculate the molar mass of the solute. K_b for benzene is 2.53K kg mol^{-1}

Q29. The time required for 10% completion of first order reaction at 298 K is equal to that

required for its 25% completion at 308K. If the pre-exponential factor for the reaction is $3.56 \times 10^9 \, s^{-1}$, calculate the energy of activation.

OR

Show that in a first order reaction, time required for completion of 99.9% is 10 times of half-life ($t_{1/2}$) of the reaction.

Q30. Explain what is observed

(i) when a beam of light is passed through a colloidal sol.

(ii) an electrolyte, NaCl is added to hydrated ferric oxide sol.

(iii) electric current is passed through a colloidal sol?

Q31. How would you account for the following?

 (i) With the same d-orbital configuration (d^4) Cr^{2+} is a reducing agent while Mn^{3+} is an oxidizing agent.

 (ii) The actinoids exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series.

 (iii) Most of the transition metal ions exhibit characteristic colours in aqueous solutions.

OR

Explain the following:

 (i) The transition elements have great tendency for complex formation.

 (ii) There is a gradual decrease in the atomic sizes of transition elements in a series with increasing atomic numbers.

 (iii) Lanthanum and Lutetium do not show colouration in solutions. (At. No.: La = 57, Lu = 71)

Q32. Account for the following

a) Haloarenes are less reactive towards nucleophilic substitution reactions .

b) Grignard reagents should be prepared under anhydrous conditions .

c) Melting point of p- dichlorobenzene is more than O & m isomers.

Q33. Write the mechanism of acid-catalysed dehydration of ethanol to yield ethene.

OR

(a) Account for the following

   (i) Propanol has higher boiling point than butane

(ii) Ortho-nitrophenol is more acidic than ortho-methoxyphenol

   (iii) Preparation of ethers by acid dehydration of secondary or tertiary alcohol is not a suitable method .

Q34. Give one chemical test each to distinguish between the compounds in the following pairs:

  (*i*) Methylamine and dimethylamine

  (*ii*) Aniline and benzylamine

   (iii) Ethylamine and aniline

OR

Account for the following

 (a) Why are primary amines higher boiling than tertiary amines ?

 (b) Ethylamine is soluble in water whereas aniline is not ?

 (c) aniline does not undergo Friedel-Crafts reaction ?

Q35. (*a*) Depict the galvanic cell in which the following reaction takes place:

$$Zn\,(s) + 2Ag^+\,(aq) \longrightarrow Zn^{2+}\,(aq) + 2Ag\,(s)$$

Also indicate that in this cell

  (*i*) which electrode is negatively charged.

(ii) what are the carrier of the current in the cell.
(iii) what is the individual reaction at each electrode.
(b) Write the Nernst equation and determine the e.m.f. of the following cell at 298 K:

$$Mg\,(s)\,|\,Mg^{2+}\,(0.001\ M)\,||\,Cu^{2+}\,(0.0001\ M)\,|\,Cu\,(s)$$
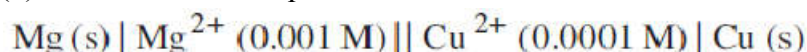
$$(Given : E^{\circ}_{Mg^{2+}/Mg} = -\,2.375\ V,\ E^{\circ}_{Cu^{2+}/Cu} = +\,0.34\ V)$$

OR

(a) Define conductivity and molar conductivity for the solution of an electrolyte. How do theyvary when the concentration of electrolyte in the solution increases?

(b) Three conductivity cells A, B and C containing solutions of zinc sulphate, silver nitrate and copper sulphate respectively are connected in series. A steady current of 1.5 amperes is passed through them until 1.45 g of silver is deposited at the cathode of cell B. How long did the current flow? What mass of copper and what mass of zinc got deposited in their   respective cells? (Atomic mass : Zn = 65.4 u, Ag =108 u, Cu = 63.5 u)

Q36 (a) Draw the structures of the following:
 (i) $H_2S_2O_8$ (ii) $HClO_4$

(b) Account for the following :
 (i) Why do some noble gases form compounds with fluorine and oxygen only?
 (ii)H_2S has lower boiling point than H_2O.
 (iii)SF_6 is kinetically an inert substance.

OR

(a) Draw the structures of the following:
  (i) ClF_3
  (ii) $XeOF_4$

(b) Explain the following observations:
  (i) The electron gain enthalpy of sulphur atom has a greater negative value than that of oxygen atom.
  (ii) What inspired N. Bartlett for carrying out reaction between Xe and PtF6?
  (iii)In aqueous solutions HI is a stronger acid than HCl.

Q37. (a) How will you bring about the following conversions:
 (i) Ethanol to 3-hydroxybutanal
  (ii) Benzaldehyde to Benzophenone.
  (b)An organic compound A has the molecular formula $C_8H_{16}O_2$. It gets hydrolysed with dilutesulphuric acid and gives a carboxylic acid B and an alcohol C. Oxidation of C with chromic acid also produced B. C on dehydration reaction gives but-1-ene. Write equations for the reactions involved
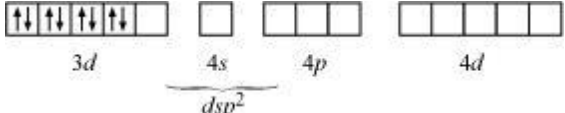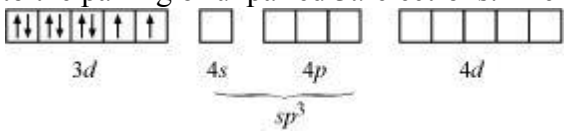
OR
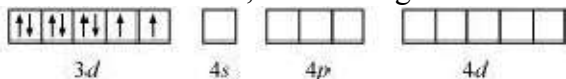
(a) Illustrate the following name reactions giving a chemical equation in each case:
  (i) Clemmensen reaction   (ii) Cannizzaro's reaction
(b) Describe how the following conversions can be brought about:
 (i) Cyclohexanol to cyclohexan-1-one
 (ii) Ethylbenzene to benzoic acid
 (iii) Bromobenzene to benzoic acid

SUB:-CHEMISTRY MARKING SCHEME

CLASS XII

Q No.	Answer	Mark
1	(B) low atmospheric pressure	1
2	(D)Hydrated Li+ has largest size hence its mobility is lowest under the electric field	1
3	(e) In k vs 1/T hint (In k = In A $^{-Ea/RT}$)	1
4	(c) homogeneous catalysis	1
5	(b)Aqueous solution of soap above critical micelle concentration	1
6	(c)Contains more impurity than the original metal.	1
7	(a) Hydrogen fluoride and oxygen	1
8	(b)Both O_2 and Xe have almost same ionisation enthalpy.	1
9	(e) Their ability to adopt variable oxidation states.	1
10	(e) $[Cu(NH_3)_4]^{2+}$. (it contains one unpaired electron $\mu = \sqrt{n(n+2)}$, n=1)	1
11	a) 5 chlorine atoms	1
12	(b)	1
13	(A)	1
14	(d)	1
15	A)Terylene,	1
16	(b) Thermosets	1
17	C) $CH_2C(Cl)CH=CH_2$	1
18	(e) Analgesic	1
19	C) Sucralose	1
20	(e) Antiseptic	1
21	JI = CRT	

	or $C = Л/RT$	½
	$Л = 7.2$ atm	
	$R = 0.0821$ L atm K^{-1}mol^{-1}	½
	$T = 37^0C = 37 + 273 = 310$ K.	
	Molar concentration (C) = $\dfrac{(7.2 \text{ atm})}{(0.082L \text{ L atm K}^{-1}\text{mol}^{-1}) \times (310K)}$	½
	$= 0.283$ mol^{-1}	
	$= 0.283$ M.	½
	OR	
	Positive deviation : For non-ideal solutions if the vapour pressure is higher, then it is said to exhibit positive deviation. $A—B$ interactions are weaker than $A—A$ or $B—B$ interactions. Due to this vapour pressure increases which results in positive deviation. In positive deviation, intermolecular force decreases, volume increases, vapour pressure increases. enthalpy increases. Therefore, $\Delta H_{mix} = +ve$, $\Delta V_{mix} = +$ ve. e.g., ethanol + acetone and carbon disulphide + acetone show positive deviation.	
	Plot for non-ideal solution showing positive deviation	
22	We know that for a 1st order reaction,	
	$t_{1/2}=0.693/K$	½
	It is given that	
	$t_{1/2}= 60$ min.	½
	$K=0.693/t_{1/2}$ $= 1.11 \times 10^{-2}$ min^{-1}	½+½
	OR	OR
	A) A bimolecular reaction becomes first order reaction when one of the reactants is in excess.	1
	B) Molecularity of a reaction means the number of molecules of the reactants taking place in an elementary reaction. Since at least one molecule must be present, so that molecularity will be atleast one.	1
23	Molten NaCl is preferred because	1
	Molten NaCl on electrolysis gives sodium but aqueous NaCl produces NaOH instead of Sodium.	1
24	(i) Transition metals and their many compounds act as good catalyst It is due to (a) partially filled(n□1)d orbital (b) Variable oxidation state (c) Ability to change oxidation state frequently.	1
	(ii) Transition metals have a strong tendency to form complexes .Most of transition elements form complex compounds due to -(a) small size (b) high charge (c) presence of vacant d-orbital of suitable energy.	1

Q25	Ni is in the +2 oxidation state i.e., in d^8 configuration.
	
	d^8 configuration : ⟨↑↓⟩⟨↑↓⟩⟨↑↓⟩⟨↑⟩⟨↑⟩ □ □□□ □□□□□
	        3d 4s 4p 4d
	
	There are 4 CN^- ions. Thus, it can either have a tetrahedral geometry or square planar geometry. Since CN^- ion is a strong field ligand, it causes the pairing of unpaired $3d$ electrons.
	
	⟨↑↓⟩⟨↑↓⟩⟨↑↓⟩⟨↑↓⟩ □ □□□ □□□□□
	    3d 4s 4p 4d
	       dsp^2
	
	It now undergoes dsp^2 hybridization. Since all electrons are paired, it is diamagnetic. In case of $[NiCl4]^{2-}$, Cl^- ion is a weak field ligand. Therefore, it does not lead to the pairing of unpaired $3d$ electrons. Therefore, it undergoes sp^3 hybridization.
	
	⟨↑↓⟩⟨↑↓⟩⟨↑↓⟩⟨↑⟩⟨↑⟩ □ □□□ □□□□□
	    3d 4s 4p 4d
	       sp^3
	
	Since there are 2 unpaired electrons in this case, it is paramagnetic in nature.
		1
		
		1

26	(a) both are of comparable masses but because of intermolecular H-bonding in propanol , it has higher boiling point. (b) -NO_2 group is an electron withdrawing group and tend to decrease the electron density on ^-OH thereby increasing its tendency to lose H^+ ions ,consequently increasing the acidic nature .but in o-methoxyphenol, $^-OCH_3$ group has +I effect and hence less is acidic .	1 1
27	(i) $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > NH_3$ (ii) $CH_3CH_2CH_3 < C_2H_5NH_2 < C_2H_5O$	1 1
28	Azeotropes are constant boiling mixture which has same composition in liquid phase as well as in vapour phase. The non ideal solutions which exhibit negative deviation from ideal solution at a particular composition are called as maximum boiling azeotropes. e.g 68% aqueous solution of HNO3 or any other suitable example. The non ideal solutions which exhibit positive deviation from ideal solution at a particular composition are called as minimum boiling azeotropes. e.g 95% aqueous ethanol by volume or any other suitable example. **OR** The elevation (ΔT_b) in the boiling point = 354.11 K – 353. 23 K = 0.88 K Substituting these values in expression (2.33) we get $M_2 = \dfrac{2.53 \text{ K kg mol}^{-1} \times 1.8 \text{ g} \times 1000 \text{ g kg}^{-1}}{0.88 \text{ K} \times 90 \text{ g}}$ = 58 g mol^{-1} Therefore, molar mass of the solute, $M_2 = 58$ g mol^{-1}	1 ½ ½ ½ ½ 1 1 1

| 29 | For first order reactions, $$t = \frac{2.303}{K} \log \frac{N_0}{N_1}$$ At 298 k; $$t = \frac{2.303}{K_{298}} \log \frac{100}{90}$$ At 308 K; $$t = \frac{2.303}{K_{308}} \log \frac{100}{75}$$ Since time is the same hence, $$\frac{2.303}{K_{298}} \log \frac{100}{90} = \frac{2.303}{K_{308}} \log \frac{100}{75}$$ or $$\frac{0.0458}{K_{298}} = \frac{0.1249}{K_{308}}$$ or $$\frac{K_{308}}{K_{298}} = \frac{0.1249}{0.0458} = 2.73$$ According to Arrhenius equation $$2.303 \log \frac{K_{308}}{K_{298}} = \frac{E_a}{8.314}\left[\frac{1}{298} - \frac{1}{308}\right]$$ or $$2.303 \log 2.73 = \frac{E_a}{8.314}\left[\frac{10}{298 \times 308}\right]$$ **E_a = 76.65 kJ** E_a = 76.65 kJ/mol
 OR
 When reaction is completed 99.9%, $[R]n = [R]_0 - 0.999[R]_0$ $$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$$ $$= \frac{2.303}{t} \log \frac{[R]_0}{[R]_0 - 0.999[R]_0} = \frac{2.303}{t} \log 10^3$$ $$t = 6.909/k$$ For half-life of the reaction $$t_{1/2} = 0.693/k$$ $$\frac{t}{t_{1/2}} = \frac{6.909}{k} \times \frac{k}{0.693} = 10$$ | |
| 30 | *(i)*   Scattering of light by the colloidal particles takes place and the path of light becomes visible(Tyndall effect).
 (ii)   The positively charged colloidal particles of ferric hydroxide sol get coagulated by the oppositely charged Cl^- ions provided by NaCl.
 (iii)   On passing electric current through a sol, colloidal particles start moving | 1

 1 |

		towards oppositely charged electrode where they lose their charge and get coagulated (electrophoresis).	1
31	(i)	Cr^{2+} is a reducing agent as its configuration changes from d^4 to d^3, the later having a half-filled t_{2g} level. On the other hand, the change from Mn^{3+} to Mn^{2+} results in the extra stable half-filled (d^5) configuration and hence Mn^{3+} is an oxidizing agent.	1
	(ii)	This is due to very small energy gaps between $5f$, $6d$ and $7s$ subshells in actinoids.	1
	(iii)	In aqueous solutions, the transition metal ions which have partially filled d-orbitals undergo d-d transition by absorbing light from visible region and radiate complementary colour.	1
		OR	
	(i)	The transition elements have great tendency for complex formation due to presence of vacant d-orbitals of suitable energy, small size of cations and higher nuclear charge.	1
	(ii)	There is a gradual decrease in the atomic sizes of transition elements in a series with increasing atomic numbers due to poor shielding effect of d-electrons, the net electrostatic attraction between the nucleus and the outermost electrons increase.	1
	(iii)	Lanthanum and Lutetium do not show colouration in solutions because both the element exhibit +3 oxidation state in their compound thus their cations do not possess any unpaired electrons in them	1
32		a)due to resonance a partial double bond character is developed between C & X or any other suitable reason	1
		b)because they are highly reactive towards any source of H^+	1
		c) due to more symmetry of p-dichlorobenzene.	1
33		The mechanism of acid dehydration of ethanol to yield ethene involves the following three steps: **Step 1:** Protonation of ethanol to form ethyl oxonium ion:	
		Ethanol — Protonated ethanol (Ethyl oxonium ion)	1
		Step 2: Formation of carbocation (rate determining step):	1
		Step 3: Elimination of a proton to form ethene: Ethene	1

		OR	1
		(i) It is because propanol can form intermolecular hydrogen bonds. (ii) It is because –NO2 group is electron withdrawing and –OCH3 group is electron releasing. Therefore o-nitrophenoxide is more stable than o-methoxyphenoxide ion. (iii)It is because secondary and tertiary alcohols on dehydration lead to the formation of alkene and not ethers due to stability of secondary and tertiary carbocation.	1 1
34		(i) Methylamine on treatment with alcoholic KOH and $CHCl_3$ gives offensive smell of methyl isocyanide but dimethyl amine does not. $CH_3 —NH_2+CHCl_3+3KOH \longrightarrow CH_3—CH_2—NC+3KCl + 3H_2O$ (alc)Ethyl isocyanide $\qquad\qquad$ (Offensive smell) $CHCl_3$ /KOH $(CH_3)_2 NH \longrightarrow$ No reaction. Dimethyl amine $\quad$ (2 amine) (ii) Aniline on treatment with $NaNO_2$/HCl (HNO_2) at 0–5°C followed by treatment with an alkaline solution of □□naphthol gives an orange coloured azo dye while benzylamine does not give this test. (iii) Add Br_2(*aq*), aniline forms white ppt while ethyl amine does not form such ppt. 2,4,6-Tri bromo Aniline White ppt **OR** (a) Primary amines have two hydrogen atoms on the N atom and therefore form intermolecular hydrogen bonding. Tertiary amines do not have hydrogen atoms on the N atom and therefore,these do not form hydrogen bonds . (b) Ethylamine when added to water forms intermolecular H−bonds with water. Hence, it is soluble in water. (c)Friedel-Crafts reaction is carried out in the presence of $AlCl_3$. But $AlCl_3$ is acidic in nature, while aniline is a strong base. Thus, aniline reacts with $AlCl_3$ to form a salt	1 1 1

	Due to the positive charge on the N-atom, electrophilic substitution in the benzene ring is deactivated. Hence, aniline does not undergo the Friedel-Crafts reaction.
35	(*a*) $\quad$ Zn $\big|$ Zn^{2+} (conc.) $\big\|$ Ag$^+$ (conc) $\big|$ Ag

(*i*) Zn electrode is negatively charged.

(*ii*) Current carriers of cell are electrons in external wire.

· Zn^{2+} ions in anodic half cell.

· Ag+ ions in cathodichalf cell.

· Ions of salt bridge, *i.e.,* K+ and Cl$^-$

(*iii*) At anode Zn $\longrightarrow$ Zn^{2+}+ 2*e-*

At cathode 2Ag$^+$ + *e-* $\longrightarrow$ 2Ag

(*b*) Mg $\longrightarrow$ Mg^{2+} + 2*e-*

Cu^{2+} + 2*e-* $\longrightarrow$ Cu

$$\underline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad}$$
$$Mg \;+\; Cu^{2+} \;\longrightarrow\; Cu \;+\; Mg^{2+}$$
$$\overline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad}$$

n=2

According to Nernst equation,

$$E_{cell} = E^{\circ}{}_{cell} - \frac{0.059}{n} \log \frac{[Cu][Mg^{2+}]}{[Mg][Cu^{2+}]}$$

$$E_{cell} = (E^{\circ}{}_{Cu^{2+}/Cu} - E^{\circ}{}_{Mg^{2+}/Mg}) - \frac{0.059}{2} \log \frac{[Mg^{2+}]}{[Cu^{2+}]}$$

$$= 0.34 - (-2.375) - \frac{0.059}{2} \log \frac{10^{-3}}{10^{-4}}$$

$$= 0.34 + 2.375 - 0.0295 \log 10$$

$$E_{cell} = 2.6855 \text{ V}$$

<div align="center">OR</div>

(*a*) The conductivity of a solution at any given concentration is the conductance of one unit volume of solution kept between two platinum electrodes with unit area of cross section at a distance of unit length. On increasing the concentration of solution, the number of ions per unit volume of solutionincreases and thus its conductivity increases.

Molar conductivity ($\wedge m$) of a solution at a given concentration is the conductance of thevolume$V$ of solution containing one mole of electrolyte kept between two electrodes with area
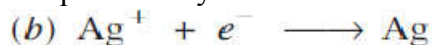
of cross section A and distance of unit length. Therefore

$$\Lambda_m = \frac{\kappa A}{l} = \kappa$$

Since $l = 1$ and $A = V$ (volume containing 1 gram mole of electrolyte)

$\wedge m = \text{K} v$Molar conductivity increases with decrease in concentration. This is because the total volume, V of solution containing one mole of electrolyte also increases. It has been found that decrease in K on dilution of solution is more than

compensated by increase in its volume.

(b) $Ag^+ + e^- \longrightarrow Ag$

  108 g of Ag are deposited by 96500 C

∴ 1.45 g of Ag will be deposited by $= \dfrac{96500}{108} \times 1.45$ C

  $= 1295.6$ C

$t = \dfrac{Q}{I} = \dfrac{1295.6}{1.50} = 863.7$ s.

$Cu^{2+} + 2e^- \longrightarrow Cu$

2×96500 C deposit Cu $= 63.5$ g

∴ 1295.6 C deposit Cu $= \dfrac{63.5}{2 \times 96500} \times 1295.6 = 0.426$ g

$Zn^{2+} + 2e^- \longrightarrow Zn$

2×96500 C deposit Zn $= 65.3$ g

∴ 1295.6 C deposit Zn $= \dfrac{65.3}{2 \times 96500} \times 1295.6 = 0.438$ g

---

36 | **(a) (i)** | 1

Peroxodisulphuric Acid
$H_2S_2O_8$

(ii)

Perchloric Acid
$HClO_4$

| 1

(B) i) Fluorine and oxygen are the most electronegative elements and hence are very reactive. Therefore, they form compounds with noble gases particularly with xenon. | 1

ii)   H2O   H2S | 1

 Boiling point 373 K > 213 K

The abnormally high boiling point of H2O is due to strong intermolecular H-bonding. Since, all other elements have much lower electronegativity than oxygen, they do not undergo H-bonding.

iii) In SF6, S atom is sterically protected by six F atoms and does not allow any reagent to attack on the S atom. Due to these reasons, SF6 is kinetically an inert substance. | 1
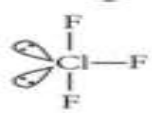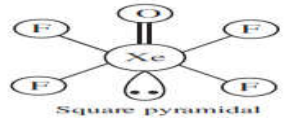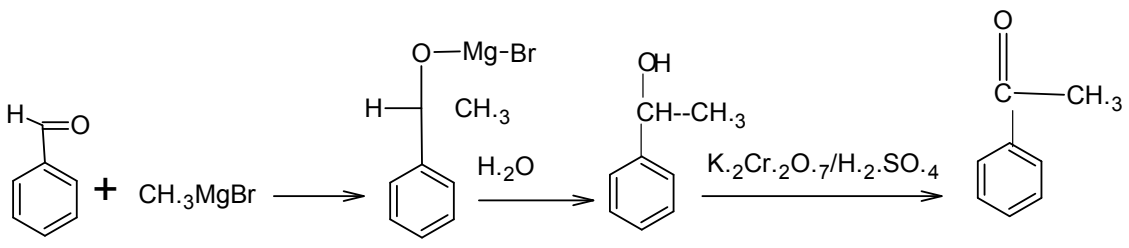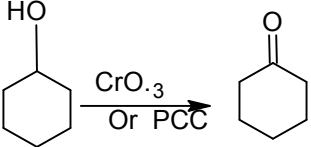
| 1

OR
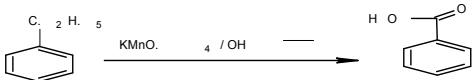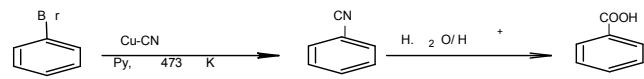
	I) Hybridisation – sp^3d Structure – Trigonal bipyramidal Shape – Bent (*T*-shaped) Angle F–Cl–F : less than 90°		1
	(ii) XeOF₄ : Square pyramidal		1
	(a) (*i*) Due to small size of oxygen atom there will be greater interelectronic repulsions in oxygen.		1
	(ii) Neil Bartlett first prepared a red compound which is formulated as O2 +PtF6 –. He then realised that the first ionisation enthalpy of molecular oxygen (1175 kJ/mol) is almost identical with Xe (1170 kJ/mol). He made efforts to prepare same type of compound with Xe and was successful in preparing another red compound Xe+PtF6 –. (*iii*) Due to low bond dissociation enthalpy of H-I as compared to H—Cl.		1
37	**(a)(i)** $CH_3\text{-}CH_2\text{-}OH \xrightarrow{PCC} CH_3\text{-}CHO \xrightarrow{Dil\ NaOH} CH_3\text{--}CHOHCH_2\text{--}CHO$ 3-Hydroxy Butanal **(ii)**		1
			1
	(*b*) A = Butyl butanoate B = Butanoic acid C = Butanol D = But–1–ene Reactions involved: $CH_3—CH_2—CH_2—C—O—CH_2—CH_2—CH_2—CH_3+ H_2O \xrightarrow{H_2SO_4}$ $\qquad\qquad\ \|$ $\qquad\qquad\ O$ $\qquad\quad$ (A)		1
	$CH_3 — CH_2 — CH_2 —\overset{\overset{O}{\|}}{C}— OH+ CH_3 — CH_2 — CH_2 — CH_2 — OH$ Butanoic acid(B) $\qquad\qquad\qquad\qquad\qquad\qquad$ Butanol(C) $CH_3 — CH_2 — CH_2 — CH_2 — OH \xrightarrow[H_2CrO_4]{(O)} CH_3 — CH_2 — CH_2 — CHO \xrightarrow{(O)}$ Butanol(C) $CH_3 — CH_2 — CH_2 —COOH$ Butanolic acid (B) $CH_3 — CH_2 — CH_2 — CH_2 — OH \xrightarrow[Heat]{conc.H_2SO_4} CH_3 — CH_2 — CH=CH_2 + H_2O$ Butan–1- ol $\qquad\qquad\qquad\qquad\qquad\qquad$ But–1–ene. (C) $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (D)		1 1 1

OR

(a) (i) Clemmensen reaction

$$CH_3\underset{\underset{O}{\|}}{C}CH_3 \xrightarrow{\text{Zn-Hg/HC(Conc.)}} CH_3 - CH_2 CH_3$$
Propane

1

(ii) Cannizzaro's reaction:

$$2HCHO + NaOH \longrightarrow HCOONa + CH_3 OH$$
Formaldehyde   Sodium formate

1

(b) (i)

1

(ii)

(iii)

1

1

PAPER NO 13

KENDRIYA VIDYALAYA SANGATHAN

HALF YEARLY EXAMINATION: 2019-20

CLASS: XII

CHEMISTRY(THEORY)

TIME: 3 Hours   **Max. Marks: 70**

General Instructions:-
(a) All questions are compulsory.
(b) Q.no. 1 to 20 are very short answer questions and carry 1 mark each.
(c) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
(d) Q.no. 28 to 34 are long answer questions and carry 3 marks each.
(e) Q.no. 35 to 37 are long answer questions and carry 5 marks each.

Q.1   Which of the following solutions has the highest boiling point?

   (a)   5.85% solution of NaCl   (b)   18.0% solution of glucose
   (c)   6.0% solution of urea   (d)   all have same boiling point

Q.2   Molarity of pure water is
   (a)   1   (b)   18

(c)   55.5   (d)   6

Q.3   The half life period for a zero order reaction is equal to :

   a. $2k/[A]°$

   b. $\dfrac{[A]°}{2k}$

   c. $\dfrac{0.693}{k}$

   d. $\dfrac{0.693}{k[A]°}$

Q.4 Which property of colloidal solution is independent of charge on the colloidal particles?

   a. Coagulation
   b. Electrophoresis
   c. Electro-osmosis
   d. Tyndall effect

Q.5   Which of the following ore is concentrated by froth-floatation method?
   a) Magnetite b) Galena c) Cassiterite d) Malachite

Q.6. When excess of KI is added to copper sulphate solution:
   (a)   Cuprous iodide is formed
   (b) I_2 is liberated
   (c)   Potassium iodide is oxidized
   (d)   all

Q.7. The BCl_3 is a planar molecule whereas NCl_3 is pyramidal because:
   (a)   N – Cl bond is more covalent than B – Cl bond
   (b)   B – Cl bond is more polar than N – Cl bond
   (c)   Nitrogen atom is smaller than boron
   (d) BCl_3 has no lone pair but NCl_3 has a lone pair of electron

Q.8. Which of the following transition metal ion has magnetic moment 3.87 BM?
   A) Co^{2+} (B) Co^{3+} (C) Fe^{2+} (D) Fe^{3+}

Q.9. Which of the following sentence is not suitable for the capacity of transition metal to form complex compounds?
   A). Transition metal ions are small in size.
   B). Nuclear charge of transition metal ion in comparatively more.
   C). Co-ordination covalent bond is not directional.
   D). Transition metal ions possesses different oxidation states.

Q.10   The number of unidentate ligands in the complex ion is called

a) Effective atomic number   b) Coordination number

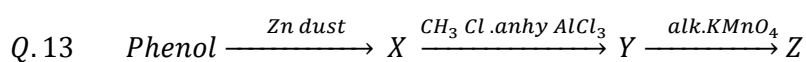c) Primary valency   d)Oxidation number

Q.11 When two moles of ethyl chloride react with two moles of sodium in the presence of ether

what will be formed?

a)   2 moles of ethane

b)   1 moles of ethane

c)   2 moles of butane

d)   1 moles of butane

Q.12. Lowest boiling point is for
   a. Butanol
   b. Pentanol
   c. 2-methylpropan-2-ol
   d. 2-methylbutan-2-ol

$Q.13$ $Phenol \xrightarrow{\quad Zn\ dust \quad} X \xrightarrow{\quad CH_3\ Cl\ .anhy\ AlCl_3 \quad} Y \xrightarrow{\quad alk.KMnO_4 \quad} Z$

The product Z is
   a) Benzaldehyde
   b) Benzoic acid
   c) Benzene
   d) Toluene

Q.14   The major product obtained on interaction of phenol with NaOH and CO_2 is

   a) Benzoic acid
   b) Salicylic acid
   c) Salicylaldehyde
   d) Phthalic acid

Q.15. Hoffmann degradation of m-bromobenzenamide gives

   a) Aniline b) m-bromo aniline c) bromo benzene d) m-bromo ethyl benzene
   b) whichis reducingsugar?
         a. lactose   (B)maltose   (C)fructose   (D) all ofabove

Q.16 Which of the following is a broad spectrum antibiotic?

         a) Penicillin

b)Chloramphenicol

c) Ampicillin

         d) Aspirin

Q.17.Which of the following is a chain growth polymer?
   A) Nucleic acid
   B) Polystyrene
   C) Protein
   D) Starch

Q.18. Alcohols and ethers are
   a. Position isomers
   b. Functional isomers
   c. Chain isomers
   d. Metamers

Q.19   Use of glycol as antifreeze in the automobile is an important application of
   (a)   colligative property   (b)   Roault's law
   (c)   fractional crystallization   (d)   hydrolysis
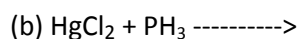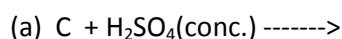
Q20.   Aniline react with $NaNO_2$ and HCl to give

a)Nitroaniline   b) Diazonium salt   c) Phenol   d) Chloroaniline

Q.21. Explain what is meant by the following?

(i) zwitter ion   (ii) Biocatalysts

Q.22. Complete the following chemical equations;

(a) C + H_2SO_4(conc.) ------->

(b) $HgCl_2$ + PH_3 ---------->

Q.23. Explain giving a suitable reason for each of the following;

(i)Generally there is an increase in the density of elements from titanium (Z=22) to copper (z=29) in the first series of transition elements.

(ii)The chemistry of actinoids is more complicated as compared to lanthanoids.

Q.24.Why does NH_3 acts as a Lewis base?

Q.25.Out of H_2Te and H_2S which is more acidic and why?

OR

 Give a chemical test to distinguish between a primary amine and a secondary amine.

Q.26. The rate constant for a reaction of zero order in A is 0.0060 mol L^{-1} S^{-1}.How lonh will it take for the initial concentration of A to fall from 0.20 M to 0.080 M ?

OR

Derive the general form of the expression for half life of a zero order reaction.

Q.27. The conductivity of 0.20M solution of KCl at 298 K is 0.025 S cm^{-1}. Calculate its molar conductivity.

Q.28. write the following name reaction .

(a) Aldol condensation   (b)Cannizzaro reaction (c) Wolf kishner reaction

Q.29. What is the difference between multi-molecular and accociated colloids? Give one example of each.

Q.30 The decomposition of A into product has value of K as $4.5 \times 103S^{-1}$ at 10' C and energy 60 kJ mol^{-1} At what temperature would k be $1.5 \times 104\ S^{-1}$?

Q.31 Explain the following observations;

(i) Zinc is not regarded as transition element[1]

(ii) Among the divalent cations in the first series of transition elements ,mangnese exhibits the maximum paramagnetism.

(iii)Transition elements have great tendency for catalytic activity .

Q.32 Write .the names and structures of the monomers of the following polymers;

(A) Buna-N   (B) Bakalite   (C) Nylon-66

Q.33. Explain the term rusting of iron .

OR

. (a) Explain why an alkylamine is more basic than ammonia.

(b)How would you convert?

A. aniline to nitrobenzene   B. aniline to carbyl amine

Q.34 a. Out of 2- chloroethanol and ethanol,which is more acidic and why?

   b. Phenol donot give protonation reaction readily.why?

   c. Kolbes reaction- explain

OR

 Give reasons:

   a. Ethyl iodide undergoes Sn^2 reaction faster than ethyl bromide.
   b. Although chlorine is an electron withdrawing group,yet it is ortho,para- directing in electrophilic aromatic substitution
   c. The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

Q.35. Compare the chemistry of lanthanoids with that of the actinoids with refrence to -

(I) Electronic configuration (ii) Oxidation state (iii) Atomic and ionic sizes (iv)Chemical reactivity

(v) Complex formation.

OR

Describe the preparation potassium permangnate . What is the effect of increasing pH on a solution of potassium dichromate ?

Q.36. Explain why:

(i) The dipole moment of chlorobenzene is lower than that of cyclohexyle chloride.

(ii)Alkyl halides,though polar, areimmiscible with water.

(iii) Wurtz reaction should be done under anhydrous conditions.

OR

Write the structures of the major organic product in each of the following reactions:

Acetone

(i) $CH_3 CH_2CH_2Br + NaI$ ---------------->

Heat

Ethanol

(ii) $(CH_3)_3CCl + KOH$ ---------------->

Heat   Water

(iii) $CH_3CH(Br) CH_2CH_3 + NaOH$ ------------->aq.ethanol

(iv) $CH_3 CH_2Br + KCN$ ----------------->

(v)$C_6 H_5ONa + C_2H_5Cl$ ------------>

Q.37(a). Define the terms reverse osmosis and osmotic pressure.

(b). Calculate the boiling point of a solution prepared by adding15.0 g of NaCl to 500 g of water.

(K_b for water= 0.512 K kg mol^{-1} and molar mass of NaCl=58.44 g)

OR

(a). State the following :

(i) Applications of Henry's law

(ii) Ideal solution .

(b). A solution prepared by dissolving 8.95 mg of a gene fragment in 70.0 ml of water has an osmotic pressure of 0.335 torr at 25^{0}C. Assuming the gene fragment s a non-etectrolyte, determine its molar mass.

PAPER NO 14

KENDRIYA VIDYALAYA SANGATHAN SESSION ENDING PAPER SESSION 2019-20
SUB:-CHEMISTRY
CLASS XII

TIME:-3 HRS   **MM:-70**

General Instructions:

1. All questions are compulsory.

2. Question No. 1-20 are multiple choice questions and carry 1 mark each.

3. Question No. 21-27 are short answer questions and carry 2 marks each.

4. Question No. 28-34 are also short answer questions and carry 3 marks each.

5. Question No. 35-37 are long answer questions and carry 5 marks each.

6. Use log tables if necessary, use of calculators is not allowed.

Q1. Which Of The following is incorrect for ideal solution ;-

(a) $\Delta H_{mix}=0$

(b) $\Delta U_{mix}=0$

(c) $\Delta G_{mix}\neq 0$

(d) None of the above

Q2. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solutionof their salt are put under an electric field?

(e) Na

(f) K

(g) Rb

(h) Li

Q3. The activation energy of a reaction can be determined from the slope of which of the

following graph?

(f) In k vs 1/T

(g) T/In k vs 1/T

(h) In k vs T

(i) In k /T vs T

Q4. Adsorption is accompanied by :-

(a) Decrease in enthalpy and increase in entropy.

(b) Increase in enthalpy and increase in entropy.

(c) Decrease in enthalpy and decrease in entropy.

(d) No change in enthalpy and entropy.

Q5. Fog is a colloidal solution of :-

(a) Solid in gas.

(b) Gas in gas.

(c) Liquid in gas.

(d) Gas in liquid.

Q6. In Zone refining method , the molten zone:-

(e) Contains impurities.

(f) Contains purified metal only.

(g) Contains more impurity than the original metal.

(h) Moves to either side.

Q7. Which of the following elements does not show allotropy ?

(a) Nitrogen.

(b) Bismuth.

(c) Antimony.

(d) Arsenic.

Q8. In the preparation of compounds of Xe , Bartlett had taken $O_2^+PtF_6^-$ as a base compound

.this is because ?

(e) Both O_2 and Xe have same size.

(f) Both O_2 and Xe have almost same ionisation enthalpy.

(g) Both O_2 and Xe have almost same electron gain enthalpy.

(h) Both Xe and O_2 are gases

Q9. The catalytic activity of transition metals and their compounds is ascribed mainly to:-

(f) Their ability to adopt variable oxidation states.

(g) Their thermal reactivity.

(h) Their magnetic behaviour.

(i) None of the above.

Q10. A magnetic moment of 1.73 BM will be shown by one among the following :-

(f) $[Cu(NH_3)_4]^{2+}$.

(g) $[Ni(CN)_4]^{2-}$

(h) $TiCl_4$

(i) $[CoCl_6]^{4-}$

Q11.Which of the following halide can give best SN2 reaction?

a) Primary alkyl halide

b) Tertiary alkyl halide

c) Secondary alkyl halide

d) All can give SN2 reaction at same rate

Q12. Solubility ofglucose in alcohol is
(D) notsoluble   (B)soluble   (C)moresoluble   (D) soluble in morealcohol

Q13. Which carbohydrate isn't soluble in water and tasteless?
(Al) Lactose   (B)dextrin   (C)fructose   (D) melitriose

Q14. Which of the following is a polyamide?

A) Teflon
B) Nylon-6,6
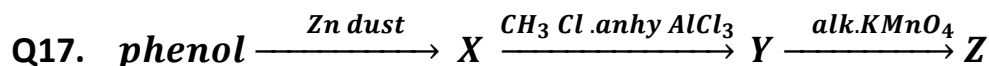C) Terylene
D) Bakelite

Q15. An artificial sweetener which is stable under cold conditions only is _____
(a)Saccharine
(b)Aspartame
(c)Alitame
(d)Sucralose

Q16. $R_2CO \rightarrow R_2CHOH$

Which reagent is required for this conversion?

    a. $LiAlH_4$
    b. $NaBH_4$
    c. Ni/H_2
    d. All of these

Q17. $phenol \xrightarrow{Zn\ dust} X \xrightarrow{CH_3\ Cl\ .anhy\ AlCl_3} Y \xrightarrow{alk.KMnO_4} Z$

The product Z is
    e) Benzaldehyde
    f) Benzoic acid
    g) Benzene
    h) Toluene

Q18. When RX react with AgCN it gives

    a) RCN
    b) RNC
    c) both of these
    d) none of these

Q19. . Weight of copper deposited when 2 Faradays of electricity is passed through cupric salt solution is

    a)63.5g

    b)31.15g

    c)127g

    d)2g

Q20. In modern periodic table, by which name d-block elements are known?
    a) More electropositive elements
    b) Transition elements
    c) Less electropositive elements
    d) Inner transition

Q21.What is the molar concentration of solute particles in human blood if the osmotic pressure is 7 atm at normal body temperature, i.e. 37^0 C?
      (2)

Q 22. Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the

decomposition is a first order reaction, calculate the rate constant of the reaction.   (2)

Q23. Out of molten NaCl and aqueous NaCl, which is used for the extraction of sodium and
why?
(2)

Q24. Describe the method of preparation of $KMnO_4$ from MnO_2
(2)

<center>OR</center>

Explain giving reason:
(i) Transition metals and their many compounds act as good catalyst.
(ii)Transition metals have a strong tendency to form complexes.

Q25. $CuSO_4.5H_2O$ is blue in color while $CuSO_4$ is colorless. Why?
(2)

<center>OR</center>

Explain on the basis of valence bond theory that $[Ni(CN)_4]^{2-}$ ion with square planar
structure is diamagnetic and the $[NiCl_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.

Q26.Account for the following:
(2)
  (a) Propanol has higher boiling point than butane
  (b) O-nitrophenol is more acidic than o- methoxyphenol

Q27. Arrange the following
(2)
  (i)NH_3, $C_2H_5NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$ (Decreasing order of basicity in gaseous phase)
  (ii) $CH_3CH_2CH_3$, $CH_3CH_2NH_2$, CH_3CH_2OH (Increasing order of Boiling Point)

Q28. The boiling point of benzene is 353.23 K. When 1.80 g of a non-volatile solute was
    dissolved in 90 g of benzene, the boiling point is raised to 354.11 K. Calculate the molar
    mass of the solute. K_b for benzene is 2.53K kg mol^{-1}
          (3)

Q29. The time required for 10% completion of first order reaction at 298 K is equal to that
    required for its 25% completion at 308K. If the pre-exponential factor for the reaction
is 3.56 ×109 s^{-1}, calculate the energy of activation.
    (3)

<center>OR</center>

Show that in a first order reaction, time required for completion of 99.9% is 10 times of
half-life ($t_{1/2}$) of the reaction.

Q30. Explain what is observed
    (3)
  (i) when a beam of light is passed through a colloidal sol.

(ii) an electrolyte, NaCl is added to hydrated ferric oxide sol.

(iii) electric current is passed through a colloidal sol?

Q31. How would you account for the following? (3)

(iv) With the same *d*-orbital configuration (d^4) Cr^{2+} is a reducing agent while Mn^{3+} is an oxidizing agent.

(v) The actinoids exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series.

(vi) Most of the transition metal ions exhibit characteristic colours in aqueous solutions.

OR

Explain the following:

(iv) The transition elements have great tendency for complex formation.

(v) There is a gradual decrease in the atomic sizes of transition elements in a series with increasing atomic numbers.

(vi) Lanthanum and Lutetium do not show colouration in solutions.
(At. No.: La = 57, Lu = 71)

Q32.Account for the following (3)

a) Haloarenes are less reactive towards nucleophilic substitution reactions .

b) Grignard reagents should be prepared under anhydrous conditions .

c) Melting point of p- dichlorobenzene is more than O & m isomers.

Q33.(a)Account for the following (3)

(i) Propanol has higher boiling point than butane

(ii) Ortho-nitrophenol is more acidic than ortho-methoxyphenol

(iii)Preparation of ethers by acid dehydration of secondary or tertiary alcoholis
not a suitable method .

Q34. Give one chemical test each to distinguish between the compounds in the following pairs: (3)

(*i*) Methylamine and dimethylamine
(*ii*) Aniline and benzylamine
(iii)Ethylamine and aniline

Q35. (*a*) Depict the galvanic cell in which the following reaction takes place: (5)

$$Zn\,(s) + 2Ag^+\,(aq) \longrightarrow Zn^{2+}\,(aq) + 2Ag\,(s)$$

Also indicate that in this cell

(*i*) which electrode is negatively charged.
(*ii*) what are the carrier of the current in the cell.
(*iii*) what is the individual reaction at each electrode.

(b) Write the Nernst equation and determine the e.m.f. of the following cell at 298 K:

$$Mg\,(s)\,|\,Mg^{2+}\,(0.001\ M)\,||\,Cu^{2+}\,(0.0001\ M)\,|\,Cu\,(s)$$

$$(Given : E^{\circ}_{Mg^{2+}/Mg} = -2.375\ V, E^{\circ}_{Cu^{2+}/Cu} = +0.34\ V)$$

OR

(c) Define conductivity and molar conductivity for the solution of an electrolyte. How do they vary when the concentration of electrolyte in the solution increases?

(d) Three conductivity cells A, B and C containing solutions of zinc sulphate, silver nitrate and copper sulphate respectively are connected in series. A steady current of 1.5 amperes is passed through them until 1.45 g of silver is deposited at the cathode of cell B. How long did the current flow? What mass of copper and what mass of zinc got deposited in their respective cells? (Atomic mass : Zn = 65.4 u, Ag =108 u, Cu = 63.5 u)

Q36 (a) Draw the structures of the following:

(5)

(i) $H_2S_2O_8$ (ii) $HClO_4$

(b) Give an explanation for each of the following observations:

(i) In the structure of HNO3, the N – O bond (121 pm) is shorter than the N – OH

bond (140 pm).

(ii) All the P – Cl bonds in PCl_5 are not equivalent.

(iii)ICI is more reactive than I_2.

OR

(a) Draw the structures of the following:

(i) N_2O_5

(ii) $XeOF_4$

(b) Explain the following observations:

(i) The electron gain enthalpy of sulphur atom has a greater negative value than that

of oxygen atom.

(ii) Nitrogen does not form pentahalides.

(iii)In aqueous solutions HI is a stronger acid than HCl.

Q37. (a) How will you bring about the following conversions:

(5)

(i) Ethanol to 3-hydroxybutanal

(ii) Benzaldehyde to Benzophenone.

(b)An organic compound A has the molecular formula $C_8H_{16}O_2$. It gets hydrolysed with dilute sulphuric acid and gives a carboxylic acid B and an alcohol C. Oxidation of C with chromic acid also produced B. C on dehydration reaction gives but-1-ene. Write equations for the reactions involved

OR

(*a*) **Illustrate the following name reactions giving a chemical equation in each case:**

    (*i*) **Clemmensen reaction**   (*ii*) **Cannizzaro's reaction**

(*b*) **Describe how the following conversions can be brought about:**

    (*i*) **Cyclohexanol to cyclohexan-1-one**

    (*ii*) **Ethylbenzene to benzoic acid**

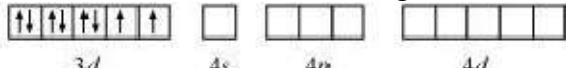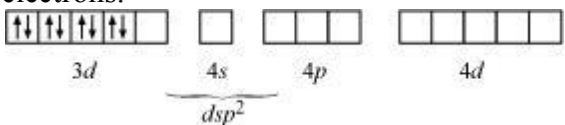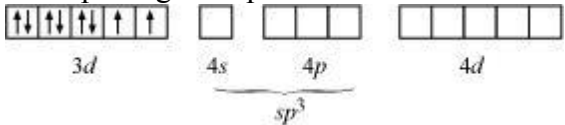   (*iii*) **Bromobenzene to benzoic acid**

BLUE PRINT
KENDRIYA VIDYALAYA SANGATHAN
SUBJECT-CHEMISTRY
CLASS-XII

S.NO.	Name of the unit	Distribution of Marks unit wise	TOTAL MARKS OF UNITS	1Marks	2 Marks	3 Marks	5 Marks	Total Q[M]
1	Solutions	6		1x1	1x2	1x3		6
2	Electrochemistry	6		2×1			1x5	7
3	Chemical Kinetics	6	23	1x1	1x2	1x3		6
4	Surface Chemistry	5		2x1		1x3		5
5	General Principles and Processes of Isolation of Elements	3		1x1	1x2			3
6	p -Block Elements	7		2x1			1x5	7
7	d -and f -Block Elements	6	2x1	2x1	1x2	1x3		7
8	Coordination Compounds	3		1x1	1x2			3
9	Haloalkanes and Haloarenes	4		2x1		1x3		5
10	Alcohols, Phenols and Ethers	5		1x1	1x2	1x3		6
11	Aldehydes, Ketones and Carboxylic Acids	5		1x1			1x5	6
12	Organic Compounds containing Nitrogen	5	28		1x2	1x3		5
13	Biomolecules	3		3x1				3
14	Polymers	3		1x1				1
15	Chemistry in Everyday Life	3						
	TOTAL	70	51	20x1=20	7x2=14	7x3=21	3x5=15	70(37)

KENDRIYA VIDYALAYA SANGATHAN SESSION ENDING PAPER SESSION 2019-20

SUB:-CHEMISTRY MARKING SCHEME

CLASS XII

Q No.	Answer	Mark
1	$\Delta G_{mix} \neq 0$	1
2	Hydrated Li+ has largest size hence its mobility is lowest under the electric field	1
3	(j) In k vs 1/T hint (In k = In A – Ea/RT)	1
4	(c) Decrease in enthalpy and decrease in entropy.	1
5	(c) liquid in gas	1
6	(c)Contains more impurity than the original metal.	1
7	(e) Nitrogen.	1
8	(b)Both O_2 and Xe have almost same ionisation enthalpy.	1
9	(j) Their ability to adopt variable oxidation states.	1
10	(j) $[Cu(NH_3)_4]^{2+}$. (it contains one unpaired electron $\mu= \sqrt{n(n+2)}$, n=1)	1
11	**Primary** alkyl halid	1
12	a) Not soluble	1
13	b) Dextrin	1
14	Nylon 6,6	1
15	Aspartame	1
16	All of these	1
17	Benzoic acid	1
18	RNC	1
19	63.5g	1
20	c) Transition elements	1
21	ЛI = CRT or C = ЛI/RT ЛI = 7.2 atm R = 0.0821 L atm $K^{-1}mol^{-1}$ $T = 37^0C = 37 + 273 = 310$ K. Molar concentration (C) = $\dfrac{(7.2 \text{ atm})}{(0.082L \text{ L atm } K^{-1}mol^{-1}) \times (310K)}$ = 0.283 mol^{-1} = 0.283 M.	½ ½ ½ ½
22	We know that for a 1st order reaction, $t_{1/2}=0.693/K$ It is given that $t_{1/2}= 60$ min. $K=0.693/t_{1/2}$ = 1.11 x 10^{-2} min^{-1}	½ ½ ½+½
23	Molten NaCl is preferred because Molten NaCl on electrolysis gives sodium but aqueous NaCl produces NaOH instead of Sodium.	1 1
24	It takes place in two steps: (i)Conversion of MnO2 into K2MnO4 (ii) Conversion of K2MnO4into KMnO4 Following reactions take place	1

	$2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$ $3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO4^- + MnO_2 + 2H_2O$ **OR** (i) Transition metals and their many compounds act as good catalyst It is due to (a) partially filled(n$\square$1)d orbital (b) Variable oxidation state (c) Ability to change oxidation state frequently. (ii) Transition metals have a strong tendency to form complexes .Most of transition elements form complex compounds due to -(a) small size (b) high charge (c) presence of vacant d-orbital of suitable energy.	1 1 1
Q25	In $CuSO_4.5H_2O$,water acts as ligand as a result it causes crystal field splitting. Hence d-d transition is possible in field splitting is $CuSO_4.5H_2O$ and shows color. In the anhydrous $CuSO_4$ due to the absence of water (ligand), crystal not possible and hence no color. **OR** Ni is in the +2 oxidation state i.e., in d^8 configuration. There are 4 CN^- ions. Thus, it can either have a tetrahedral geometry or square planar geometry. Since CN^- ion is a strong field ligand, it causes the pairing of unpaired $3d$ electrons. It now undergoes dsp^2 hybridization. Since all electrons are paired, it is diamagnetic. In case of $[NiCl4]^{2-}$, Cl^- ion is a weak field ligand. Therefore, it does not lead to the pairing of unpaired $3d$ electrons. Therefore, it undergoes sp^3 hybridization. Since there are 2 unpaired electrons in this case, it is paramagnetic in nature.	1 1 1 1
26	(a) both are of comparable masses but because of intermolecular H-bonding in propanol , it has higher boiling point. (b) -NO_2 group is an electron withdrawing group and tend to decrease the electron density on ^-OH thereby increasing its tendency to lose H^+ ions ,consequently increasing the acidic nature .but in o-methoxyphenol, $^-OCH_3$ group has +I effect and hence less is acidic .	1 1
27	(i) $(C_2H_5)_3N > (C_2H_5)_2NH > C_2H_5NH_2 > NH_3$ (ii) $CH_3CH_2CH_3 < C_2H_5NH_2 < C_2H_5O$	1 1
28	The elevation (ΔTb) in the boiling point = 354.11 K – 353. 23 K = 0.88 K Substituting these values in expression (2.33) we get $M_2 = $ <u>2.53 K kg mol^{-1} × 1.8 g × 1000 g kg^{-1}</u> 0.88 K × 90 g = 58 g mol^{-1} Therefore, molar mass of the solute, $M_2 = 58$ g mol^{-1}	1 1 1

29	For first order reactions, $$t = \frac{2.303}{K} \log \frac{N_o}{N_1}$$ At 298 k; $t = \frac{2.303}{K_{298}} \log \frac{100}{90}$ At 308 K; $t = \frac{2.303}{K_{308}} \log \frac{100}{75}$ Since time is the same hence, $$\frac{2.303}{K_{298}} \log \frac{100}{90} = \frac{2.303}{K_{308}} \log \frac{100}{75}$$ or $\frac{0.0458}{K_{298}} = \frac{0.1249}{K_{308}}$ or $\frac{K_{308}}{K_{298}} = \frac{0.1249}{0.0458} = 2.73$ According to Arrhenius equation $$2.303 \log \frac{K_{308}}{K_{298}} = \frac{E_a}{8.314} \left[\frac{1}{298} - \frac{1}{308} \right]$$ or $2.303 \log 2.73 = \frac{E_a}{8.314} \left[\frac{10}{298 \times 308} \right]$ **E_a = 76.65 kJ** E_a = 76.65 kJ/mol		
	OR		
	When reaction is completed 99.9%, $[R]n = [R]_0 - 0.999[R]_0$ $$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$$ $$= \frac{2.303}{t} \log \frac{[R]_0}{[R]_0 - 0.999[R]_0} = \frac{2.303}{t} \log 10^3$$ $t = 6.909/k$ For half-life of the reaction $t_{1/2} = 0.693/k$ $$\frac{t}{t_{1/2}} = \frac{6.909}{k} \times \frac{k}{0.693} = 10$$		
30	(iv)	Scattering of light by the colloidal particles takes place and the path of light becomes visible(Tyndall effect).	1
	(v)	The positively charged colloidal particles of ferric hydroxide sol get coagulated by the oppositely charged Cl^- ions provided by NaCl.	1
	(vi)	On passing electric current through a sol, colloidal particles start moving towards oppositely charged electrode where they lose their charge and get coagulated (electrophoresis).	1
31	(iv)	Cr^{2+} is a reducing agent as its configuration changes from d^4 to d^3, the later having a half-filled t_{2g} level. On the other hand, the change from Mn^{3+} to Mn^{2+} results in the extra stable half-filled (d^5) configuration and hence Mn^{3+} is an oxidizing agent.	1
	(v)	This is due to very small energy gaps between 5f, 6d and 7s subshells in actinoids.	1

	(vi)	In aqueous solutions, the transition metal ions which have partially filled *d*-orbitals undergo *d-d* transition by absorbing light from visible region and radiate complementary colour.	1
		OR	
	(iv)	The transition elements have great tendency for complex formation due to presence of vacant d-orbitals of suitable energy, small size of cations and higher nuclear charge.	1
	(v)	There is a gradual decrease in the atomic sizes of transition elements in a series with increasing atomic numbers due to poor shielding effect of d-electrons, the net electrostatic attraction between the nucleus and the outermost electrons increase.	1
	(vi)	Lanthanum and Lutetium do not show colouration in solutions because both the element exhibit +3 oxidation state in their compound thus their cations do not possess any unpaired electrons in them	1
32	a)due to resonance a partial double bond character is developed between C & X or any other suitable reason b)because they are highly reactive towards any source of H$^+$ c) due to more symmetry of p-dichlorobenzene.		1 1 1
33	The mechanism of acid dehydration of ethanol to yield ethene involves the following three steps: (i) It is because propanol can form intermolecular hydrogen bonds. (ii) It is because –NO2 group is electron withdrawing and –OCH3 group is electron releasing. Therefore o-nitrophenoxide is more stable than o-methoxyphenoxide ion. (iii)It is because secondary and tertiary alcohols on dehydration lead to the formation of alkene and not ethers due to stability of secondary and tertiary carbocation.		1 1 1
34	(iv) Methylamine on treatment with alcoholic KOH and CHCl$_3$ gives offensive smell of methyl isocyanide but dimethyl amine does not. CH_3 —NH_2+$CHCl_3$+3KOH ⟶ CH_3—CH_2 —NC+3KCl + 3H_2O (alc)Ethyl isocyanide (Offensive smell) CHCl$_3$ /KOH $(CH_3)_2$ NH ⟶ No reaction. Dimethyl amine (3 amine) (v) Aniline on treatment with NaNO$_2$/HCl (HNO$_2$) at 0–5°C followed by treatment with an alkaline solution of ⬚⬚naphthol gives an orange coloured azo dye while benzylamine does not give this test. (vi) Add Br$_2$(*aq*), aniline forms white ppt while ethyl amine does not form such ppt. 		1 1 1

2,4,6-Tri bromo Aniline
White ppt

35	(a) $\quad$ Zn $\left|\ Zn^{2+}\ (conc.)\ \right|\left|\ Ag^+\ (conc)\ \right|$ Ag	

(i) Zn electrode is negatively charged.

(ii) Current carriers of cell are electrons in external wire.

· Zn^{2+} ions in anodic half cell.

· Ag+ ions in cathodic half cell.

· Ions of salt bridge, i.e., K+ and Cl⁻

(iii) At anode Zn → Zn^{2+} + 2e-

At cathode 2Ag⁺ + e- → 2Ag

(b) Mg → Mg^{2+} + 2e-

Cu^{2+} + 2e- → Cu

$$\underline{\quad\quad Mg\ +\ Cu^{2+} \longrightarrow Cu\ +\ Mg^{2+} \quad\quad}$$

n=2

According to Nernst equation,

$$E_{cell} = E°_{cell} - \frac{0.059}{n} \log \frac{[Cu][Mg^{2+}]}{[Mg][Cu^{2+}]}$$

$$E_{cell} = (E°_{Cu^{2+}/Cu} - E°_{Mg^{2+}/Mg}) - \frac{0.059}{2} \log \frac{[Mg^{2+}]}{[Cu^{2+}]}$$

$$= 0.34 - (-2.375) - \frac{0.059}{2} \log \frac{10^{-3}}{10^{-4}}$$

$$= 0.34 + 2.375 - 0.0295 \log 10$$

$$E_{cell} = 2.6855\ V$$

OR

(b) The conductivity of a solution at any given concentration is the conductance of one unit volume of solution kept between two platinum electrodes with unit area of cross section at a distance of unit length. On increasing the concentration of solution, the number of ions per unit volume of solutionincreases and thus its conductivity increases.

Molar conductivity ($\wedge m$) of a solution at a given concentration is the conductance of thevolume V of solution containing one mole of electrolyte kept between two electrodes with area

of cross section A and distance of unit length. Therefore

$$\Lambda_m = \frac{\kappa A}{l} = \kappa$$

Since $l =1$ and $A = V$ (volume containing 1 gram mole of electrolyte)

$\wedge m = Kv$ Molar conductivity increases with decrease in concentration. This is because the total volume, V of solution containing one mole of electrolyte also increases. It has been found that decrease in K on dilution of solution is more than compensated by increase in its volume.

(b) $Ag^+ + e^- \longrightarrow Ag$

108 g of Ag are deposited by 96500 C

$\therefore$ 1.45 g of Ag will be deposited by $= \dfrac{96500}{108} \times 1.45\ C$

$$= 1295.6 \text{ C}$$

$$t = \frac{Q}{I} = \frac{1295.6}{1.50} = 863.7 \text{ s.}$$

$$Cu^{2+} + 2e^- \longrightarrow Cu$$

2×96500 C deposit Cu $= 63.5$ g

$$\therefore \quad 1295.6 \text{ C deposit Cu} = \frac{63.5}{2 \times 96500} \times 1295.6 = 0.426 \text{ g}$$

$$Zn^{2+} + 2e^- \longrightarrow Zn$$
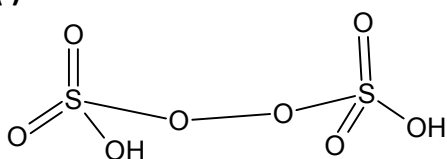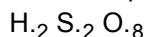
2×96500 C deposit Zn $= 65.3$ g

$$\therefore \quad 1295.6 \text{ C deposit Zn} = \frac{65.3}{2 \times 96500} \times 1295.6 = 0.438 \text{ g}$$

36	**(b) (i)**	1

Peroxodisulphuric Acid
$H_2S_2O_8$

(ii)

Perchloric Acid
$HClO_4$

1

(b)

1

(i) Due to resonance, N—O bond length is the average of single and double bond whereas N—OH bond is purely single bond.

1

(ii) PCl5 has trigonal bipyramidal structure in which the three equatorial P—Cl bonds are equivalent, while the two axial bonds are longer than equational bonds. This is due to thefact that axial bond pairs suffer more repulsion as compared to equatorial bond pairs.

(iii) This is because I—Cl bond has lower bond dissociation enthalpy than Cl—Cl bond.

1

OR

(a) (i)

(N_2O_5)

1

(ii) XeOF$_4$:

Square pyramidal

1
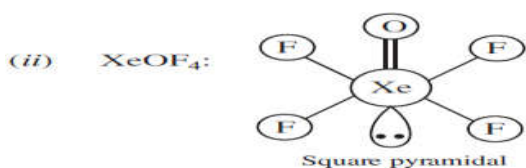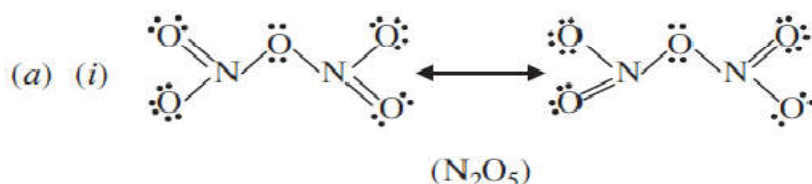
(b) (*i*) Due to small size of oxygen atom there will be greater interelectronic repulsions in oxygen.

1

(ii)Due to non-availability of d orbitals in valence shell nitrogen does not form pentahalide.

1

	(*iii*) Due to low bond dissociation enthalpy of H-I as compared to H—Cl.	1
37	**(a)(i)**

$CH_3-CH_2-OH \xrightarrow{PCC} CH_3-CHO \xrightarrow{Dil\ NaOH} CH_3-CHOH-CH_2-CHO$

3-Hydroxy Butanal | 1 |
| | **(ii)**

 | 1 |
| | (*b*) A = Butyl butanoate B = Butanoic acid
C = Butanol D = But–1–ene
Reactions involved:

$$CH_3-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-O-CH_2-CH_2-CH_2-CH_3 + H_2O \xrightarrow{H_2SO_4}$$

(A) | 1 |
| |

$CH_3-CH_2-CH_2-\underset{\underset{\|}{O}}{C}-OH + CH_3-CH_2-CH_2-CH_2-OH$
Butanoic acid(B)   Butanol(C)

$CH_3-CH_2-CH_2-CH_2-OH \xrightarrow[H_2CrO_4]{(O)} CH_3-CH_2-CH_2-CHO \xrightarrow{(O)}$
Butanol(C)

$CH_3-CH_2-CH_2-COOH$
Butanolic acid (B) | 1 |
| | $CH_3-CH_2-CH_2-CH_2-OH \xrightarrow[Heat]{conc.H_2SO_4} CH_3-CH_2-CH=CH_2 + H_2O$
Butan–1–ol   But–1–ene.
(C)   (D)

OR | 1 |
| | **(c) (*i*) Clemmensen reaction**

$CH_3\underset{\underset{O}{\|}}{C}CH_3 \xrightarrow{Zn-Hg/HC(Conc.)} CH_3 - CH_2 CH_3$
                                      Propane | |
| | **(ii)Cannizzaro's reaction:**

$2HCHO + NaOH \longrightarrow HCOONa + CH_3OH$
Formaldehyde   Sodium formate | 1 |
| | **(d) (i)**

 | 1 |
| | **(ii)**

 | |
| | **(iii)**
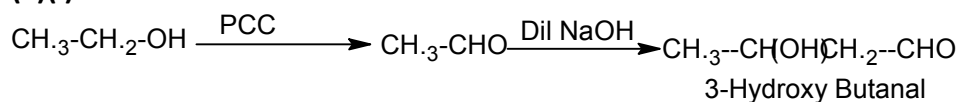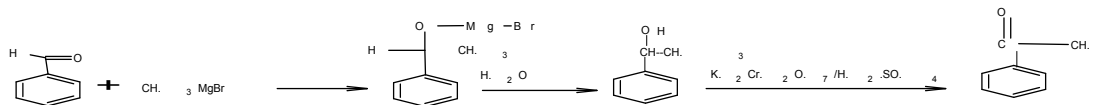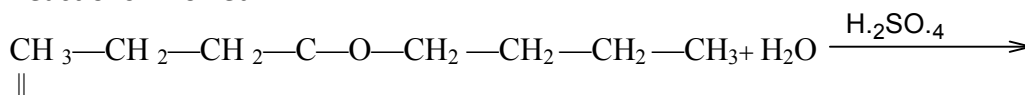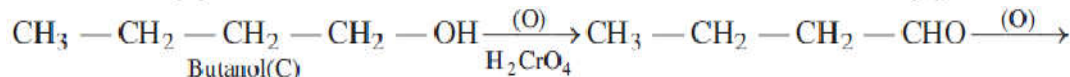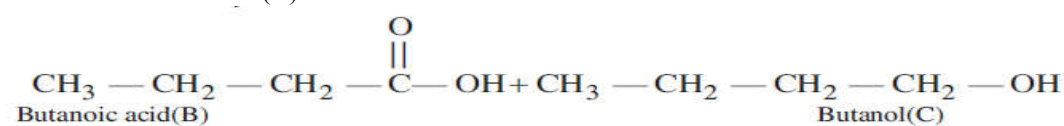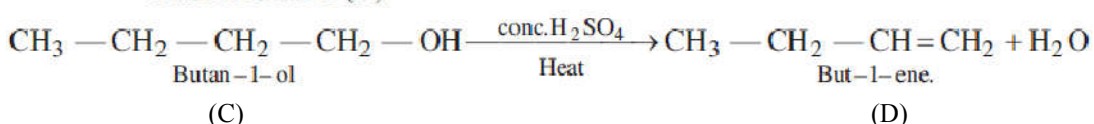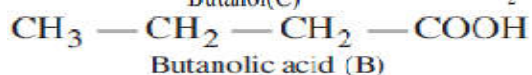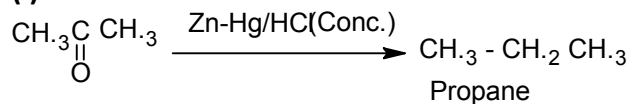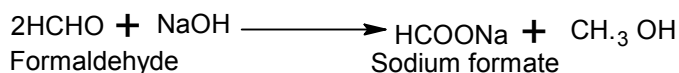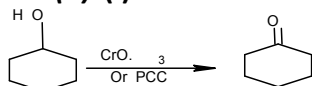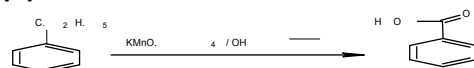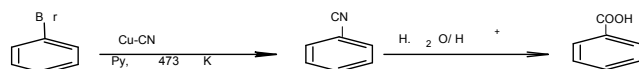
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PAPER NO 15

KENDRIYA VIDYALAYA SANGATHAN

HALF YEARLY EXAMINATION: 2019-20

CLASS: XII

CHEMISTRY(THEORY)

TIME: 3 Hours **Max. Marks: 70**

General Instructions:-
(a) All questions are compulsory.
(b) Q.no. 1 to 20 are very short answer questions and carry 1 mark each.
(c) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
(d) Q.no. 28 to 34 are long answer questions and carry 3 marks each.
(e) Q.no. 35 to 37 are long answer questions and carry 5 marks each.

Q.1 Molarity of pure water is

(a) 1 (b) 18
(c) 55.5 (d) 6

Q.2. Weight of copper deposited when 2 Faradays of electricity is passed through cupric salt

solution is

1)63.5g   2)31.15g   3)127g   4)2g

Q.3. For a chemical reaction, A ⟶ B, it is observed that the rate of reaction doubles when the concentration of A is increased four times. The order of reaction in A is :

a. Two
b. One
c. Half
d. Zero

Q.4 At the equilibrium position in the process of adsorption:

e. $\Delta H > 0$
f. $\Delta H = T\Delta S$
g. $\Delta H < T\Delta S$
h. $\Delta H > T\Delta S$

Q.5 Which of the following pairs of metals is purified by Van Arkel method?

Ga and In b) Zr and Ti c) Ag and Au d) Ni and Fe

Q.6. Which one is most basic in character?

(a) F^-
(b) Cl^-

(c) Br⁻

(d) I⁻

Q.7. Which of the following is/are paramagnetic:

(a) Only NO_2

(b) NO_2, NO

(c) NO, NO_2, N_2O_5

(d) All are paramagnetic

Q.8 Which of following is used in dry cell?

A) KMnO4	(B) MnO2
C) $K_2Cr_2O_7$	(D) K_2 MnO_2

Q.9. Thermal stability of transition metal elements depends upon which of the following?

A) Atomic radii	(B) Magnitude of ionisation enthalpy
C). On electrode potential	(D) Shielding effect

Q.10.The oxidation state of Cr in $[Cr(NH_3)_4Cl_2]^+$ is

a) +3   b) +2   c) +1   d)0

Q.11Which of the following is not the method of preparation of alkyl halide?

a)   Darzen's method

b)   Halogenation of alkene

c)   Addition of HX on alkenes

d)   Hydration of alkene

Q.12. Lucas test is used to distinguish
a. Phenols
b. alcohols
c. ethers
d. alkyl halides

Q.13   Aldol condensation will not take place in

q) CH_3CHO
r) CH_3CO CH_3
s) HCHO
t) CH_3CH_2CHO

Q14. The oxidation of toluene to benzaldehyde by chromyl chloride is called

a) Étard reaction
b) Reimer Riemann reaction
c) Wurtz reaction
d) Cannizzaro's reaction

Q15.Gabriel phthalamide reaction is used to prepare

a) Primary amine b)Secondary amine c) Tertiary amine d) Aniline

Q.16   Solubility ofglucose in alcohol is
(A) notsoluble   (B)soluble (C)moresoluble   (D) soluble in morea

Q.17 Chloroxylenol is an important component of
     (a)Antibiotics

     (b)Tincture of iodine

     (c)Dettol

     (d)Detergents

Q.18 .Which one of the following is not a condensation polymer?
(e) Dacron   B) Neoprene   C) Melamine   D) Glyptal

Q.19 Mixture of alcohol and water can be separated by
    (a)   solvent extraction   (b)   crystallization
    (c)   filtration   (d)   fractional
distillation

Q20. Which is the following is the most basic

  a)Aniline b) Benzylamine c) p-nitro aniline d) acetalidine

Q21 Distinguish between adsorption and absorption.

Q22 Why is ICl more reactive than I_2?

Q23Write general electronic configuration of lanthanoids and actinoids.

Q24 STATE REASON FOR

1.CO is stronger complexing reagent than ammonia

2 The molecular shape of $Ni(CO)_4$ is not the same as that of $(Ni(CN)_4)^{2-}$

Q25 How will you show the following conversion

  1 chlorobenzene to p- nitrophenol

  2 Iodobenzene is treated with copper powder

Q26 Aromatic carboxylic acids don't undergo Friedel Crafts reaction.

OR

a.What is glycosidic linkage?

b.Deficiency of which vitamin causes scurvy.

Q27 Give a chemical test to distinguish between a primary amine and a secondary amine.

OR

Give a chemical test to distinguish between a primary amine and a secondary amine.

Q.28. The rate constant for a reaction of zero order in A is 0.0060 mol $L^{-1} S^{-1}$.How long will

it take for the initial concentration of A to fall from 0.20 M to 0.080 M .

Q29 a. Name the polymer used for making medicinal capsules.

b. what is Buna-N?

c. Name the monomer of Nylon-6

Q30 a. Name a drug that acts both as an antipyretic and analgesic.

b. Which type of drugs come under antimicrobial drugs?

c.Hair shampoos belong to which class of synthetic detergents.

Q31 a. Primary amines have higher boiling points than tertiary amines.

b. Write a chemical test to distinguish between aniline and methylamine

c. Hoffmann degradation reaction

Q32 a. Out of 2- chloroethanol and ethanol,which is more acidic and why?

b. Phenol doenot give protonation reaction readily.why?

c. Kolbes reaction- explain

Q33 Give reasons:

   a.Ethyl iodide undergoes Sn 2 reaction faster than ethyl bromide.

   b.Although chlorine is an electron withdrawing group,yet it is ortho,para- directing in

   electrophilic aromatic substitution

   c.The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

                                        OR

write the following name reaction .

(a) Aldol condensation   (b)Cannizzaro reaction (c) Wolfkishner reaction

Q.34 What is the difference between multi-molecular and accociated colloids? Give one

example of each.

                                        OR

a. Low spin octahederal complexes are not formed by nickel.why?

  b. Name two complexes that are used in medicines.

c.If the value of Δ_o is less than P in the crystal field ,write the arrangement of d^4

coordination entity in crystal field split.

Q35a. Why are Cr+2 reducing and Mn+3 oxidising when both are having d4 configuration.

b.Why do transition element exhibit higher enthalpies of atomization?

c.Which element shows the highest oxidation state among the d-block elements.?

            OR

Describe the preparation potassium permagnate . What is the effect of increasing pH

on a solution of potassium dichromate ?

Q36.A.StateRaoult's law for a solution containing volatile components

b. 18 g glucose $C_6H_{12}O_6$ is dissolved in 1 kg of water in a sauce pan.At what
temperature will this solution boil.(K_b for water =0.52KKg/mol , boiling point of
pure water = 373.15 K)

c.Explain why a solution of chloroform and acetone shows negative deviation
fromRaoult's law?

<div align="center">OR</div>

Define the term osmosis and osmotic pressure. What is the advantage of using
osmotic pressure as compared to other colligative properties for the determination
of molar masses of solutes in solution.

What is reverse osmosis ?Defineazeotrope.

Q37 Give reason

A Fluorine exhibits only -1 oxidation state in its compounds whereas other halogens exhibit
many other oxidation states.

B Iron dissolves in HCl to form $FeCl_2$ but not $FeCl_3$.

C The boiling point of HF is much higher than HCl.

D Halogens are coloured.

E F_2 is a stronger oxidising agent than Cl_2.

<div align="center">OR</div>

Complete the following reactions:

A Cl_2 +   NaOH (hot and conc)   --------------------$\rightarrow$

B SO_2 + MnO_4^-+ H_2O ---------------$\rightarrow$
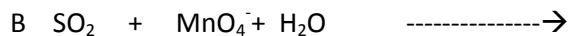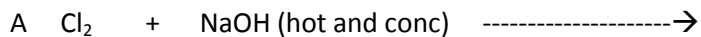
PAPER NO 16

SUBJECT CHEMISTRY (043)

SESSION 2019-20

M.M.: 70   TIME : 3 HRS

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S.NO.	UNIT	VSA (1 MARK)	SA I (2MARKS)	LA-I (3 MARKS)	LA-II (5 MARKS)	TOTAL	
1	Solutions	1(1)	1(2)	1(3)		6	23
2	Electrochemistry	1(1)	1(2)	1(3)		6	
3	Chemical kinetics	1(1)			1(5)	6	
4	Surface chemistry	3(3)	1(2)			5	
5	General principles & processes of isolation of Elements			1(3)		3	19
6	p-block elements	3(3)	1(2)			5	
7	d-& f- block elements	1(1)			1(5)	6	
8	Coordination compounds	2(2)		1(3)		5	
9	Haloalkanes & Haloarenes	2(2)	1(2)			4	28
10	Alcohol, Phenols& ethers	1(1)		1(3)		4	
11	Aldehydes,Ketones & Carboxylic acids	1(1)			1(5)	6	
12	Amines	1(1)		1(3)		4	
13	Biomolecules	1(1)		1(3)		4	
14	Polymers	1(1)	1(2)			3	
15	Chemistry in everyday life	1(1)	1(2)			3	
	TOTAL	20(20)	7(14)	7(21)	3(15)	37(70)	70

SUBJECT CHEMISTRY (043)

SESSION 2019-20

M.M.: 70   TIME : 3 HRS

General Instructions:-
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(b) Q.no. 1 to 20 are very short answer questions and carry 1 mark each.
(c) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
(d) Q.no. 28 to 34 are long answer questions and carry 3 marks each.
(e) Q.no. 35 to 37 are long answer questions and carry 5 marks each.
(f) Use log tables if necessary, use of calculators is not allowed.

Q1 Low concentration of oxygen in the blood and tissues of people living at high altitude is due to _____.
    (i)   low temperature
    (ii)   low atmospheric pressure
    (iii)   high atmospheric pressure
    (iv)   both low temperature and high atmospheric pressure

Q2. For Freundlich isotherm a graph of log x/m is plotted against log P. The slope of the line and its y-axis intercept, respectively corresponds to:
a.   1/n, k
b.   log 1/n, k
c.   1/n, log k
d.   log 1/n, log k

Q3. When aqueous solution of NaCl is electrolysed

(a) Cl_2 is evolved at the cathode   (b) H_2 is evolved at cathode

(c) Na is deposited at the cathode   (d) Na appears at the anode

Q4. Which property of colloidal solution is independent of charge on the colloidal particles?

    e.   Coagulation
    f.   Electrophoresis
    g.   Electro-osmosis
    h.   Tyndall effect

Q5. The value of rate constant of a pseudo first order reaction _____.

    a.   depends on the concentration of reactants present in small amount.
    b.   depends on the concentration of reactants present in excess.

c.   is independent of the concentration of reactants.
d.   depends only on temperature

Q6. Which of the following can be used for purification of colloids
   (1) Coagulation
   (2) Dialysis
   (3) Flocculation
   (4) All the above

Q7. When d-block elements are considering as d-block elements?
   A) d-orbital is fully filled in ground state.
   B) d-orbital is half filled in ground state.
   C) d-orbital is fully filled in all oxidation states.
   D). d-orbital is fully filled in only anyone oxidation state.

Q8. Which of the following pairs of ions are isoelectronic and isostructural?
   (i) $CO_3{}^{2-}$, $NO_3{}^{-}$
   (ii) $ClO_3{}^{-}$, $CO_3{}^{2-}$
   (iii) $SO_3{}^{2-}$, $NO_3{}^{-}$
   (iv) $ClO_3{}^{-}$, $SO_3{}^{2-}$

Q9. **Which one is most basic in character?**
   (a) F^-
   (b) Cl^-
   (c) Br^-
   (d) I^-

Q10. Highest oxidation state of manganese in fluoride is +4 (MnF_4) but highest oxidation state in oxides is +7 (Mn_2O_7) because _____.
(i) fluorine is more electronegative than oxygen.
(ii) fluorine does not possess d-orbitals.
(iii) fluorine stabilises lower oxidation state.
(iv) in covalent compounds fluorine can form single bond only while oxygen forms double bond.

Q11. The oxidation state of Cr in $[Cr(NH_3)_4Cl_2]^+$ is
a) +3   b) +2   c) +1   d)0

Q12. Which of the following pairs of coordination compounds or complex ions are examples of linkage isomers?

   a) $[Cu(NH_3)_5Br]Cl$ and $[Cu(NH_3)_5Cl]Br$

   b) $[Fe(NH_3)_2(H_2O)_4]Cl_2$ and $[Fe(NH_3)_4(H_2O)_2]Cl_2$

   c) $[Fe(CO)_5NO_2]^{2+}$ and $[Fe(CO)_5ONO]^{2+}$

d) $[Fe(NH_3)_2(H_2O)_4]Cl_2$ and $[Fe(NH_3)_2(H_2O)_4]Br_2$
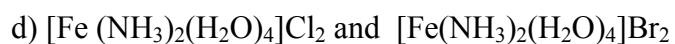
Q13. Phenols can be distinguished from alcohols by
    a. $FeCl_3$
    b. Fehling solution
    c. Tollen's reagent
    d. 2,4- DNP

Q14. Which of the following reactant gives the best method of preparation of alkyl halides when reacts with alcohol?

a)   Zn/HCl

b)   PCl5

c)   SOCl2/ Pyridine

d)   PCl3

Q15. Which one of the following is the correct formula of methylene dichloride?
a) $ClCH = CHCl$
b) $ClC \equiv CCl$
c) CH_2Cl_2
d) $CH_2(Cl)\,CH_2Cl$

Q16. Acid anhydrides on reaction with primary amines give _____.
    (i)   amide
    (ii)   imide
    (iii)   secondary amine
    (iv)   imine

Q17. In Clemmensen Reduction carbonyl compound is treated with _____.

(i) Zinc amalgam + HCl

(ii) Sodium amalgam + HCl

(iii) Zinc amalgam + nitric acid (iv) Sodium amalgam + HNO3

Q18. Which one of the following polymers is prepared by condensation polymerization?
   E) Teflon
   F) Rubber
   G) Styrene
   H) Nylon-6,6

Q19. which carbon is anomeric carbon in cyclic structure of glucose?

   (E) Cl (B) C2 (C) C3 (D) C4

Q20. Which of the following statements about vitamin B12 is false
   1. It has a cobalt atom
   2. It also occurs in plants
   3. It is present in rain water
   4. It is needed for human body in very small amount

Q21. Calculate the molarity of a solution containing 5 g of NaOH in 450 mL solution.
                              OR

Calculate molality of 2.5 g of ethanoic acid (CH3COOH) in 75 g of benzene

Q22. . The standard electrode potential for Daniell cell is 1.1V. Calculate the standard Gibbs energy for the reaction: $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$

Q23. Give reasons
(I) A delta is formed at the meeting point of Sea water and river water.
(II) NH_3 gas absorbs more readily than N_2 gas on the surface of charcoal

Q24. What happens when
(i) Concentrated H2SO4 is added to calcium fluoride
(ii) SO3 is passed through water?
Q25.Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain.

OR

Predict the order of reactivity of the following compounds in S N1 and SN2 reactions: (i) The four isomeric bromobutanes (ii) C6H5CH2Br, C6H5CH(C6H5)Br, C6H5CH(CH3)Br, C6H5C(CH3)(C6H5)Br

Q26. Write the structure of the monomer of each of the following polymers:
(*i*) nylon6
(*ii*) Bakelite.

Q27. With reference to which classification has the statement, "ranitidine is an antacid" been given?

Q28. 200 cm3 of an aqueous solution of a protein contains 1.26 g of the protein. The osmotic pressure of such a solution at 300 K is found to be 2.57×10^{-3} bar. Calculate the molar mass of the protein

Q29. The electrical resistance of a column of 0.05 mol L–1 NaOH solution of diameter 1 cm and length 50 cm is 5.55×10^3 ohm. Calculate its resistivity, conductivity and molar conductivity.
OR

The conductivity of 0.001028 mol L–1 acetic acid is 4.95×10^{-5} S cm–1. Calculate its dissociation constant if Λ^0_m for acetic acid is 390.5 S cm2 mol–1.

Q30. Outline the principles of refining of metals by the following methods: (i) Zone refining (ii) Electrolytic refining (iii) Vapour phase refining

Q31. Explain the following:
(*i*) Low spin octahedral complexes of nickel are not known.
(*ii*) The p-complexes are known for transition elements only.
(*iii*) CO is a stronger ligand than NH3 for many metals.

Q32.Explain the following with an example.
(i) Kolbe's reaction.
(ii) Reimer-Tiemann reaction.
(iii) Williamson ether synthesis.

Q33.Arrange the following:
(i)Increasing order of their basic strength in aq. Solution
CH_3NH_2, $(CH_3)_2N$, $(CH_3)_2NH$
(ii)Decreasing order of the Pk_b values
$C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$
(iii)Increasing order of Boiling point
C_2H_5OH, $(CH_3)_2NH$, $C_2H_5NH_2$
.
OR
Illustrate the following reactions giving a chemical equation in each case:
(*i*) Gabriel phthalimide synthesis
(*ii*) A coupling reaction
(*iii*) Hoffmann's bromamide reaction

Q34.Define the following as related to proteins (i) Peptide linkage (ii) Primary structure (iii) Denaturation.

Q35. (*a*) A reaction is of first order in A and of second order in B. Write the differential rate equation for this reaction. How will its initial rate be affected if the concentration of both A and B are together doubled?
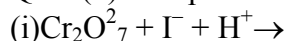
(*b*) The rate constant k of a reaction increases four fold when the temperature changes from 300 K to 320 K. Calculate the activation energy for the reaction. (R = 8.314 J mol $^{-1}$ K $^{-1}$)
OR
(*a*) List the factor which affect the rate of a chemical reaction.
(*b*) The half-life for radioactive ^{14} C is 5730 years. The wooden part of an archaeological artefact has only 80% of the ^{14} C activity found in fresh wood. Calculate the age of the artefact.

Q36. (*a*) Complete the following reactions :
(i)$Cr_2O^2_7 + I^- + H^+ \rightarrow$
(ii)$MnO_4^- + SO_3^{2-} + H^+ \rightarrow$
(*b*)How would you account for the following
I. Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7
II. Transition metal and their compound show catalytic properties.
(*iii*) Among the 3*d* series of transition elements, the largest number of oxidation states are exhibited by manganese.
OR
(*a*) Complete the following chemical equations:
(*i*) $Cr_2O_7^{2-}(aq) + C_2O_4^{2-}(aq) + H^+(aq) \rightarrow$
(*ii*) $MnO_4^- (aq) + Fe^{2+} (aq)+ H^+(aq) \rightarrow$
(*b*) Explain the following:
(*i*) Copper (I) ion is not stable in an aqueous solution.
(*ii*) With same (d^4) configuration Cr (II) is reducing whereas Mn (III) is oxidising.
(*iii*) Transition metals in general act as good catalysts.

Q37) Give simple chemical tests to distinguish between the following pairs of Compounds-   i) Propanal and Propanone ii) Formic acid and benzoic acid

 b) Explain following reactions   i) Rosenmund reduction   ii) Clemmensen reduction

c)Draw the structures of p-Methylbenzaldehyde

  OR

a) Explain following reactions i) Gabriel Phthalimide reaction ii) Stephen reduction

 b) An organic compound with the molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.   5

MARKING SCHEME

Q.No.	ANSWER	MARKS
1.	b	1
2.	c	1
3.	b	1
4.	d	1
5.	b	1
6.	(2) dialysis	1
7.	b	1
8.	a	1
9.	a	1
10.	(iv) in covalent compounds fluorine can form single bond only while oxygen forms double bond.	1
11.	a	1
12.	c	1
13.	a	1
14.	c	1
15.	c	1
16.	a	1
17.	a	1
18.	d	1
19.	a	1
20.	It is present in rain water	1

21.	Moles of NaOH =
	 -1
	 5 g 40 g mol
	  = 0.125 mol
	 Volume of the solution in litres = 450 mL / 1000 mL L-1 Using equation (2.8),
	 Molarity =
	 −10.125 mol × 1000 mL L 450 mL
	  = 0.278 M
	 = 0.278 mol L–1 = 0.278 mol dm–3
	 OR
	 Molar mass of C2H4O2: 12 × 2 + 1 × 4 + 16 × 2 = 60 g mol–1
	 Moles of C2H4O2 = 1 2.5 g 60 g mol− = 0.0417 mol Mass of benzene in kg = 75 g/1000 g kg–1 = 75 × 10–3 kg
	 Molality of C2H4O2 = 2 4 2 Moles of C H O kg of benzene
	  =
	 1 0.0417 mol 1000 g kg 75 g −×
	           = 0.556 mol kg–1
		1,1
		
		½,½,½,½

22.	i∆rGJ = − nF (cell) EV n in the above equation is 2, F = 96487 C mol–1 and ( ) cellE V = 1.1 V Therefore, ∆rGJ = − 2 × 1.1V × 96487 C mol–1 = − 21227 J mol–1 = − 212.27 kJ mol–1	½,½,½,½

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23.	(I) due to coagulation	1
	(II) NH_3 has high critical temp. than N_2	1
24.	(i) It forms hydrogen fluoride	1
	(ii) It dissolves SO_3 to give H_2SO_4	1
25.	(i) Correct reason	1
	(ii) Correct reason	1
		1
		1
26.	(i) (i Nylon 6: It is obtained by heating caprolactum with water at a high temperature i) C_6H_5OH + HCHO	1 ½ + ½
27.	This statement refers to the classification according to pharmacological effect of the drug because any drug which will be used to counteract the effect of excess acid in the stomach will be called antacid	
28.	(iThe various quantities known to us are as follows: $\Pi = 2.57 \times 10^{-3}$ bar, V = 200 cm3 = 0.200 litre T = 300 K R = 0.083 L bar mol-1 K-1 Substituting these values in equation (2.42) we get M2 = 1 1 3 1.26 g × 0.083 L bar K mol × 300 K 2.57×10 bar × 0.200 L − − − = 61,022 g mol-1 ANS 29 A = π r2 = 3.14 × 0.52 cm2 = 0.785 cm2 = 0.785 × 10−4 m2 l = 50 cm = 0.5 m = l R A ρ or ρ × Ω× = = 3 2 5.55 10 0.785cm 50cm RA l = 87.135 Ω cm Conductivity = κ ρ 1 = = 1 87.135 □ □ □ □ □ □ S cm−1 = 0.01148 S cm−1 Molar conductivity, m Λ = × 1000 c κ cm3 L−1 =	½ ½ 1 ½ , ½

−1 3 −1
−1 0.01148 S cm ×1000 cm L 0.05 mol L = 229.6 S cm2 mol−1 If we want to calculate the values of different quantities in terms of 'm' instead of 'cm',

ρ
=
RA l
=
3 −4 2 5.55 × 10 × 0.785×10 m 0.5 m Ω
 = 87.135 ×10−2 Ω m
1
 = κ
ρ
=
100
 m
87.135
Ω = 1.148 S m−1
and   = m c κ Λ
 =
−1
−3 1.148 S m

29.	Correct formula Correct substitution of values Correct calculations and answer	1 ½ ½ ½ , ½
30.	Correct definitionA	Q
31.	(*i*) Ni in its atomic ionic state can not afford two vacant 3d orbitals hence *d* 2 *sp*3 hybridisation is not possible. (*ii*) Transition metals have vacant d orbitals in their atoms or ions into which the electron pairs can be donated by ligands containing p electrons, *e.g.*, C_6H_6, $CH_2 = CH_2$, etc. Thus *d*Π-*P*Πbonding is possible. (*iii*) Because in case of CO back bonding takes place in which the central metal uses its filled dorbital with empty anti bonding Π* molecular orbital of CO.	1 1 1
32.	CORRECT REACTIONS	1 1 1
33.	(i) $(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$ (ii) $C_6H_5NH_2 > C_6H_5NHCH_3 > C_2H_5NH_2 > (C_2H_5)_2NH$ (iii) $(CH_3)_2 < C_2H_5NH_2 < C_2H_5OH$ OR	1

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	(i) Correct chemical equation. (ii) Correct chemical equation. (iii) Correct chemical equation.	1
		1
		1 1 1
34.	CORRECT DEFINITION	
35.	(a) Rate $= -dx/dt = K[A][B]^2$ If concentration of both A and B are doubled, then Rate $= K[2A][2B]^2$ $= 8K[A][B]^2$ i.e., the rate of reaction becomes 8 times. (b) Correct formula Substituting correct values Calculations Correct answer and units $Ea = 55.327$ kJ/mol OR (a) Rate of reaction depends on (Any four) (i) Concentration (ii) Temperature (iii) Nature of reactant (iv) Pressure of the gaseous reactant (v) Surface area (vi) Catalyst (b) Correct formula Substituting correct values Calculations Correct answer and units $t = 1847.7$ years	1 1 ½ ½ 1 ½, ½ ½ x 4 = 2 ½ ½ 1 ½, ½
36.	(a) (i) Correct balanced equation. (ii) Correct balanced equation. (b) (i) Correct reason. (ii) Correct reason. (iii) Correct reason.	1 1 1 1 1

37.	(a) i) Propanone gives iodoform test but propanal not.
	ii)Formic acid Reduces Tollen's reagent but benzoic acid does not
	b) i) Rosenmund reduction $CH_3COCl + H_2 \xrightarrow{Pd/BaSO_4} CH_3CHO + HCl$
	     ii) Clemmensen reduction with chemical equation
	        $CH_3COCH_3 \xrightarrow{Zn/Hg -HCl}$ $CH_3.CH_2.CH_3 +$
		1
		1
		1
		1
		1
		
		1
		1

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	H2O	1
	OR correct reactions	1
		1

TEST PAPER NO. 4

TOPIC :   CHEMICAL KINETICS

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1. In a reaction, $2A \rightarrow$ Products,the concentration of A decreases from 0.5 $molL^{-1}$ To 0.4 mol L^{-1} in 10 minutes. Calculate the rate during this interval?

2. For a reaction, $A+B \rightarrow$ Product, the rate law is given by, $r=k[A]^{1/2}[B]^2$ what is the order of reaction?

3. What will be the effect of temperatue on rate constant?

4. What is meant by pseudo first order reaction?

5. What is meant by order of reaction?

6. Derrive the steps of reaction for a reaction:
    $2N_2O_5 \rightarrow 4NO_2 + O_2$ Rate = k $[N_2O_5]^1$

7. What is meant by molecularity of reaction?

8. By what factor a reaction with reaction coefficient 2 increases when the temperature is increased from 300 K to 400 K?

9. What is the effect of catalyst on rate of reaction?

10. The decomposition of NH_3 on platinum surfae is zero order reaction. What are the rates of production of N_2 and H_2 if k =2.5×10^{-4} mol L^{-1}?

11. What are the different factor which affect the rate of reaction?

12. A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is:
    a.   Doubled   b.   Reduced to half

13. The rate constant for a first order reaction is 60 s^{-1} How much time will it take to reduce the initial concentration fo the reactant to its 1/16 th value?

14. For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction.

15 A first order reaction takes 40 min. for 30% decomposition. Calculate $t_{1/2}$

16 The decomposition of hydrocarbon follows the equation
    $K=(4.5\times10^{11}s^{-1})e^{-28000K/T}$ Calculate E_a.

17. The decompostion of A into product has value of k as 4.5×10^3 s^{-1} at 10^oC and energy of activation 60 kj mol^{-1} At what temperature would k be 1.5×10^4 s^{-1}

18. The time required for 10 % completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308 K. If the value of A is 4×10^{10} s^{-1}. Calculate k at 318 K and E_a.

19. The rate of a reaction quadruples when the temperature changes from 293K to 313 K. Calculate the energy of activation of the reaction assuming that it does not change with temperature.

20. Sucrose decomposes in acid solution into glucose and fructose according to the first order rate law, with $t_{1/2}$ = 3.00 Hrs. What fraction of a sample of sucrose remains after 8 hours?

21. A reaction is first order in A and second order in B:
   i. Write the differential rate equation
   ii. How is the rate affected on increasing the concentration of B three times?
   iii. How is the rate affected when the concentrations of both A and B are doubled?

22. The rate constants of a reaction at 500 K and 700 K are 0.02 s^{-1} and 0.07 s^{-1} respectively. Calculate the values of E_a and A.

23. The first order rate constant for the decomposition of ethyl iodide by the reaction: $C_2H_5I_{(g)} \longrightarrow C_2H_{4(g)} + HI_{(g)}$ at 600 K is 1.60×10^{-5} s^{-1} Its energy of activatin is 209 Kj/mol. Calculate the rate constant of the reaction at 700 K.

24 Prove: $10\, t_{1/2} = t_{99.9}$

25 During nuclear explosion, one of the products is ^{90}Sr with half-life of 28.1 years. If 1 μgm of ^{90}Sr was absorbed in the bones of a newly born baby instead of calcium, how much of it will remain after 10 years and 60 years if it is not lost metabolically.

26 What is meant by Average rate and Instantaneous rate.
   Determine the Rate law and order of reaction for A and B from the given data:

EXPERIMENT	Conc. [A] mol/litre	Conc. [B] mol/litre	Rate of reaction mol/litre/sec
I	0.1	0.2	2×10^3
II	0.2	0.2	4×10^3
III	0.1	0.4	8×10^3

Also determine value of rate constant. And find the rate if the conc. Of [A] = 0.7 mol and [B] = 0.3 mol.

TOPIC :   CHEMISTRY IN ACTION

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   What is the difference b/w drug and medicine?
2.   What are receptors?
3.   What is allosteric site?
4.   What are antagonist and agonist?
5.   With reference to which classification has the statement, "rantidine is an antacid" been given?
6.   Why do we require artificial sweetening agents?
7.   Why do we need to classify drugs in different ways?
8.   Explain the term, target molecules or drug targets as used in medicinal chemistry?
9.   Define the term chemotherapy?
10.   Which forces are involved in holding the drugs to the active site of enzymes?
11.   Explain Cationic, anionic and non-ionic detergent with example?
12.   What are biodegradable and non-biodegradable detergents? Give one example of each?
13.   Explain the cleansing action of soaps?
14.   What is the composition of Dettol? Name a substance which can be used as an antiseptic and disinfectant?
15.   What are artificial sweetening agents? Give four example in detail.
16   Name the sweetening agent used in the preparation of sweets for a diabetic patient? What problem arises in using alitame as artificial sweetener?
17.   What are synthetic detergents? How are they better than soaps?
18.   What are antibiotics? Explain Broad Spectrum and Narrow Spectrum with example?
19.   Explain the mechanism of Drug enzyme interaction?
20.   What are the different aspects on basis of which drugs are classified. Explain with example
21.   Write short notes on the following:
      a.   Analgesic   b.   Tranquilizers   c.   Antacids
22.   Define the following terms:
      a.   Antihistamines   b.   Antifertility Drugs   c. Food Preservatives
23.   What are different types of Soap? Explain with example.
24   Explain receptor as Drug Target?
25   What are non narcotic and narcotic analgesics? Explain with example.
26   Classify the following drugs, with there use: a. tincture iodine b. Veronal
      c. Prontosil   d. Salvarsan e. Erthyromycin f. Chloramphenicol   g. Furacine
      h. Codiene   i. Iproniazid   j. Terfenadine

TEST PAPER NO. 09

TOPIC :   COORDINATION CHEMISTRY

M.M. 50   TIME: 3 HRS.

Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Write the formulae of compound: Tetraamineaquachloridocoalt(III) chloride
2.   Write the IUPAC name of $K_3[Cr(C_2O_4)_3]$
3.   Why geometrical isomerism is not possible for tetrahedra complexes having two different types of unidentate ligands coordinated with the central metal atom?
4.   Indicate the type of isomerism exhibited by $[Co(en)_3]Cl_3$
5.   The spin only moment of $[MnBr_4]^{-2}$ is 5.9 BM. Predict the geometry of the complex ion?
6.   Calculate the overall complex dissociaation equilibrium constant for the $[Cu(NH_3)_4]^{2+}$ ion, given β_4 for this complex is 2.1×10^{13}
7.   Draw the stuctures of optical isomers of: $[Cr(C_2O_4)_3]^{-3}$?
8.   A solution of $[Ni(H_2O)_6]^{2+}$ is green but a solution of $[Ni(CN)_4]^{-2}$ is colourless?
9.   What is meant by chelate effect give one example?
10.   How many ions are produced from complex $[Co(NH_3)_6]Cl_2$ in a solution?
11.   List various types of isomerism possible for coordination compounds, giving an example of each type?
12.   Discuss the nature of bonding in metal carbonyls?
13.   What is spectrochemical series? Explain the difference b/w a weak and strong field ligand with example?
14.   Draw figure to show the splitting of d orbitals in an octahedral crystal field?
15.   What is meant by the the stabillity of a cooordination compound in solution? State the factors which govern the stability of complexes?
16.   Explain the bonding in the coordination compounds in terms of Werner's postulate?
17.   What is meant by unidentate, didentate and ambidentate ligands? 2 ex of each.
18.   Give the application of coordination compound in field of biological science?
19.   Give the application of coordination compound :
      a.   Extraction or Metallurgy   b. Photography
20.   Explain the :
      a. $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{-2}$ is diamagnetic.
      b. $[Fe(CN)_6]^{-4}$ and $[Fe(H_2O)_6]^{+3}$ are different colours in dilute solution.
21.   Write shor not on:
      a.   Coordination number   b. Ligand   c.   Homoleptic and heteroleptic
22.   Explain Crystal field theory in reference to : octahedral and tetrahedral complex.
23.   Explain $[Ni(CN)_4]^{-2}$: under following heads:
      a.   Nomenclature   b.   Hybridization c.   Magnetic moment

24   Write the formulae and name of complex formed during qualatitive test:
   a.   Ring test of Nitrate
   b.   Prussian Blue colour in test of Ferric
   c.   EDTA Ligand

25   Give the oxidation state, d orbital occupation and coordination number of the central metal ion in the following complex:
   a. $K_3[Co(C_2O_4)_3]$
   b. $(NH_4)_2[CoF_4]$
   c.   cis-$[Cr(en)_2Cl_2]Cl$

26   a.   Explain on the basis of vlaence bond theory that $[Ni(CN)_4]^{-2}$ ion with square planar structure is diamagnetic and the $[Ni(Cl)_4]^{-2}$ ion with tetrahedra geometry is paramagnetic.
   b. $[Ni(Cl)_4]^{-2}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral.
   c. $[Fe(H_2O)_6]^{3+}$ is strongly paramagnetic whereas $[Fe(CN)_6]^{-3}$ is weakly paramagnetic.
   d. $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex.
   e.   Hexaquo manganese (II) ion contains five unpaired electrons, while the hexacyanoion contains only one unpaired electron.

TEST PAPER NO. 08

TOPIC :   D AND F BLOCK ELEMENT

M.M. 50   TIME: 3 HRS.

Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Why are Mn^{2+} compounds are more stable than Fe^{3+} towards oxidation to their +3 state?

2.   What are the different oxidation state exhibited by Lanthanoids?

3.   Compare the stability of +2 oxidation state for the elements of first series.

4.   Which metal in the first transition metals exhibits +1 oxidation state most frequently and why?

5.   Name a lathanoid series element exhibiting +4 oxidation state?

6.   Actinoid contraction is greater from element to element than lanthanoid contraction. Why?

7.   What are misch metal?

8.   Explain why Cu^+ ion is not stable in aqueous solutions?

9.   Calculate the spin only magnetic moment of $M^{2+}_{(aq)}$ ion (Z = 27)

10.   Which is the stronger reducing agent and why Cr^{2+} or Fe^{2+} ?

11.   What is disproportionation reaction? Explain with two example.

12.   a. How would you account for the increasing oxidising power $VO_2^+ < CrO_7^{-2} < MnO_4^-$

b. How would you account for irregular variation of IE in I^{st} transition series.

13.   Why transition element show magnetic behaviour. Calculate the magnetic moment of a divalent ion in aqueous solution if its Z =25.

14.   What is lanthanoid contraction. Explain its consequences. (any two)

15   WhY;

a.   Transition element have high enthalpy of atomisation

b.   Transition element show variable oxidation state.

16   Why:

a.   Transition element have irregular variation in atomic radii along the series.

b.   Zn, Cd and Hg are not considered as transition element.

17.   Give example and suggest reasons for the following features of the transition element:

a.   The lowest oxide of transition metal is basic, the highest is amphoteric/acidic

b.   The highest oxidation state is exhibited in oxoanions.

18.   Why

a.   A transition metall exhibits highest oxidation state in oxides and fluorides.

b.   +2 state becomes more and more stable in the first half of the first row transition elements with increasing atomic number.

19. Write the ionic equaiton for action of acidified potassium dichromate on:
    a.   iron(II) solution   b. H_2S

20. Explain the :
    a.   For the I^{st} row transition metals the value of E^o are irregular.
    b. Cr^{4+} reducing and Mn^{3+} oxidising when both have d^4 configuration.

21. Write general electronic configuration of d and f block element
    Why Cr and Cu have anomalous configuration.

22. Write:
    a.   Chromyl Chloride Test Reaction
    b.   Effect of change of pH on Potasium Dichromate
    c.   Action of neutral $KmnO_4$ on thiosulfate

23. Compare the chemistry of actinoids with that of the lanthanoids with special reference to:
    a.   Electronic configuration   b.   Oxidation State
    c.   Atomic and ionic sizes   d.   Chemical reactivitiy
    Why: Cobalt (II) is stable in aqueous solution but in the presence of complexing reagents it is easily oxidised.

24 Explain $K_2Cr_2O_7$ under following head:
    a. Preparation
    b.   Action of $KmnO_4$ (acidified) on Ferrous Sulfate and Potassium Iodide.
          Write balanced chemical reaction.
.
25 Explain $KMnO_4$ under following head:
    a. Preparation
    b.   Action of $KmnO_4$ (acidified) on Ferrous Sulfate and Potassium Iodide.
          Write balanced chemical reaction.
    c.   Structure and 2 uses.

26 Explain the following property of transition element:
    a   Coloured compound
    b.   Interstitial compound
    c.   Complex compound
    d.   Catalyst
    e.   Alloy formation.

TEST PAPER NO.03

TOPIC :   ELECTROCHEMISTRY

M.M. 50   TIME: 3 HRS.

Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Write the reaction involved in Lead Storage Battery?
2.   Why Zn-HgO cell volatage remains constant during its life?
3.   Define conductivity and molar conductivity?
4.   The conductivity of 0.20 M solution KCl at 298 K is 0.0248 S cm^{-1} Calculate its molar conductivity?
5.   Write the unit of molar and equivalent conductivity?
6.   Define Kohlrausch law?
7.   What are the units of molar and equivalent conductance?
8.   Calculate the potential of hydrogen electrode in contact with a solution pH=10
9.   Calculate the equilibrium constant of the reaction:

$$Cu_{(S)} + 2Ag^+_{(aq)} \longrightarrow Cu^{2+} + 2Ag_{(s)} \quad E^o_{cell} = 0.46 \text{ V}$$

10.   Can we store copper sulfate solution in a zinc pot?
11.   What are the factors which affect conductance of ions in solution?
12.   A $CuSO_4$ solution is electolysed for 10 minutes with a current of 1.5 amperes. What is the mass of copper deposited at cathode? (Cu = 63.5 u)
13.   Explain the Fuel Cell with equations and its application?
14.   Explain the mechanism of corrision with equation and prevention?
15   What is the effect of dilution on weak and strong electrolyte. Explain graphically?
16   How much electrictiy in terms of Faraday is required to produce:
    a.   20 gm of Ca from molten $CaCl_2$
    b.   40 gm of Al from molten Al_2O_3
17.   How much electricity is required in columb for the oxidation of
    a.   1 mol of H_2O to O_2
    b.   1 mol of FeO to Fe_2O_3
18.   A sp;itopm pf $Ni(NO_3)_2$ is electrolysed b/w platinum electrodes using a current 5 amperes for 20 minutes. What mass of Ni is deposited at the time of cathode?
19.   Predict the products of electrolysis in each of the following:
    a.   An aqueous solution of $AgNO_3$ with silver electrode.
    b.   An aqueous soluiton of $AgNO_3$ with platinum electrodes.
    c.   A dilute solution of H_2SO_4 with platinum electrodes.
    d.   An aqeous solution of $CaCl_2$ with platinum electrodes.
20.   The electrical resistance of a column of 0.05 mol L^{-1} NaOH solution of diameter 1 cm and legth 50 cm is 5.55×10^3 ohm. Calculate its resistivity, conductiviy and molar conductivity.

21. Represent the cell in which the following reaction takes place:
$$Mg_{(s)} + 2 Ag^+_{(0.0001 M)} \longrightarrow Mg^{2+}_{(0.130 M)} + 2 Ag_{(s)}$$
Calculate its $E_{(cell)}$ if $E° = 3.17$ V, $G°$ and K_c

22. How much charge is required for the following reductins:
   a. 1 mol of Al^{3+} to Al
   b. 1 mol of Cu^{2+} to Cu
   c. 1. mol of MnO_4^{-1} to Mn^{2+}

23. Three electrolytic cells A,B,C containing solutions $ZnSO_4$, $AgNO_3$ and $CuSO_4$ respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 gm of silver deposited at the cathode of cell B. How long did the current flow? What mass of copper and zinc were deposited?

24 Suggest the list of metals that are extracted electrolytically?
   If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons would flow through the wire?

25 Explain the difference b/w Electrochemical and Galvanic cell?
   What are electrolytes? How are electrolytes responsible for conduction in soltuion?

26 a. Calculate $\lambda°_m$ for $CaCl_2$ and $MgSO_4$ from the given data:
   $\lambda°_{ca}{}^{2+} = 119$ $\lambda°_{Cl-} = 76.3$ $\lambda°_{mg}{}^{2+} = 106$ $\lambda°_{SO4}{}^{-2} = 160$ S cm^{2}mol^{-1}
   β. $\lambda°_m$ for NaCl, HCl and NaAc are 126.4,425.9 and 91.0 S cm^{2}mol^{-1} respectively Calculate $\lambda°_m$ for HAc.

TOPIC :   GENERAL PRINCIPLE OF EXTRACTION

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   What is the difference b/w ore and mineral?
2.   What is meant by metallurgy and gangue?
3.   What are depressant and activators in Froth Flotation Process?
4.   What is the significance of leaching in the extraction of Aluminium?
5.   Why is the reduction of a metal oxde easier if the metal formed is in liquid state at the temperature of reduction?
6.   At a site, low grade copper ores are available and zinc and iron scraps are also available. Which of the two scraps would be more suitable for reducing the leached copper ore and why?
7.   Copper can be extracted by hydrometallurgy but not Zinc. Explain.
8.   Why is the extraction of copper from pyrites more difficult than that from its oxide ore through reduction?
9.   Name the common elements present in the anode mud in electrolytic refining of copper. Why are they so present?
10.   State the role of silica in metallurgy of copper?
11.   What is meant by the term "Chromatography"? What criterion is followed for the selection of the stationary phase in chromatography?
12.   Give examples, differentiate b/w roasting and calcination?
13.   The value of D_fG for formation of Cr_2O_3 is -540 kJmol^{-1} and that of Al_2O_3 is -827 kJmol^{-1} . Is the reduction of Cr_2O_3 is possible with Al?
14.   a.   Why copper matte is put in silica lined convertor?
        b.   What is the role of cryolite in the metallurgy of aluminium?
15   a.   What is the role of graphite rod in the electrometallurgy of Aluminium?
        b.   Predict the conditions under which Al might be expected to reduce MgO.
16   a.   Out of C and CO, which is a better reducing agent at 673 K.
        b.   Write reactions taking place in the extraction of Zinc from blende
17.   Write reactions in different zones in blast furnace during the iron extraction?
18.   Write 2-2 uses of : Al, Cu, Zinc and Iron.
19.   Suggest with equation, condition under which Mg could reduce Alumina.
20.   What is Ellingham Diagram? What are its limitations.
21.   Write short notes on:
        a.   Froath Floatation   b. Leaching   c.   Liquation
22.   Define the following terms:
        a.   Electrolytic refining   b. Zone refining   c. Vapor phase refining
23.   Explain: a. Mond Process   b. Van Arkel   c.   Metallurgy of Al
24   Explain the equations involved in extraction of Copper with 2 ores.
25   Explain the electrochemical and thermodynamic principles of Metallurgy?

26   Write a summay of the occurrence and extraction of Al, Fe, Cu and Zinc in the form of table with following heads: Metal, Occurrence, Common Extraction methad and remarks including method and limitations.

TOPIC :   ORGANIC FUNCTIONAL GROUP NO. I
             ALKYL AND ARYL HALIDES

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   What are gem and vic dihalides?
2.   Write the structure of following compound:
      a.   2-chloro methylpentane   b.   4-tert-Butyl-3-iodoheptane
3.   Write the isomer of the compound having formulae C_4H_9Br.
4.   What are ambident nucleophiles? Explain with example.
5.   Arrange the following compounds of each set in order of reactivity towards S_N2 displacement:
a.   2-Bromo-2-methylbutane, 1-Bromopentane, 2- Bromopentane
b.   1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 3-Bromo-2methybutane
6.   Why is sulphuric acid not used during the reaction of alcohols with KI?
7.   Arrange the compounds in order of increasing boiling points:
      Bromomethane, Bromoform, Chloromethane, Dibromomethane.
8.   Why does the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?
9.   p-Dichlorobenzene has higher m.p. and solubility than those of o- and m- isomers. Why?
10.   The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohols but in the presence of alcoholic KOH, alkenes are major products. Explain
11.   Draw the structures of all the eight structural isomer that have molecular formulae: $C_5H_{11}Br$. Name each isomer according to IUPAC system and classify them as primary, secondary and tertiary bromide.
12.   Identify all the possible monochloro structural isomers expected to be formed on fre radical monochlorination of $(CH_3)_2CHCH_2CH_3$
13.   Write the mechanism of SN_1 and SN_2 reaction with example and difference b/w the two?
14.   Explain the following name reaction:
      a.   Wurtz   b.   Swart Reaction
15   Explain the nitration of chloro benzene and suggest a reason for the effect of NO_2 group and why it is more pronounced at o and p than m position?
16   Write Friedel Craft reaction? Why chlorine is an electron withdraing group, yet it is ortho- para- directing in electophillc aromatic substitution reactions?
17.   Write the equations for the preparation of 1-iodobutane from:
      a.   1-butanol   b.   but-1-ene
18.   Explain :
      a.   Alkyl halides, though polalr, are immiscible with water

b.   Grignard reagents should be prepared under anhydrous conditions.

19.   Carry out the following conversion:

a.   Ethanol to but-1-yne   b.   Bromomethane to propanone

20.   Complete the following reaction:

a.   Benzene to 4 bormonitrobenzene   b. Ethyl Chloride to propanoic acid

21.   Write the chemical reaction of RX with following agent:

a.   NaOR   b.   AgCN   c.   R'NH$_2$

22.   Write short note on following compound:

a.   Freon   b.   DDT   c.   Iodoform

23.   What happens when:

a.   n-butyl chloride is treated with alcoholic KOH

b.   chlorobenzene is subject to hydrolysis

c.   methy bormide is treated with sodium (dry ether)

24   Predict all the alkenes that would formed by dehydrohalogenation of the following halides with sodium ethoxide in ethanol and identify the major alkene:

a.   1 Brommo 1 methylchclohexane   b.   2-chloro-2-methylbutane

c.   2,2,3- trimethyl 3-boromopentane

25   Predict the order of reactivity of four isomeric bromobutanes for SN$_2$ reaction?

26   Write the mechanism of the following reaction:

$$nBuBr \quad + \quad KCN \xrightarrow{\quad EtOH-H_2O \quad} nBuCN$$

Primary alkyl halide C$_4$H$_9$Br (A) reacted with alcoholic KOH to give compound (B) Compound (B) is reacted with HBr to give (C) which is an isomer of (A). When (A) is reacted with sodium metal it gives compound (D), C$_8$H$_{18}$ which is different from the compound formed when n-butyl bromide is reacted with sodium metal. Give the structure formuale of A,B and C and write the reactions involved.

TEST PAPER NO. 12

TOPIC :   ORGANIC FUNCTIONAL GROUP : III
ALDEHYDE, KETONE AND CARBOXYLIC ACID

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Arrange the following compounds in increasing order of their boiling points:
         CH_3CHO, CH_3CH_2OH, CH_3OCH_3, $CH_3CH_2CH_3$

2.   Draw the structures of the following derivatives:
      a.   Cyclopropanone oxime   b.   The ethylene ketal of hexan-3-one

3.   Write the mechanism of esterification reaction?

4.   Write the structure of following compound:
      a. α-Methoxypropionaldehyde   b.   4-Oxopentanal

5.   Give the name of reagent involved for following transformation:
      a.   Hexan-1-ol to hexanal
      b.   Ethanenitrile to ethanal

6.   Arrange the following compound in increasing order of their reactivity in nucleophilic addition reaction with explaination:
         Ethanal, Propanal, Propanone, Butanone

7.   What is the effect of substitutent on the acidity of carboxylic acid?

8.   What are: a.   Acetal   b.   Semicarbazone

9.   Allthough phenoxide iion has more number of resonating structures than carboxylate ion, carboxylic acid is stronger acid than phenol. Why?

10.   Discuss the structure of Carbonyl group?

11.   Complete the following reaction:
      a.   Hydrolysis of Propyne in presence of Hg^{2+}/H_2SO_4
      b.   Benzene + C_2H_5COCl (in presence of Anh. $AlCl_3$ /CS_2)

12.   Write the following name reaction:
      a.   Wolf Kishner
      b.   Clemenson

13.   Explain Aldol Condensation with example? (Mechanism Also)

14.   Write short note on Cannizaro Reaction? Example and Mechanism.

15.   Write the chemical reactions to affect the following transformations:
      a.   Butan-1-ol to butanoic acid
      b.   Cyclohexene to hexane-1,6-dioic acid

16   Show how the following compounds can be converted to benzoic acid:
      a.   Ethyl benzene   b.   Phenlethene (Styrene)

17.   Distinguish b/w the following pair:
      a.   Propanone and propanal   b.   Phenol and Benzoic acid

18.   Convert ethanal into following compound:
      a.   Butane-1,3-diol   b.   But-2-enal

19. Which of the following will undergo Cannizaro and which will go for aldol condensation reaction:
    a. Methanal   b. 2-Methylpentanal   c. Benzaldehyde
    d. Benzophenone   e. Cyclohexanone   f. 1-Phenlypropanone
    g. 2,2-Dimethylbutanal   h. Butan-1-ol

20. Explain the :
    a. Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.
    b. There are two NH_2 groups in semicarbazide. However, only one is involved in the formation of semicarbazones.

21. Write the chemical reaction of ethanl with following agent:
    a. HCN   b. Dil NaOH   c. Fehling Reagent

22. Carry out the following conversion:
    a. Propanone to propene
    b. Benzoic acid to Benzaldehyde
    c. Benzoic acid to m-Nitrobenzyl alcohol

23. Describe the following:
    a. Acetylation   b. Decarboxylation   c. HVZ reaction

24. Predict the producgts formed when cyclohexanecarbaldehyde reacts with following reagents:
    a. PhMgBr and then H_3O^+
    b. Tollen's Reagent
    c. Semicarbazide and weak acid

25. An organic compound A with molecular formulae C_8H_8O forms an orange-red precipitate with 2,4 DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces Tollens or Fehlings' reagent, nor does it decolourises bromine water or Baeyer's reagent. On drastic oxidation with chromic acid, it gives a carboxylic acid B having molecular formulae C_7H_6O . Identify the compound A and B and explain the reaction invovlved.

26. a. An organic compound A molecular formulae $C_8H_{16}O_2$ was huydrolysed with dilute sulfuric acid to give a carboxylic acid B and an alcohol C. Oxidation of C with chromic acid produced B. C on dehydration gives but-1-ene. Write equations for the reactions invovlved.
    b. An organic compound contains 69.77% Carbon, 11.63% Hydrogen and rest oxygen. The molecular mass of the compund is 86.. It does not reduce Tollen's Reagent but forms an addidtion compound with sodium hydrogensulfite and give positive iodoform test. On vigorous oxidation it gives ethanoic and propanoic acid. Write the possible structure of the compound.

TEST PAPER NO. 13

TOPIC : ORGANIC FUNCTION GROUP IV
NITROGEN CONTAINING COMPOUND

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Arrange the following in decreasing order of their basic strength:
            $C_6H_5NH_2$, $C_2H_5NH_2$, $(C_2H_5)_2NH$, NH_3

2.   Write reactions of the final alkylation product of aniline with excess of methyl iodide in presence of sodium carbonate solution.

3.   Describe a method for the identification of primary, secondary and tertiary amines. Also write chemical equaions of the reaction invovlved?

4.   Why pk_b of aniline is more than that of methylammine.

5.   Ethylamine is soluble in water but anilien is not why?

6.   Aniline does not undergo Friedel Crafts reaction. Why?

7.   Gabriel phthalimide synthesis is preferred for synthesising primary amines why?

8.   What is Diazotization reaction. Explain with example?

9.   Write the IUPAC name for following compound:
            a. $(CH_3)_2CHNH_2$ b. $C_6H_5NHCH_3$

10.   Write the structures of different isomeric amines corresponding to the molecular formulae $C_4H_{11}N$

11.   Write the chemical equations for the following reactions:
            a.   Reaction of ethanolic NH_3 with C_2H_5Cl
            b.   Ammonolyisis of benzyl chloride and reaction of amine so formed.

12.   Write down the chemical equations for the following conversions:
            a. CH_3CH_2Cl to $CH_3CH_2CH_2NH_2$
            b. $C_6H_5CH_2Cl$ to $C_6H_5CH_2CH_2NH_2$

13.   Write the sturctures and IUPAC names of
            a.   The amide which gives propanamie by hoffmann bromamide reaction
            b.   The amine produced by theHoffmann degradation of benzamide

14.   How will you distinguish b/w
            a.   Methyl amine and dimethylamine   b.   Anile and benzylamine

15   Write short note on:
            a.   Carbylamine Reaction   b.   Hoffmann Bromamide

16   Explain the basic nature of primary, secondary and tertiary amine in
            a.   Vapour Phase   b.   Aqueous solution

17.   Convert :
            i.   3-Methylaniline into 3-nitrotoluene
            ii.   Aniline into 1,3,5 - tribromobenzene

18.   How will you convert 4-nitrotoluene to 2-bromobenzoic acid (5 steps) and write the IUPAC name of each intermediate product.

19. What are Diazonium compound? Write its reaction with:
    a. KI   b. HBF_4
20. Explain the :
    a. Although amino group is o- and p- directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline
    b. Methylamine in water reacts with Ferric chloride to precipitate hydrated ferric oxide.
21. Write the chemical reaction of Methylamine with following agent:
    a. HNO_2 b. $CHCL_3$ and KOH   c. CH_3COCl
22. Define:
    a. Coupling reaction   b. Ammonolysis   c. Isocyanide test
23. Accomplish the following conversion:
    a. Benzamide to toluene
    b. Aniline to benzyl alcohol
    c. Chlorobenzene to p-chloroaniline
24 Explain:
    a. Reacton of pri,sec and ter amine with arylsulphonyl chloride
    b. Bromination of aniline with Br_2 in presence of water
    c. Sulfonation of Aniline
25 Arrange the following:
    a. In decreasing order of the pK_b values:
       $C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$ and $C_6H_5NH_2$
    b. In increasing order of the basic strength
       $C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$ and CH_3NH_2
    c. In increasing order of boiling point:
       C_2H_5OH , $(CH_3)_2NH$, $C_2H_5NH_2$
26 Give the structures of A, B and C in the following reactions:

    a. CH_3CH_2I $\xrightarrow{NaCN}$ A $\xrightarrow{OH-}$ B $\xrightarrow{NaOH + Br2}$ C

    b. $C_6H_5N_2Cl$ $\xrightarrow{CuCN}$ A $\xrightarrow{H2O/H+}$ B $\xrightarrow{NH3}$ C

    c. CH_3CH_2Br $\xrightarrow{KCN}$ A $\xrightarrow{LiAlH4}$ B $\xrightarrow{HNO2/\ 0\ C}$ C

    d. CH_3COOH $\xrightarrow{NH3/\Delta}$ A $\xrightarrow{NaOBr}$ B $\xrightarrow{NaNO2/HCl}$ C

    e. $C_6H_5NO_2$ $\xrightarrow{Fe/HCl}$ A $\xrightarrow{HNO2/273K}$ B $\xrightarrow{C6H5OH}$ C

TOPIC :   ORGANIC FUNCTIONAL GROUP II (ALCOHOL, PHENOL AND ETHER)

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Write the structure of : 2 Ethoxy propane and 2,6 dimethylphenol?
2.   Write down the mechanism of hydration of alkene to form alcohol?
3.   Give the structures and IUPAC names of the products expected from:
        a.   Catalytic reduction of butanal   b.Propanone with Methyl Mg Bromide
4.   How will you prepare the following alcohol usng suitable Grignard reagent:
        A.   2-Methyl Propan-1-ol   b.   cyclo hexyl methanol
5.   Complete the following reaction:
        a.   2 Methyl Butanal   (NaBH$_4$)   b.   Chloro benzene (NaOH)
6.   a.   Why alcohols have greater boiling point than comparable ethers and
                Alkanes.
        b.   Why ethers are having higher boiling point than alkane of comparable
                molecular mass.
7.   Arrange the following set of compounds in order of their increasing boiling
        point: Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol
8.   Arrange the following compounds on the basis of increasing acidic strength:
        Propan-1-ol, 2,4,6-trinitrophenol, 3-nitrophenol, 3,5-dinitrophenol, phenol, 4-methylphenol
9.   Ortho and para nitropheols are more acidic than phenol. Draw the resonance
        structures of the corresponding phenoxide ions.
10.   Write the reaction involved in fermentation of sucrose to give ethyl alcohol?
11.   Write the reactions of Williamson Synthesis of 2-ethoxy-3-methylpentane
        starting from ethanol and 3-methylpentan-2-ol?
12.   Draw the structures of all isomeric alcohols of molecular formulae $C_5H_{12}O$ and
        give their IUPAC names.
13.   Why:
        a.   Alcohols are comparatively more soluble in water than hydrocarbons of
        comparable molecular mass.
        b.   Propanol has higher boiling point than that of the hydrocarbon butane.
14.   What is meant by hydroboration oxidation reaction? Illustrate it with example?
15   Give the equation for preparation of phenol from cumene?
16   Write the mechanism of acid dehydration of ethanol to yield ethene and ethoxy
        ethane with temperature and conditions prescribed?
17.   Show how will you synthesise the following:
        a.   1-phenylethanol from a suitable alkene
        b.   pentan-1-ol using suitable alkyl halide.
18.   How is 1-propoxy propane sythesised from propan-1-ol? Write the mechanism?
19.   Write the reacgtion of HI with: a. 1-propoxypropane   b. benzyl ethyl ether
20.   Write the mechanism of HI with methoxy methane.

21. Write the following name reaction with equations involved:
    a.   Williamson Synthesis b.   Dow process   c.   Freidel Craft acylation
22. Carry out the following conversion:
    a.   Propene to propan-2-ol b.   Benzyl chloride to Benzyl alcohol
    c.   Ethyl magnesium chloride to Propan-1-ol
23. Name the reagents used in the following reactions:
    a.   Oxidation of a primary alcohol to carboxylic acid
    b.   Bromination of phenol to 2,4,6 tribromo phenol
    c.   Butan-2-one to Butan-2-ol
24 Give two reactions that show the acidic nature of phenol. Compare the acidity of phenol with that of ethanol?
25 Explain the following name reaction:
    a.   Kolbe's reaction   b.   Reimer Tiemann reaction
    c.   Esterification reaction.
26 Give thturee structures of the products expected when each of the following alcohol reacts with a. $HCl-ZnCl_2$ b. HBr   c. $SOCl_2$
    i.   1-methylcyclohexanol   ii.   2-methylbutan-2-ol
    Write the structures of the major products expected from the following reactions:
    a.   Mononitratlion of 3-methylphenol
    b.   Dinitration of 3-methylphenol
    c.   Mononitration of phenyl methanoate.
                          Or//
    Carry out the following conversion:
    a.   Halogenation of Anisole (in presence of ethanoic acid)
    b.   Anisole with Chloromethane (in presence of Anhy. $AlCl_3$)
    c.   Nitration of Anisole (in presence of H_2SO_4)
    d.   Phennatole with HBr.
    e. $(CH_3)_3C-OC_2H_5$ with HI.

TEST PAPER NO. 07

TOPIC :   P BLOCK ELEMENTS

M.M. 50   TIME: 3 HRS.

Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Why are pentahalides more covalent than trihalides?
2.   Why is BiH_3 the strongest reducing agent amongst all the hydrides of Group 15.
3.   Write the reaction of thermal decomposition of sodium azide?
4.   Why is N_2 less reactive at room temperature?
5.   Why does NH_3 act as lewis base?
6.   Why does NO_2 dimerises?
7.   Write the chemical reaction invovled in Brown Ring Test of Nitrate ion?
8.   Bond angle in PH_4^+ is greater than that in PH_3. Why?
9.   Why does PCl_3 fumes in moisture?
10.   How do you account for the reducing behaviour of H_3PO_2 on the basis of its structure?
11.   Why:
      a. H_2S is less acidic than H_2Te.
      b. H_2O is liquid and H_2S is a gas.
12.   Complete the following reaction:
      a. P_4 + NaOH
      b. C_2H_4 + O_2
13.   Explain why
      a. O_3 act as a powerful oxidising agent
      b.   Sulphur show paramagnetic behaviour in gaseous state.
14.   What happens when:
      a.   Concentrated H_2SO_4 is added to CaF_2
      b. SO_3 is passed through water.
15   Write the conditions to maximize the yield of H_2SO_4 by contact process.
16   a.   Halogens have maximum negative electron gain enthalpy in the respective period of periods of periodic table.
      b.   Although electron gain enthalpy of fluorine is less negative than chlorine. Flourine is a stronger oxidising agent than chlorine.
17.   What are interhalogen compounds explain with example.
18.   Give two examples to show anomalous behaviour of fluorine
      Flourine exhibits only -1 oxidation state.
19.   a.   Why is ICl more reactive than I_2
      b.   Balanced chemical reaction of Cl_2 with hot and concentrated NaOH and justify whether it is a disproportionation reaction
20.   Explain the :
      a.   Noble gases have very low boiling points
      b.   Helium is used in diving apparatus

21. **Explain:**
    a. Dioxygen is a gas sulfur is solid
    b. Halogens are strong oxidising agent
    c. Halogens are coloured.
22. **Write down the structure and hybridization of following:**
    a. XeF_2 b. XeF_6 c. BrF_3
23. **Explain hydrides of group 15 under following head:**
    a. Bond Angle   b. Boiling point   c. Stability
24. **Explain group 16 element under following head:**
    a. Oxidation state
    b. Hydrides
    c. Halides.
25. **How are xenon fluorides obtained, XeF_2, XeF_4 and XeF_6. Explain with chemical equations invovlved.**
26. a. Explain the oxyacids of group 16 elements
    b. List the uses of Neon and Argon
    c. Explain why:
        i. H_3PO_3 is diabasic whereas H_3PO_4 is tribasic
        ii. All the bonds in PCl_5 are not equivalent.
    d. How are XeO_3 and $XeOF_4$ prepared?

<mark>TEST PAPER NO. 15</mark>

TOPIC :   POLYMERS

M.M. 50   TIME: 3 HRS.

Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   Is $(-NH-CHR-CO)_n$, a homopolymer or co polymer?
2.   How does the presence of double bond in rubber molecules influence their structure and reactivity?
3.   How is dacron obtained from ethylene glcol and terephthalic acid?
4.   Classify the following as addition and condensation polymer: Terylene, Bakelite, PVC and Polythene?
5.   What is the difference b/w Buna N and Buna S?
6.   Arrange the following polymers in increasing order of their intermolecular forces: Nylon 6,6, Buna S, Polythene.
7.   Write the free radical polymerisation mechanism for obtaining ethene?
8.   What is copolymerization? Give two example?
9.   What are the monomeric repeating unit of Nylon 6 and Nylon 66?
10.   What are linear and cross linked polymer?
11.   Write difference b/w addition and condensation polymer with 2 examples each?
12.   What are bio degradable polymer? Explain with example?
13.   What is vulcanization of rubber? Discuss the purpose of vulcanization?
14.   Write difference b/w thermosetting and thermoplastic with example?
15   Write the monomer unit of following polymers:
        a.   Polypropene   b.   Polystyrene   c.   PVC
16   Write short notes on: i. Phenol-Formaldehyde resin
                              ii. Melamine-formaldehyde resin.
17.   Write explaination for Synthetic and natural rubber with monomer units?
18   Explain Low Density and High Density polymer with example?
19.   What are Elastomers and Fibres. Explain with example?
20.   What are polyamides and polyesters. Explain with example?
21.   What are the different class of polymers on the basis of source?
22.   What are different class of polymers on the basis of structure?
23.   Write the name and structure of one of the common initiators used in free radical addition polymerisation. Explain its application with mechanism?
24   Write down the monomer unit and example of following polymer:
        a.   Polythene   b.   Nylon 6,6   c.   Nylon 6
25   Write down the monomer unit and example of following polymer:
        a.   Polyesters   b.   PVC   c.   Teflon
26   Write down the monomer unit and example of following polymer:
        a.   Novalac   b.   PHBV c.   Nylon-2 Nylon -6
        d.   Glyptal   e.   Buna N

TOPIC :   SOLUTION

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   What are substitutional and interstitial solution?
2.   What is meant by molarity and molality?
3.   Define mole fraction with example?
4.   Calculate the mole fraction of ethylene glycol ($C_2H_6O_2$) in a solution containing 20% of $C_2H_6O_2$ by mass.
5.   Calculate the molarity of a solution containing 5 gm of NaOH in 450 ml solution.
6.   Calculate the mass of urea (NH_2CONH_2) required in making 2.5 kg. of 0.25 molal aqeous solution.
7.   Which of the following will have greater boiling point: 1 M KCl, 1M $AlCl_3$ or 1M Sucrose (Give reason in support of your answer)
8.   Why ethylene glycol is add to the water used for radiator in the hills and cold area?
9.   What role does the molecular interaction play in a solution of alcohol and water?
10.   Why does gases always tend to be less soluble in liquids as the temperature is raised?
11.   State Henry's Law and mention some important application?
12.   Calculate the mass of a non-volatile solute (molarmass 40 gm mol^{-1}) which should be dissolved in 114 octane to reduce its vapour pressure to 80%.
13.   What are the most important type of intermolecular attractive interaction in the following pairs:
        a.   n-hexane and n-octane   b. I_2 and CCl_4
        c. $NaClO_4$ and water   d.   methanol and acetone
14.   What is menat by positive and negative deviations from Raoult's Law and how is the sign of $D_{mix}H$ related to positive and negative deviations from Raoult's Law.
15   Calculate the mass percentage of aspirin ($C_9H_8O_4$) in acetonitrile (CH_3CN) and when 6.5 gm of $C_9H_8O_4$ is dissolved in 450 gm of CH_3CN
16   Concentration nitric acid used in laboratory work is 68 % nitric acid by mass in aqueous solution. What should be the molarity of such sample of the acid if the density of the solution is 1.504 g ml^{-1}?
17.   What is meant by reverse osmosis. Explain with example.
18.   What are azeotropes? Explain minimum and maximum azeotrope with example?
19.   The boiing point of benzene is 353.23 K. When 1.80 gm of a non-volatile solute was dissolved in 90 gm of benzene, the boiling point is raised to 354.11 K Calculate the molar mass of the solute, K_b for benzene is 2.53 K kg mol^{-1}
20.   1.00 gm of a non-electrolyte (sulfur) is dissolved in 50 gm of benzene lowered the freezing point of benzene by 0.40 K The freezing point depression constant

of benzene is 5.12 K Kg mol^{-1} Find the molar mass of the solute and the atomicity of sulfur molecule (Atomic mass of sulfur = 32 u)

21. What is meant by abnormal mass? 2 gm of benzoic acid (C_6H_5COOH) dissolved in 25 gm. Of benzene shows a depression in freezing point equal to 1.62 K Molal depression constant for benzene is 4.9 K Kg mol^{-1} What is the % association of acid if it forms dimer in solution?

22. What is meant by term osmotic pressure? 19.5 gm of FCH_2COOH is dissolved in 500 gm of water. The depression in the freezing point of wter observed is 1° C Calculate the van't Hoff factor and dissociation constant of fluoroacetic acid.

23. Two elements A and B form compounds having formulae AB_2 and AB_4 When dissolved in 20 gm of benzene, 1 gm of AB_2 lowers the freezing point by 2.3 K whereas AB_4 lowers it by 1.3 K The molar depression constant for benzene is 5.1 K Kg Mol^{-1} Calculate the atomic masses of A and B.

24. Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litre of water at 25° C assuming that it is completely dissociated. What hypertonic and hypotonic solution?

25. What are ideal solution? Give 2 examples of it.
Heptane and octane form an ideal solution. At 373 K the vapour pressures of the two liquid components are 105.2 kPa and 46.8 kPa respectively. What will be the vapour pressure of a mixture of 26 gm of heptane and 35 gm of octane?

26. What is meant by Vant Hoff Factor? What are its value for electrolytes (association and dissociation) and non electrolytes?
0.6 ml of acetic acid, having density 1.06 g ml^{-1} is dissolved in 1 litre of water The depression in freezing point observed for this stregth of acid was 0.0205° C Calculate the van't Hoff factor and the dissociation constant of acid. K_f for water is 1.86 K kg mol^{-1} for water

TEST PAPER NO. 05

TOPIC :   SURFACE CHEMISTRY

M.M. 50   TIME: 3 HRS.
Name of Student_____ Roll No. _____

Q.NO. 1-10 carries 1 mark, 11-20 2 marks, 21-25 carries 3 marks, 26 carries 5 marks.

1.   What is demulsification? Give 2 examples of demulsifiers.
2.   What is an adsorption isotherm?
3.   Why is it essential to wash the precipitate with water before estimating it quantitatively?
4.   Why it is necessary to remove CO when ammonia is obtained by Haber's Process?
5.   Why is the ester hydrolysis slow in th beginning and becomes faster after sometimes?
6.   What is the role of desorption in the process of catalysis?
7.   Why are substances like platinum and palladium often used for carrying out electrolysis of aqueous solutions?
8.   What are promoter and poison?
9.   To which class of colloid the following belongs: a. milk   b. alloy
10.   Name the catalyst used in the following process:
       a.   Haber process for preparation of Ammonia
       b.   Ostwald process for preparation of Nitric Acid
11.   Write difference b/w Physiosorption and Chemosorption?
12.   What is Hardy Shuzule rule? Explain with example.
13.   What are the factors which affect absorption?
14.   Explain why:
       a.   Phsisorption decrease with the increase of temperature
       b.   Powdered substances are more effective adsorbents than their crystalline form.
15   Write 4 applications for adsroption?
16   What is meant by Selectivity and Activity of catalyst?
17.   What are shape selective catalyst explain with example?
18.   Explain adsorption theory of heterogeneous catalysis?
19.   What are emulsions? What are their different types? Give example of each type.
20.   Explain the :
       a.   Adsorption is always exothermic
       b.   Colloid is not a substance but a state of substance.
21.   Explain the following terms:
       a.   Electrophoresis   b.   Coagulation   c.   Tyndall Effect
22.   Explain what is observed:
       a.   When a beam of light is passed through a colloidal sol.
       b.   An electrolyte, NaCl is added to hydrated ferric oxide sol

c.   Electric current is passed through a colloidal sol.

23. How are colloids classified on the basis of:
a.   Phsical states of components
b.   nature of dispersion medium
c.   Interaction b/w dispersed phase and dispersion medium

24   Write short notes on:
a.   Macromolecular colloid
b.   Associated colloid
c.   Micelle

25   Give difference b/w
a.   Adsorption and Absorption
b.   Lyophilic and Lyophobic colloid
c.   Homogeneous and Heterogeneous catalysis

26   Explain:
a.   Electrophoresis   b.   Peptization   c.   Brownian Movement
What are enzymes? Write in brief the mechanism of enzyme catalysis.

कक्षा ११

प्रश्न पत्र

CLASS XI

CHEMISTRY

HALF YEARLY EXAMINATION

BLUE PRINT

QUESTION PAPER

MARKING SCHEME

BLUE PRINT XI
CHEMISTRY Half Yearly Exam (2019-20)

CHAPTER	1 MARK	2 MARKS	3 MARKS	5 MARKS	Total
Some basic concepts of Chemistry	3		2		9
Structure of Atom	2	1	2		10
Periodic Classification	3	2	1		10
Chemical Bonding	2	1	1	1	12
States of Matter	4	1		1	11
Thermodynamics	3	1		1	10
Chemical Equilibrium	3	1	1		8
Total	20	14	21	15	70

SECTION-A

1. Molarity is number of moles of solute per unit volume of: 1
    (a) Solution (b) Solvent (c) Both of these (c) None of these

2. How many significant figures are there in 62.500 ?   1
    (a) Zero (b) 3 (c) 5 (d) 1

3. How many moles are present in 44.8 L of CO_2 at STP?   1
    (a) 1 mole (b) 2 moles (c) 1.5 moles (d) 3 moles

4. The total number of nodes present in 3d orbital are   1
   a) 0   b) 1   c) 2   d) 3

5. The energy associated with a radiation of 200 nm wavelength is   1
   a) 9.9×10^{-15} J   b) 6.63×10^{-24} J   c) 12.03×10^{-32} J   d) 3.3×10^{-32} J

6. Electron Affinity has same but positive value equal to :   1
   a) Electronegativity   b) Electron Gain Enthalpy   c) Ionisation Enthalpy   d) None of

7. these   1

8. Which of the following parameters decreases along the period generally?   1
   a) Metallic Character   b) Electronegativity   c) Ionisation Enthalpy   d) All of these

9. Which of the following is not a reperesentative element?   1

10. a) Na   b) Mg   c) Mn   d) Cs   1
    What is the state of hybridization of Cl in ClF_3 ?

11. a) sp^2 b) sp^3 c) sp^3d d) sp^3d^2 1
    Which of the following has highest dipole moment ?

12. a) NH_3 b) CO_2 c) CCl_4 d) BF_3 1
    At constant temperature, when pressure of a gas is doubled, the volume of the gas becomes

13. a) Double   b) Half   c) Four times   d) Remains same   1
    Intermolecular H-bonding is not observed in:

14. a) HF   b) HCl   c) H_2O d) NH_3 1
    Vander Wal's parameter 'b' units is equal to units of:
    a) mol L^{-1} b) L mol^{-1} c) atm $mol^{-2} L^2$ d) None of these
    A gas will approach ideal behaviour at   1

15. (a) Low temperature ,low pressure (b) Low temperature ,high pressure
    (c) High temperature, low pressure (d) High temperature, high pressure
    A system absorbs 500J of heat and does 200J of work. What is the change in internal
    energy?
    a) -700 J   b) -300J   c) 700J   d) 300 J

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16. The enthalpy of neutralisation of HCl and NaOH is   1
    (a) zero   (b) – 57.3kJ/mol (c) + 57.3kJ/mol   (d) cannot be predicted

17. For the process to occur under adiabatic conditions, the correct condition is: 1
    (a) $\Delta T = 0$ (b) $\Delta p = 0$ (c) $q = 0$ (d) $w = 0$

18. The unit of equilibrium constant for the reaction   1
    $N_2 + 3H_2 \longrightarrow 2NH_3$
    (a) $mol^{-2}L^2$ (b) mol/L
    (c) $mol^2 L^{-2}$ (d) L/mol

19. In the reaction, if pressure increases then the equilibrium constant would   1
    $N_2(g) + O_2(g) \longrightarrow 2NO(g)$

(a) increases(b)decreases

(c) remains unchanged (d)sometime increases sometime decreases

Chemical equilibrium is dynamic in nature because

20. (a) The equilibrium in maintained quickly   1

(b) Conc. of reactants and products become same at equilibrium

(c) Conc. of reactants and products are constant but different

(d) Both forward and backward reactions occur at all times with same speed

SECTION-B

21. What is the wavelength of light emitted when the electron in a hydrogen atom undergoes   **2**
transition from an energy level with $n = 4$ to an energy level with $n = 2$?

22. Differentiate between Electron gain enthalpy and Electronegativity.   **2**

23. Give reasons: **2**

(a) IE of B is less than Be.

(b) Electron gain enthalpy of F is less negative than Cl.

24. Give the reasons: **2**

(i)   The dipole moment for NH_3 is higher than NF_3 .

(ii)   Are all the bond in PCl_5 is equal and why ?

25. At 25 ^{0}C and 760 mm Hg pressure a gas occupies 600 ml volume. What will be its   **2**
pressure at a height where temperature is 10 ^{0}C and volume is 640 mL?

OR

Calculate the volume occupied by 8.8 g of CO2 at 31.1 ^{0}C and 1 bar pressure.
    R= 0.0823 bar LK^{-1} mol^{-1}

26. Derive relationship between Cp and Cv.   **2**

27. pKa of acetic acid and pK_b of ammonium hydroxide are 4.76 and 4.75 respectively.   **2**
Calculate the pH of ammonium acetate solution.

SECTION-C

28. A compound contains 4.07 % hydrogen, 24.27% carbon and 71.65% chlorine. It's molar   3
mass is 98.96 g. What are its empirical and molecular formula?

29. Dinitrogen and Dihydrogen react with each other to produce ammonia according   3
to the following chemical equation:

N_2 (g) + H_2 (g) → 2NH$_3$ (g)

(i) Calculate the mass of ammonia produced if 2.00×10^3 g dinitrogen reacts
with 1.00×10^3 g of dihydrogen.

(ii) Will any of the two reactants remain unreacted?

(iii) If yes, which one and what would be its mass?

30. When electromagnetic radiation of wave length 300 nm falls on the surface of   3
sodium,electrons are emitted with a kinetic energy of 1.68×10^5 J mol^{-1}. What is the
minimumenergy needed to remove an electron from sodium? What is the maximum
wavelength that will cause a photoelectron to be emitted?

31. (i) An atomic orbital has $n = 3$. What are the possible values of l and m_l?   3

(ii) List the quantum numbers ($m_l$and l) of electrons for 3d orbital.

(iii) Which of the following orbitals are possible?
1p, 2s, 2p and 3f

OR

(a) State Pauli's exclusion principle.

(b) Write the electronic configuration of Na and find out the number of unpaired electrons
present in it .

32. (a) Would you expect the second electron gain enthalpy of O as positive, more negative or less negative than the first? Justify your answer.   3
(b) Why does Li show diagonal relationship with Mg ?
(c) The first element of a respective group show anomalous properties. Explain
33. Draw the molecular orbital diagram of O_2 and give its bond order and properties.   3
34. (a) Give conjugate acid and base of (i) HCO_3^- (ii) NH_3 3
(b) Write relation between Kp and Kc .

OR

(a) The concentration of hydrogen ion in a sample of soft drink is 3.8×10^{-3} M. What is its pH?
(b) What is meant by the conjugate acid-base pair? Find the conjugate acid/base for the following species: CN^-, F^-

SECTION-D

35. (a) State and explain Hess's law of constant heat summation.   5
(b) Calculate the standard enthalpy of formation of $CH_3OH(l)$ from the following data:
$CH_3OH(l) + 3/2 O_2 (g) \longrightarrow CO_2(g) + 2H_2O(l)$; $\Delta rH\theta = -726$ kJ mol–1
$C(g) + O_2(g)$ $CO_2(g)$; $\Delta cH\theta = -393$ kJ mol–1
$H_2(g) + 1/2 O_2 (g) \longrightarrow H_2O(l)$; $\Delta fH\theta = -286$ kJ mol–1

OR

(a) For the reaction at 298 K 2A + B $\rightarrow$ C $\Delta H=400$ kJ mol^{-1} and $\Delta S=0.2$ kJ K^{-1} mol^{-1}
At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range.
(b) For the reaction,
    $2 Cl_{(g)} \rightarrow Cl_{2(g)}$, what are signs of ΔH and ΔS ?

36. (a) Discuss the shape of the following molecules using the VSEPR model: 5
$BeCl_2$, $SiCl_4$
(b) Write the important conditions required for the linear combination of atomic orbitals to form molecular orbitals.
(c) Use molecular orbital theory to explain why the Be_2 molecule does not exist.

OR

(a) Explain the important aspects of resonance with reference to the CO_3^{2-} ion.
(b) Distinguish between a sigma and a pi bond.
(c) Which out of NH_3 and NF_3 has higher dipole moment and why ?

37. (i) What will be the pressure exerted by a mixture of 3.2 g of methane and 4.4 g of carbon   5
dioxide contained in a 9 dm^3 flask at 27 °C ?

(ii) Derive the gas equation PV=nRT from gas laws. Find out values of R in SI system.

(1 (a) Write Van der Waals equation for n moles of a gas.

(b) Under what conditions a real gas would behave ideally?

(c) Why does sharp glass edge become smooth on heating it upto its melting point in a flame?

(2) At 0°C, the density of a certain oxide of a gas at 2 bar is same as that of dinitrogen at 5 bar.

What is the molecular mass of the oxide?

Half Yearly Examination

Class XI

Subject Chemistry

Time Allowed:- 3 Hrs.
    M.M.:- 70

General Instructions

All questions are compulsory.

Questions 1 to 20are very short answer type questions and carry one mark each.

Questions 21 to 27carry two marks each.

Questions 28 to 34 carry three marks each.

Questions 34 to 37 carry five marks each

Use of calculators is not permitted. Use log table if necessary.

1. Bohr's model of atom is not in agreement with
   (A)   Line spectra of hydrogen atom   (B) Pauli's principle
   (C)   Planck's theory   (D) Heisenberg's principle.

2. The property of an element in the periodic table depends on its _____.
   (A) Atomic size   (B) Atomic mass
    (C) Electronic configuration   (D) Number of protons

3. Expanded octet can be observed in the valence shell of the central atom in
   (A) NH_3 (B) PCl_5 (C) $AlCl_3$ (D) $BeCl_2$

4. No. of Significant figure in 6.022×10^{23} are
   (A) 3   (B) 4   (C) 0   (D) 6

5. A living in Darjeeling observed that cooking food without using pressure cooker
   takes more time. The reason for this observation is that at high altitude
   (A) pressure increases   (B) temperature decreases
   (C)pressure decreases   (D) temperature increases

6. For a spontaneous process ,which of the following is always true

   (A) $\Delta G > 0$ (B) $\Delta S_{total} < 0$

   (C) $-T\Delta S > 0$ (D) $\Delta G < 0$

7

7. A chemical reaction A B is said to be in equilibrium when -

   (A) Complete conversion of A to B has take place

   (B) Conversion of A to B is only 50% complete

   (C) Only 10% conversion of A to B has taken place

   (D) The rate of transformation of A to B is just equal to rate of transformation of B to A in the system

8. Most ionic bond is present in

A) LiH   B) HF   C) CsH   D) HI

9. In the Schrodinger's wave equation ϕ represents

(A)   orbit   (B) wave function

            (C) wave   (D) radial probability

10. The number of shells in an atom is equal to its _____.

(A) Atomic mass   (B) Group number
(C) Period number   (D) Atomic volume

11. Molecule having maximum number of lone pairs of electrons on central atom is

(A) PH_3 (B) H_2S (C) CH_4 (D) BrF_5

12. Covalent nature of a compound increases with

   (A) Decrease in cation size
   (B) Increase in cation size
 (C) Decrease in anion size
 (D) Decrease in both cation and anion size

13. Maximum deviation from ideal gas behaviour is expected from which of the following gases

(a) H_2
(b) N_2
(c) CH_4
(d) NH_3

14. .An adiabatic process is one in which

A)No heat enters or leaves the gas

B)the temperature of the gas changes

C)the change in internal energy is equal to the mechanical workdone

D)all of the above

15. No. of molecules in a drop of water weighing 0.05g-

A) 1.67×10^{21}

B) 1.67×10^{23}

C) 16.7×10^{21}

D) 0.67×10^{21}

16. The relation between K p and K c for the reaction

2NO(g) + Cl 2 →(g) 2NOCl(g) is -
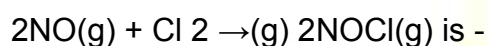
(A) K p = K c   (B) K p = K c (RT)

(C) K p = K c /RT   (D) K p = K c /(RT)

17. What is the workdone in case of isothermal free expansion

A) maximum

B) minimum

C) zero

D) positive

18. The use of hot air balloons is an application of
(A) Gay Lussac's law
(B) Avogadro's law
(C) Charles law
(D) Boyle's law

19. The first alkali metal is _____.
A. Hydrogen   B. Lithium
C. Sodium   D. Francium

20. Mass of an electron is :
A) 1.9×10^{-31}Kg   B) 9.1×10^{-31}Kg
C) $91\ 10^{-31}$Kg   D) 9.1×10^{-31}g

21. Define the following: a) 1amu   b) Limiting reagent.
                (2)
                        Or
    State: a) Law of multiple proportion   b) Law of definite proportion
22. Calculate the number of atoms in : (a) 52u of He (b) 52g of He
                (2)

23. .Write the electronic configuration of Br (Z=35) and Xe (Z=54).
        (2)

                Or

Why do Cu and Cr show exceptional configuration. Explain.

24.How would you explainthe fact that first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium?
        (2)

25.A system absorbs 700 J of heat and does a work of 450 J, calculate the internal energy change of the system.
        (2)

26. Give reason:
        (2)

a) Cations are always smaller than parent atom.

b) Cl shows more electron enthalpy than fluorine.

27.   Define buffer solutions . Give two examples.
        (2)

        Or

        Define common ion effect. Give any one example.

28.   Explain and draw the shape of following molecules with help of hybridisation:
        (3)

        a) PCl_5

        b) NH_3

        c) SF_6

29(a)For a reaction at 298k , $2A + B \rightarrow C$, $\Delta H + 400KJ/mol$ and $\Delta S = 200.0$ KJ/mol.At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range
                                (2)

    (b) State Second law of thermodynamics.
            (1)

30. Calculate the enthalpy of formation of $CH_3OH(l)$ From the following data: ΔcH $CH_3OH(l) = -726$ kJmol^{-1}
                (3)

$$\Delta cH \ C(s) = -393 \ kJmol^{-1} \ , \ \Delta cH \ H_2(g) = -286 \ kJmol^{-1}$$

Or

Enthalpies of formation of $CO(g)$, $CO_2(g)$, $N_2O(g)$ and $N_2O_4(g)$ are -110 kJ mol-1, -393 kJ mol-1, 81 kJ mol-1 and 9.7 kJ mol-1 respectively. Find the value of ΔrH for the reaction:
$N_2O_4(g) + 3CO(g) \longrightarrow N_2O(g) + 3CO_2(g)$
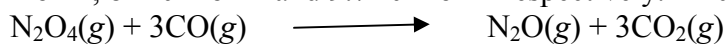
31(a) Explain Hess's law of constant heat summation.
(2)

(b)What is reaction quotient.
(1)

Or

State Le Chatelier's Principle. Explain effect of change in concentration and temperature on the reaction in equilibrium stage.
(3)

32. Define Atomic radii. Dissuss itsvariation while moving down thegroup and along the period in the periodic table..
(3)

33.Define i) Charles law ii) Dalton law   iii) Avogadro law
(3)

Or

a) Derive the relation between Cp and Cv

b) Define Boyle's temperature

34. State /Define the following:

1. Boyle's law.
2. Critical temperature.
3. Surface tension.

35. State the following (i) Aufbau Principle (ii) Pauli exclusion principle (iii) Hund's rule of maximum multiplicity.

(b)Show that the circumference of the Bohr orbit for hydrogen atom is an integral multiple of the De

broglie wave length associated with it .

11

OR

What are quantum numbers? How many electrons in an atom have the following quantum numbers (i) $n = 4$, $m_s = -1/2$ (ii) $n = 3$, $l = 0$

(3)

(b)A golf ball has a mass of 40 g and a speed of 45m/s . If the speed can be measured with with accuracy of 2%. Calculate the uncertainity in the position?

36(a) Define the term Formal charge and calculate the formal charge on S in HSO_4^- and Cl in $HClO_4$(b) (b)Explain the geometry of SF_4 and $ClBr3$ molecule on the basis of VSEPR theory.

OR

a. Write the electronic configuration for molecular orbitals of nitrogen molecule and calculate the bond order of the molecule.

(b)Compare the, bond length and magnetic behavior of O_2, O_2^-, O_2^+ and O_2^{2-} .

37. a)   A gas occupies one litre under atmospheric pressure. What will be the volume of the same amount of gas under 750mm of Hg at the same temperature?

(2)

b) How large a balloon could you fill with 4g of He gas at 22^0C and 720 mm of Hg?

(2)

c) The spherical shape of liquid drop is due to_____

(1)

Or

a)Calculate the temperature at which 28g of N_2 occupies a volume of 10 litre at 2.46 atm.   (2)

b) A gas occupies 300ml at 27^0C and 730 mm pressure. What would be its volume at STP.   (1)

c) Write ideal gas equation.   (1)

Half Yearly Examination
11th Chemistry
BLUE PRINT

Time Allowed:- 3 Hrs.

M.M:- 70

S.No.	Name of Unit	V.S.A.(1)	S.A.(2)	S.A.(3)	L.A.(5)	Total
1	Some Basic Concepts of Chemistry	3(1)	3(2)		-	9
2	Structure of Atom	2(1)		1(3)	1(5)	10
3	Classification of Elements and periodicity in properties	3(1)	1(2)	1(3)	-	8
4	Chemical bonding and Molecular Structure	4(1)	1(2)	1(3)	1(5)	14
5	States of Matter: Gases and liquids	3(1)	-	1(3)	1(5)	11
6	Thermodynamics	2(1)	1(2)	2(3)	-	10
7	Equilibrium	3(1)	1(2)-	1(3)	-	8
Total		(20)	7(14)	7(21)	3(15)	37(70)

Half Yearly Examination

11th Chemistry

Time Allowed:- 3 Hrs.   Marking Scheme
        M.M.:- 70

Q.No.	Answer	Marks
1	Heisenberg's uncertainity principle	1
2	Electronic configuration	1
3	PCl_5	1
4	4	1
5	Pressure decreases	1
6	$\triangle$G<0	1
7	Rate of transformation of A to B is just equal to B to A in system	1
8	CsH	1
9	Wave function	1
10	Period number	1
11	H_2S	1
12	Decrease in cation size	1
13	NH_3	1
14	All of the above	1
15	1.67×10^{21}	1
16	$K_p = Kc/RT$	1
17	Zero	1
18	Charle's law	1
19	Lithium	1
20	$9.1 \times 10^{-31} Kg$	1
21	a) 1/16 of the Mass of C-12 atom b) Reactant which is present in lesser quantity than required according to the balance chemical equation and limits the participation of other reactants and the formation of products also. Or Law of multiple proportion- two elements combine together to form two or more than two elements, mass of one of the element which combine with fixed mass of second element bear simple whole number ratio Law of definite proportion- A compound is formed by combination of two or more elements in definite ratio by mass.	1 1
22	4u of He = 1 atom of He ∴52 u of He = ¼ 8 52 atoms = 13 atoms 4 g of He = 6.022 * 10^{23} atoms ∴ 52 g of He = (6.022 * 10^{23} *52)/4 = 7.8286*10^{24} atoms	½ ½ ½ 1/2
23	Correct electronic configuration Or	1 1

14

	Exceptional configuration of Cu and Cr is due to following two reasons – i. symmetrical Half filled and fully filled configuration ii.Exchange energy	
24	$\Delta i\ H_1 \Delta iH_2$ Na($1s^2 2s^2 2p^6 3s^1$) $\rightarrow$ Na$^+$($1s^2 2s^2 2p^6$) $\rightarrow$ Na^{2+}($1s^2 2s^2 2p^5$) (More stable) $\Delta i\ H_1 \Delta iH_2$ Mg($1s^2 2s^2 2p^6 3s^2$) $\rightarrow$ Mg$^+$($1s^2 2s^2 2p^6 3s^1$) $\rightarrow$ Mg^{2+}($1s^2 2s^2 2p^6$) (More stable) Stability of electronic configuration.	½ ½ 1
25	$\Delta U = q + w$ q = 700 J, w = -450 J = (700 – 450) J = 250 J	½ ½ ½ ½
26	i. Cations are formed by loss of electron so in a cation no. of electrons are less protons. Therefore less protons are attracted more strongly by more protons resulting in decrease in size. ii. Cl accepts the electron easily due to less interelectronic repulsion. While in F due to small size incoming electron feels much interelectronic rep[ulsion.	1 1
27	Solutions which resist change in there PH. CH3COOH+ COONa NH4OH + NH4Cl Or Suppression in degree iof dissociation of a weak electrolyte by adding a strong electrolyte containing common ion. $CH_3COOH \leftrightarrow CH_3\ COO^- + H^+$ HCl --------------$\rightarrow$ H$^+$ + Cl$^-$	1 ½ ½ Or 1 1
28	i)Correct shape and name ii) Correct shape and name iii) Correct shape and name	1 1 1
29	$\Delta G = \Delta H - T\ \Delta S$ For the reaction to be spontaneous g shoud be –ve i.e. $\Delta H - T\Delta S < 0$ OR $\Delta H < T\Delta S$ OR T> H/S T> 400kj/mol / 0.2K-mol- T> 2000K Correct statement of the law.	½ ½ ½ ½ 1
30	C (s) + 2H$_2$ (g) + ½ O$_2$ (g) $\rightarrow$ CH$_3$OH (l), $\Delta_f H^o$= ? Given, CH$_3$OH(l) + 3/2 O$_2$(g) $\rightarrow$CO$_2$(g) +2H$_2$O(l) ; $\Delta_r H^o$ = -726 kJmol^{-1} (i) C(s) + O$_2$(g) $\rightarrow$ CO$_2$(g) ; $\Delta c H^o$ = -393kJmol^{-1} (ii)	1 1

	$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$; $\Delta_f H^0 = -286$ kJmol^{-1} (iii)	
	$\Delta H = $ Eqn.(ii) + 2 * Eqn.(iii) − Eqn.(i) $= -393 + 2 * (-286) − (-726)$ kJmol^{-1} $= -239$ kJmol^{-1}	$\frac{1}{2}$ $\frac{1}{2}$
31	1.Correct statement with one example 2.Correct definition Or Correct statement With increase in concentration of reactant reaction shifts towads forward direction If concentration of reactants decreased reaction occurs in backward direction	2 1 Or 1 2
32	Distance between centre of the nucleus to outermost shell containing electron. Down the group atomic radius increases due to increase in no. of shells. Along the period atomic radius decreases due to increase in nuclear charge	1+2
33	1Correct Statement 2Correct Statement 3.Correct Statement	1 1 1
34	1. $q_v = C_v \Delta T = \Delta U$ and $q_p = C_p \Delta T = \Delta H$ $\Delta H = \Delta U + R\Delta T$ $C_p \Delta T = C_v \Delta T + R\Delta T$ $C_p - C_v = RT$ 2.Correct definition	2 1
35	(i) Correct Statement (ii) Correct definition (iii) Correct definition (b)According to Bohr postulate of angular momentum mvr = nh/2π Or $2\pi r$ =nh / mv eq .(i) According to De broglie equation λ = h/mv Substituting this value in equation no (i) 2π r = nλ OR Quantum Numbers Definition No of electrons when n = 4 , (16) and when n = 3 , (2) (b) The uncertinity in speed=2% = 45x2/100=0.9 m/s Uncertinity in position =h/4πmxv =6.626x10-34/4x3.14x40x10-3x0.9	1 1 1 2 1 1 1 $\frac{1}{2}$ x 2=1 1 $\frac{1}{2}$

	$= 1.46 \times 10^{-33}$m	½ 1
36	(a) Definition of formal charge Correct calculation of formal charge (b) Correct explanation OR (a) Correct electronic configuration Correct calculation of bond order (b) Correct comparison of each property	1 2 2 1 1 3
37	(a) P1v1=p2v2 $1 \times 1 = 750/760 \times$ v2 V2=1.0133litre b)pv=w/mRT (R=0.0821litreatm/mol/K V=25.565litre c) Surface tension OR a)P1V1/T1 = P2V2/T2 V1 =262.2ml b) pv=w/mRT (R=0.0821litreatm/mol/K T=299.6K c)PV = nRT	½ ½ ½ ½ ½ ½ ½ ½ 1 2 2 1

PAPER NO 03

BLUE PRINT XI
CHEMISTRY Half Yearly Exam (2019-20)

	1 MARK	2 MARKS	3 MARKS	5 MARKS	Total
Some basic concepts of Chemistry	3		2		9
Structure of Atom	2	1	2		10
Periodic Classification	3	2	1		10
Chemical Bonding	2	1	1	1	12
States of Matter	4	1		1	11
Thermodynamics	3	1		1	10
Chemical Equilibrium	3	1	1		8
Total	20	14	21	15	70

KENDRIYA VIDYALAYA SANGATHAN
HALF YEARLY EXAMINATION: 2019-20
CLASS: XI
CHEMISTRY(THEORY)

TIME: 3 Hours   **Max. Marks: 70**

<u>General Instructions:-</u>
(a) All questions are compulsory.
(b) Q.no. 1 to 20 are very short answer questions and carry 1 mark each.
(c) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
(d) Q.no. 28 to 34 are long answer questions and carry 3 marks each.
(e) Q.no. 35 to 37 are long answer questions and carry 5 marks each.

Q.1 The orbital configuration of $_{24}Cr$ is $3d^5 4s^1$. The number of unpaired electrons in is

(a) 3   (b) 2

(c) 6   (d) 4

Q.2 Which of the following is a compound

(a) graphite   (b) brass

(c) milk   (d) 22 carat gold

Q.3 The maximum number of electrons in s, p and d-subshells are

(a) 2 in each   (b) 2, 4 and 6

(c) 2, 6 and 10   (d) 2, 6 and 12

Q.4 The property of an element in the periodic table depends on it.
  (a) Atomic size   (b) Atomic mass
  (c) Electronic configuration   (d). Number of protons

Q.5 An element has configuration 2, 8, 1. It belongs to, _____.
  (a)1 group and 3rd period   (b) group and 1st period
  (c)2group and 8th period   (d)17 group and 3rd period

Q.6 The number of electrons in the valence shell is equal to its _____.
  (a)Atomic mass   (b) Group number
  (c)Period number   (d) Atomic volume

Q.7 Two atoms X and Y have 5 and 7 valence electrons. The formula of the compound formed by their combination is
  (a)X Y   (b) $X Y_2$ (c) $X Y_3$ (d) $X_3 Y$

Q.8 An element A belongs to IIA group and another element B belongs to VIA group. The compound formed between A and B contains
  (a) A^{+2}, B^- ions   (b) A^{+2}, B^{-2} ions
  (c) A^{-2}, B^{+2} ions   (d) A^+, B^{-2} ions

Q.9 The percentage of oxygen in NaOH is

(a) *10*   (b) *8*   (c) *60*   (d) 40

Q.10 Maximum deviation from ideal gas behaviour is expected from which of the following gases

(a) H_2 (b) N_2

(c) CH_4

(d) NH_3

Q.11 Which of the following statements is not rue about the effect of an increase in temperature on the distribution of molecular speeds in a gas
(a) the most probable speed increases
(b) the fraction of molecules with the most probable speed increases
(c) the distribution becomes broader
(d) the area under distribution curve remains the same

Q.12 On increasing the temperature of water the surface tension of water
(a) remains constant
(b) increases
(c) shows irregular behaviour
(d) decreases

Q.13 Which of the following is an extensive property

    a) Molar heat capacity
    b) Temperature
    c) Enthalpy
    d) All of these

Q.14 Predict the sign of ΔS for the following reaction

$H_2S(s) + 3O_2 (g) \longrightarrow 2H_2 O(g) + 2SO_2 (g)$

    a) +ve
    b) Zero
    c) –ve

Q.15 For a spontaneous process ,which of the following is always true

    a) $\Delta G > 0$
    b) $\Delta S_{total} < 0$
    c) $-T\Delta S > 0$
    d) $\Delta G < 0$

Q.16 What is the workdone in case of isothermal free expansion

a) maximum

20

b)minimum

Q.17 Chemical equilibrium is dynamic in nature because

  (A) The equilibrium in maintained quickly

  (B) Conc. of reactants and products become same at equilibrium

  (C) Conc. of reactants and products are constant but different

  (D) Both forward and backward reactions occur at all times with same speed

.

Q.18 Chemical equilibrium is dynamic in nature because

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  (D) Both forward and backward reactions occur at all times with same speed

Q.19 At any moment before a reversible reaction attains equilibrium it is found that –

  (A) The rate of the forward reaction is increasing and that of backward reaction is decreasing

  (B) The rate of the forward reaction is decreasing and that of backward reaction is increasing

  (C) The rate of both forward and backward reactions is increasing

  (D) The rate of both forward and backward reactions is decreasing Q.20 The critical temperature of the following gases in K is as follows H_2, He, O_2 and N_2 are 33.2K, 5.3K,154.3k and 126 K respectively. The gas that liquefies first is
(a) H_2
(b He
(c) O_2
(d) N_2

Q21. Calculate energy of one mole of photons of radiation whose frequency is 5×10^{14} Hz.

Q22. Among the second period elements the actual ionization enthalpies are in the order

Li < B < Be < C < O < N < F < Ne. Explain why

(i) Be has higher $\Delta i\ H$ than B

(ii) O has lower $\Delta i\ H$ than N ?

Q23. Calculate the volume occupied by 8.8 g of CO_2 at 31.1°C and 1 bar pressure.
R = 0.083 bar L $K^{-1}mol^{-1}$.

Q 24.The concentration of hydrogen ion in a sample of soft drink is 3.8×10^{-3}M.What is its pH ?

Q25. (i) What are extensive properties?

(ii) Under what condition $\Delta U = \Delta H$?

Q.26Explain the difference between sigma bond and pi-bond.

<div align="center">OR</div>

Assign the reason:- (i) Ionisation enthalpy of Be is higher than B ?

(ii) Why electron gain enthalpy of Cl is more negative

Q.27 How does Molecular Orbital Theory account for the following ?
   i)   Bond order for N_2 is greater than N_2^+ but the bond order for O_2 is less than that of O_2^+

<div align="center">OR</div>

Draw lewis dot structure of $CO_3^{2-}$and NO_3^-

Q28. The density of 3 M solution of NaCl is 1.25 g mL^{-1}. Calculate molality of the solution.Q.29   Describe the effect of :

  i) addition of H_2 ii) addition of CH_3OH iii) removal of CO   iv) removal of

CH_3OH on the equilibrium of the reaction: $2H_2(g) + CO(g) \underset{\leftarrow}{\rightarrow} CH_3OH(g)$

Q.30. Find out frequency & wave length of a photon emitted during a transition from n=5 to n=2 in H atom.

<div align="center">**OR**</div>

   (a) What is Hund's rule of maximum multiplicity? What is its significance?
   (b) What do you mean by Pauli'e exclusive principle? What is its significance?

Q31 (a) Using s, p, d, f notations, describe the orbital with the following quantum numbers

(i) $n = 2, l = 1$,   (ii) $n = 5, l = 3$

(b) Draw shapes of d_z^2 and d_{XY} orbitals..
(c) Write electronic configuration of Cr (Z=24) and Cr^{3+}.

Q.32a)Define the term precision and accuracy.
     b) How are 0.50 m Na_2CO_3 and 0.50 M Na_2CO_3 different

Q33. (a). Use molecular orbital theory to explain why the Be_2 molecule does not exist.

<div align="center">OR</div>

(a) What do you understand by bond pairs and lone pairs of electrons? Illustrate by giving one example of each type.

(b) Define hydrogen bond. Is it weaker or stronger than the van der Waals forces?

Q34. (a) How would you explain the fact that first ionisation enthalpy of sodium is lower than that of magnesium but its second ionisation enthalpy is higher than that of magnesium?

(b) Explain why the electron gain enthalpy of fluorine is less negative than that of chlorine.

Q.35 In terms of Charle's Law, Explain why -273^0C is the lowest temperature.

(ii)What will be minimum pressure required compressing 500 dm^3 for air at 1 Bar to 200 dm^3 at 30^0C?

OR

State Boyle's law and Charles law .Draw the plot of P vs V for Boyle's law.

Q36. For the reaction at 298 K, $2A + B \rightarrow C$

$\Delta H = 400$ kJ mol^{-1} and $\Delta S = 0.2$ kJ K^{-1}mol^{-1}

At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range.

OR

Calculate the standard enthalpy of formation of one mole of $C_6H_{12}O_6$ (s), if the combustion of one
mole of glucose takes place at 298 K and 1 atm and after combustion CO_2 (g) and H_2O (l) are produced and 2816 kJ of heat is liberated. Assume that the standard enthalpies of formation of CO_2
(g) and H_2O (l) are - 393 kJ/mol and -286 kJ mol respectively

Q37. (a) Distinguish between a sigma and a pi bond.

(b) Discuss the shape of the following molecules using the VSEPR model:

(i) $BeCl_2$ (ii) H_2O (iii)PCl_5

OR

(a) Which out of NH_3 and NF_3 has higher dipole moment and why ?

(b) What is hybridization? Discuss the shape of the following molecules on the basis of hybridization:

(i) SF_6 (ii) $SiCl_4$

PAPER NO 04

KENDRIYA VIDYALAYA SANGATHAN

HALF YEARLY EXAMINATION: 2019-20

CLASS: XII

CHEMISTRY(THEORY)

TIME: 3 Hours   **Max. Marks: 70**

<u>General Instructions:-</u>
(a) All questions are compulsory.
(b) Q.no. 1 to 20 are very short answer questions and carry 1 mark each.
(c) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
(d) Q.no. 28 to 34 are long answer questions and carry 3 marks each.
(e) Q.no. 35 to 37 are long answer questions and carry 5 marks each.

Q.1   Which of the following solutions has the highest boiling point?

     (a)   5.85% solution of NaCl   (b)   18.0% solution of glucose

     (c)   6.0% solution of urea   (d)   all have same boiling point

Q.2   Molarity of pure water is

     (a)   1   (b)   18

     (c)   55.5   (d)   6

Q.3   The half life period for a zero order reaction is equal to :

     a. $2k/[A]°$

     b. $\dfrac{[A]°}{2k}$

     c. $\dfrac{0.693}{k}$

     d. $\dfrac{0.693}{k[A]°}$

Q.4   Which property of colloidal solution is independent of charge on the colloidal particles?

     a.   Coagulation
     b.   Electrophoresis
     c.   Electro-osmosis
     d.   Tyndall effect

Q.5   Which of the following ore is concentrated by froth-floatation method?
     a) Magnetite b) Galena c) Cassiterite d) Malachite

Q.6. When excess of KI is added to copper sulphate solution:
     (a)   Cuprous iodide is formed

(b) I_2 is liberated

(c)   Potassium iodide is oxidized

(d)   all

Q.7. The BCl_3 is a planar molecule whereas NCl_3 is pyramidal because:

(a)   N – Cl bond is more covalent than B – Cl bond

(b)   B – Cl bond is more polar than N – Cl bond

(c)   Nitrogen atom is smaller than boron

(d) BCl_3 has no lone pair but NCl_3 has a lone pair of electron

Q.8. Which of the following transition metal ion has magnetic moment 3.87 BM?

A) Co^{2+} (B) Co^{3+} (C) Fe^{2+} (D) Fe^{3+}

Q.9. Which of the following sentence is not suitable for the capacity of transition metal to form complex compounds?

A). Transition metal ions are small in size.

B). Nuclear charge of transition metal ion in comparatively more.

C). Co-ordination covalent bond is not directional.

D). Transition metal ions possesses different oxidation states.

Q.10   The number of unidentate ligands in the complex ion is called

a) Effective atomic number   b) Coordination number

c) Primary valency   d)Oxidation number

Q.11 When two moles of ethyl chloride react with two moles of sodium in the presence of ether what will be formed?

a)   2 moles of ethane

b)   1 moles of ethane

c)   2 moles of butane

d)   1 moles of butane

Q.12. Lowest boiling point is for

a.   Butanol

b.   Pentanol

c.   2-methylpropan-2-ol

d.   2-methylbutan-2-ol

$Q.13$ $Phenol \xrightarrow{Zn\ dust} X \xrightarrow{CH_3\ Cl\ .anhy\ AlCl_3} Y \xrightarrow{alk.KMnO_4} Z$

The product Z is

a)   Benzaldehyde

b)   Benzoic acid

c)   Benzene

d)   Toluene

Q.14   The major product obtained on interaction of phenol with NaOH and CO_2 is

a)   Benzoic acid

b) Salicylic acid
c) Salicylaldehyde
d) Phthalic acid

Q.15. Hoffmann degradation of m-bromobenzenamide gives

a) Aniline b) m-bromo aniline c) bromo benzene d) m-bromo ethyl benzene
b) whichis reducingsugar?
a. lactose (B)maltose (C)fructose (D) all ofabove

Q.16 Which of the following is a broad spectrum antibiotic?

a) Penicillin

b)Chloramphenicol

c) Ampicillin

d) Aspirin

Q.17.Which of the following is a chain growth polymer?
A) Nucleic acid
B) Polystyrene
C) Protein
D) Starch

Q.18. Alcohols and ethers are
a. Position isomers
b. Functional isomers
c. Chain isomers
d. Metamers

Q.19 Use of glycol as antifreeze in the automobile is an important application of
(a) colligative property (b) Roault's law
(c) fractional crystallization (d) hydrolysis

Q20. Aniline react with $NaNO_2$ and HCl to give

a)Nitroaniline b) Diazonium salt c) Phenol d) Chloroaniline

Q.21. Explain what is meant by the following?

(i) zwitter ion

(ii) Biocatalysts

Q.22. Complete the following chemical equations;

(a) C + H_2SO_4(conc.) ------->

(b) $HgCl_2$ + PH_3 ---------->

Q.23. Explain giving a suitable reason for each of the following;

26

(i)Generally there is an increase in the density of elements from titanium (Z=22) to copper (z=29) in the first series of transition elements.

(ii)The chemistry of actinoids is more complicated as compared to lanthanoids.

Q.24.Why does NH_3 acts as a Lewis base?

Q.25.Out of H_2Te and H_2S which is more acidic and why?

OR

Give a chemical test to distinguish between a primary amine and a secondary amine.

Q.26. The rate constant for a reaction of zero order in A is 0.0060 mol L^{-1} S^{-1}.How lonh will it take for the initial concentration of A to fall from 0.20 M to 0.080 M ?

OR

Derive the general form of the expression for half life of a zero order reaction.

Q.27. The conductivity of 0.20M solution of KCl at 298 K is 0.025 S cm^{-1}. Calculate its molar conductivity.

Q.28. write the following name reaction .

(a) Aldol condensation   (b)Cannizzaro reaction (c) Wolf kishner reaction

Q.29. What is the difference between multi-molecular and accociated colloids? Give one example of each.

Q.30The decomposition of A into product has value of K as $4.5 \times 103 S^{-1}$ at 10' C and energy 60 kJ mol^{-1} At what temperature would k be 1.5×104 S^{-1} ?

Q.31 Explain the following observations;

(i) Zinc is not regarded as transition element[1]

(ii) Among the divalent cations in the first series of transition elements ,mangnese exhibits the maximum paramagnetism.

(iii)Transition elements have great tendency for catalytic activity .

Q.32 Write .the names and structures of the monomers of the following polymers;

(A) Buna-N

(B) Bakalite

(C) Nylon-66

Q.33. Explain the term rusting of iron .

OR

. (a) Explain why an alkylamine is more basic than ammonia.

(b)How would you convert?

A. aniline to nitrobenzene   B. aniline to carbyl amine

Q.34 a. Out of 2- chloroethanol and ethanol,which is more acidic and why?

   b. Phenol donot give protonation reaction readily.why?

   c. Kolbes reaction- explain

OR

 Give reasons:

a. Ethyl iodide undergoes Sn^2 reaction faster than ethyl bromide.
b. Although chlorine is an electron withdrawing group,yet it is ortho,para- directing in electrophilic aromatic substitution
c. The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

Q.35. Compare the chemistry of lanthanoids with that of the actinoids with refrence to -

(I) Electronic configuration (ii) Oxidation state (iii) Atomic and ionic sizes (iv)Chemical reactivity

(v) Complex formation.

OR

Describe the preparation potassium permangnate . What is the effect of increasing pH on a solution of potassium dichromate ?

Q.36. Explain why:

(i) The dipole moment of chlorobenzene is lower than that of cyclohexyle chloride.

(ii)Alkyl halides,though polar, areimmiscible with water.

(iii) Wurtz reaction should be done under anhydrous conditions.

OR

 Write the structures of the major organic product in each of the following reactions:

                       Acetone

(i) $CH_3 CH_2CH_2Br$ + NaI --------------->

                       Heat

Ethanol

(ii) $(CH_3)_3CCl + KOH$ ----------------->

Heat

Water

(iii) $CH_3CH(Br) CH_2CH_3 + NaOH$ ------------->

aq.ethanol

(iv) $CH_3 CH_2Br + KCN$ ------------------>

(v)$C_6 H_5ONa + C_2H_5Cl$ ------------>

Q.37(a). Define the terms reverse osmosis and osmotic pressure.

(b). Calculate the boiling point of a solution prepared by adding15.0 g of NaCl to 500 g of water.

(K_b for water= 0.512 K kg mol^{-1} and molar mass of NaCl=58.44 g)

OR

(a). State the following :

(i) Applications of Henry's law

(ii) Ideal solution .

(b). A solution prepared by dissolving 8.95 mg of a gene fragment in 70.0 ml of water has an osmotic pressure of 0.335 torr at 25^{0}C. Assuming the gene fragment s a non-etectrolyte, determine its molar mass.

PAPER NO 05

BLUE PRINT

CLASS XI
HALF YEARLY

S.NO	Unit	VSA	SA-I	LA-1	LA-2	TOTAL
		(I mark)	(2 mark)	(3 mark)	(5 mark)	
1	Basic concepts in chemistry	1(2)	2(2)	3(1)		9
2	Atomic structure	1(2)		3(1)	5(1)	10
3	Classification of elements and periodicity in properties	1(3)	2(2)	3(1)		10
4	Chemical Bonding	1(4)		3(1)	5(1)	12
5	States of matter	1(3)	2(1)	3(2)		11
6	Thermodynamics	1(3)	2(1)		5(1)	10
7	Chemical Eqiullibrium	1(3)	2(1)	3(1)		8
	TOTAL	20(20)	14(7)	21(7)	15(3)	70(37)

30

	3. Q. No. 21- 27 are short answers questions, carrying 2 marks each. 4. Q. No.28- 34 are long answer questions, carrying 3 marks. 5. Q. No.35- 37are very long answers questions of 5 mark each.	

Q.1	Which of the following is not a mixture
	      (A) air (B) water
	      (C) 22 carat gold (D) bronze
		1

Q.2	Which of the following is the symbol both for the unit as well as prefix for expressing the multiple of a unit?
	      (A) k (B) g
	      (C) m (D) n
		1

Q.3	An orbital with quantum number n=4, l=3; $m_l = 0$, ms= + ½ (A) 3p (B) 3d (C) 4d (D) 4f	1

Q.4	Maximum number of electrons that can be accommodated in d subshell is.
	      (A) 6 (B) 8
	      (C) 10 (D) 14
		1

Q.5	Which of the following is not an liquid element (A) Ga (B) Cs (C) Cl (D) Br	1

Q.6	Electron gain enthalpy of noble gases is
	      (A) zero (B)negative
	      (C) positive (D) more negative
		1

Q.7	Pnictogens belongs to which group of the periodic table
	      (A) Group 13 (B)Group 14
	      (C)Group15 (D)Group 16
		1

Q.8	A covalent bond is formed between two atoms when
	      (a) the electronegativities of the two atoms differ considerably
	      (b) the two atoms are of the same size
	      (c) one or more pairs of electrons are shared by the two atoms
	      (d) the electron affinities of the two atoms are the same
		1

Q.9	In an $H_2{}^+$ ion (a) one electron is bound to two protons (b) two electrons are bound to two protons (c) three electrons are bound to two protons (d) none of these happens	1
Q.10	The types of bonds present in CuSO4.5H2O are (a) electrovalent and covalent (b) electrovalent and coordinate covalent (c) electrovalent, covalent, coordinate covalent and hydrogen bonds (d) covalent and coordinate covalent	1
Q.11	The maximum possible number of hydrogen bonds in which a water molecule can participate is	1

	(a) four (b) three (c) two (d) one	

Q.12	Liquid tend to rise in a capillary due to
	    a) Atmospheric pressure b)Viscosity
	    c) Surface Tension d)Gibbs free energy
		1

Q.13	Liquid at higher altitudes boil at low temperature because of
	    a) Humidity b) Low Temperature
	    b) Low atmospheric pressure d) Low Oxygen
		1

Q.14	Volume occupied by 1 mole gas at STP =
	    a) $6.022*10^3$ L. b) 22.4 L
	    b) 22500 mld) 1 L
		1

Q.15	The first law of thermodynamics introduces the concepts of conservation of (a) heat (b) energy and equivalence of heat and work (c) work (d) energy and equivalence of temperature and work	1
Q.16	In which of the following processes does the entropy decrease? (a) The dissolving of sodium chloride in water (b) The evaporation of water (c) The conversion of $CO_2(g)$ into dry ice (d) When a dozen marbles are taken out of a small bag and dropped on the ground	1
Q.17	Which of the following statements isincorrect? (a) The work done by the system on the surroundings is negative. (b) The work done on the system by the surroundings is negative. (c) The heat absorbed by the system from the surroundings is positive. (d) The heat absorbed by the surroundings from the system is negative.	1
Q.18	For the reaction $H_2(g) + I_2(g) \rightleftharpoons$ 2HI(g) the equilibrium constant Kp depends on the (a) total pressure (b) catalyst used (c) amount of H_2 and I_2(d) temperature	1
Q.19	Buffer solution tends to _____ pH. (a) increases(b) Change (c) resist change(d) decreases	1
Q.20	At equilibrium the rate of forward reaction and the rate of reverse reaction are _____. (a) Equal(b) Changing (c) decreases to zero(d) doubles	1
Q.21	Calculate the concentration of nitric acid in moles per litre in a sample which has a density, 1.41 g mL–1 and the mass per cent of nitric acid in it being 69%.	2
Q.22	Convert the following into basic units: (i) 28.7 pm (ii) 15.15 pm	2
Q.23	Explain why cations are smaller and anions larger in radii than their parent atoms?	2
Q.24	Which of the following pairs of elements would have a more negative electron gain enthalpy? (i) O or F (ii) F or Cl	2
Q.25	Explain the physical significance of Van der Waals parameters.	2
Q.26	The reaction of cyanamide, $NH_2CN(s)$, with dioxygen was carried out in a bomb calorimeter, and ΔU was found to be –742.7 kJ mol^{-1} at 298 K. Calculate enthalpy change for the reaction at 298 K. $NH_2CN + 3/2\ O_{2(g)} \longrightarrow N_{2(g)} + CO_{2(g)} + H_2O$	2

Q.27	A liquid is in equilibrium with its vapour in a sealed container at a fixed temperature. The volume of the container is suddenly increased. a) What is the initial effect of the change on vapour pressure? b) How do rates of evaporation and condensation change initially?	2

Q.28	Calculate the mass of
	        (a) 1 molecule of N_2
	        (b) 1 molecule of H_2O
	        (c) 100 molecules of sucrose
	OR
	In three moles of ethane (C_2H_6) calculate the following:
	(a) Number of moles of carbon
	(b) Number of moles of hydrogen atom
	(c) Number of moles of ethane
		3

Q.29	Calculate the wave length of an electron whose KE is $3x\ 10^{-25}$ J OR Calculate the mass of a photon with wavelength 3.313 Å	
Q.30	Describe the effect of the following (i) Addition OfH$_2$ (ii) Addition of CH_3OH (iii) Removal of CO in the following equilibrium reaction: $2H_2$ (g) +CO (g)CH$_3$OH (l) $\longleftrightarrow$	3
Q.31	Describe the shape of PCl_5 molecule. Why are the axial bonds longer as compared to equatorial bonds?	3
Q.32	20 mol of Chlorine gas occupies a volume of 800 mL at 300 K and 5×10^6 Pa pressure. Calculate the compressibility factor of the gas. Comment on the compressibility of the gas under these conditions	3
Q.33	Consider the following speciesN^{-3}, O^{-2}, F^-, Na^+, Mg^{+2} and Al^{+3} (a). what is common in them? (b). arrange them in the order of increasing ionic radii. (c)Write the name and symbol of an element with atomic no 213	3
Q.34	a)State First law of thermodynamics. Give its mathematical expression. .b)For an isolated system, $\Delta U = 0$, what will be ΔS ? c) Express the change in internal energy of a system when w amount of work is done by the system and q amount of heat is supplied to the system. What type of system would it be?	3
Q.35	State the following (i) Hund's Rule of Maximum Multiplicity (ii) Pauli 's Exclusion Principle. (BI) The Energy associated with Hydrogen atom for first orbit is – $2.18X10^{-18}$ J/atom. Calculate its value for Fifth Orbit. Find radius for Fifth Orbit also. OR (i)State Hiesenberg's uncertainty principal. (ii) If the position of the electron is measured within an accuracy of + 0.002 nm, calculate the uncertainty in the momentum of the electron. Suppose the momentum of the electron is h/4πm × 0.05 nm, is there any problem in defining this value.	5
Q.36	(i) Out of NH$_3$ and NF$_3$ which one has higher dipole moment and why. ii) Write the total number of sigma and pi bond in the following molecule a) C_2H_2 b) $C_2 H_4$	5
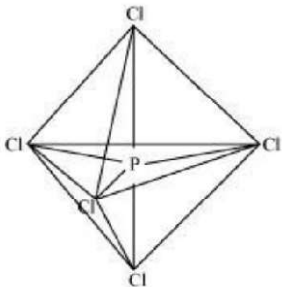
SUBJECT	CHEMISTRY	CLASS	X

iii) Though Cl has nearly same electronegativity as N, yet there is no H-bonding in HCl .Why?
iv) Describe the change in hybridization of the Al atom in the following reaction

$$AlCl_3 \quad + \quad Cl^- \quad \text{-----------} AlCl_4^-$$

OR

i)Distinguish between sigma and pi bond.
  ii)What is meant by hybridization of atomic orbital.Describe the shape of sp and sp^2 hybrid orbital.

Q.37	Calculate the standard enthalpy of formation of one mole of $C_6H_{12}O_6$ (s), if the combustion of one	5
	mole of glucose takes place at 298 K and 1 atm and after combustion CO_2 (g) and H_2O (l) are	
	produced and 2816 kJ of heat is liberated. Assume that the standard enthalpies of formation of CO_2	
	(g) and H_2O (l) are - 393 kJ/mol and -286 kJ mol respectively.	
	OR	
	Express the change in internal energy of a system when:-	
	(a) No heat is absorbed by the system from the surroundings, but work (w) is done on the system. What type of wall does the system have?	
	(b) No work is done on the system, but 'q' amount of heat is taken out from the system and given to the surroundings. What type of wall does the system have?	
	(c) 'w' amount of work is done by the system and 'q' amount of heat is supplied to the system. What type of system would it be?	

				I
Q.1	(B)			1
Q.2	(C)			1
Q.3	(D)			1
Q.4	(C)			1
Q.5	(C)			1
Q.6	(C)			1
Q.7	(C)			1
Q.8	(C)			1
Q.9	(A)			1
Q.10	(C)			1
Q.11	(A)			1
Q.12	(C)			1
Q.13	(B)			1
Q.14	(B)			1
Q.15	(B)			1
Q.16	(C)			1
Q.17	(B)			1
Q.18	(C)			1
Q.19	(C)			1
Q.20	(A)			1
Q.21	Mass percent of nitric acid in the sample = 69 % [Given] Thus, 100 g of nitric acid contains 69 g of nitric acid by mass. Molar mass of nitric acid (HNO_3) = {1 + 14 + 3(16)} g mol^{-1} = 1 + 14 + 48 = 63 g mol^{-1} ∴ Number of moles in 69 g of HNO_3 $= \dfrac{69\,g}{63\,g\,mol^{-1}}$ $= 1.095\,mol$ Volume of 100g of nitric acid solution $= \dfrac{Mass\ of\ solution}{density\ of\ solution}$ $= \dfrac{100\,g}{1.41\,g\,mL^{-1}}$ $= 70.92\,mL \equiv 70.92 \times 10^{-3}\,L$ Concentration of nitric acid Concentration of nitric acid = 15.44 mol/L			2
Q.22	(i) 28.7 pm: 1 pm = 10^{-12} m 28.7 pm = 28.7×10^{-12} m = 2.87×10^{-11} m (ii) 15.15 pm: 1 pm = 10^{-12} m 15.15 pm = 15.15×10^{-12} m = 1.515×10^{-12} m			2

Q.23	A cation has a fewer number of electrons than its parent atom, while its nuclear charge remains the same. As a result, the attraction of electrons to the nucleus is more in a cation than in its parent atom. Therefore, a cation is smaller in size than its parent atom. On the other hand, an anion has one or more electrons than its parent atom, resulting in an increased repulsion among the electrons and a decrease in the effective nuclear charge. As a result, the distance between the valence electrons and the nucleus is more in anions than in it's the parent atom. Hence, an anion is larger in radius than its parent atom.	2
Q.24	(i) O (ii) F Correct explanation	1+1
Q.25	Physical significance of 'a': 'a' is a measure of the magnitude of intermolecular attractive forces within a gas. Physical significance of 'b': 'b' is a measure of the volume of a gas molecule.	1+1
Q.26	Substituting the values in the expression of ΔH: $\Delta H = (-742.7 \text{ kJ mol}^{-1}) + (-0.5 \text{ mol}) (298 \text{ K}) (8.314 \times 10^{-3} \text{ kJ mol}^{-1} \text{ K}^{-1})$ $= -742.7 - 1.2$ $\Delta H = -743.9 \text{ kJ mol}^{-1}$	2
Q.27	(a) If the volume of the container is suddenly increased, then the vapour pressure would decrease initially. This is because the amount of vapour remains the same, but the volume increases suddenly. As a result, the same amount of vapour is distributed in a larger volume. (b) Since the temperature is constant, the rate of evaporation also remains constant. When the volume of the container is increased, the density of the vapour phase decreases. As a result, the rate of collisions of the vapour particles also decreases. Hence, the rate of condensation decreases initially.	2
Q.28	(a) 6.022×10^{23} molecules of N_2 = 28 g 1 molecule of N_2 = $28/6.022 \times 10^{23}$ = 4.65×10^{-23} g (b) 6.022×10^{23} molecules of H_2O = 18g 1 molecule of N_2 = $18/6.022 \times 10^{23}$ = 2.99×10^{-23} g (c) 6.022×10^{23} molecules of sucrose = 342g 100 molecule of sucrose = $342/6.022 \times 10^{23} \times 100$ = 5.68×10^{-20} g **OR** (a) 1 mole of C_2H_6 contain = 2 moles of carbon 3 moles of C_2H_6 contain = 6 moles of carbon b) 1 mole of C_2H_6 contain = 6 moles of hydrogen atom 3 moles of C_2H_6 contain = 18 moles of hydrogen atom c) 1 moles of C_2H_6 contain = 6.022×10^{23} molecules	3
Q.29	$\Delta E = 2.18 \times 10^{-18} (1/n_1^2 - 1/n_2^2)$ $= 2.18 \times 10^{-18} (1/5^2 - 1/2^2)$ $= -4.58 \times 10^{-19}$ J Frequency $= \Delta E/h$ $= 4.58 \times 10^{-19}$ J$/6.626 \times 10^{-34}$ Hz $= 6.91 \times 10^{14}$ Hz Wave length $= C/V0$ $= 3 \times 10^8/6.91 \times 10^{14}$ $= 434$ nm	3

	OR	
	(a) Pairing of electrons in an orbital takes place only when all orbitals of same sub-shell become singly occupied. It helps to equalize energy of a sub-shell.	
	(b) No two electrons will have same set of all q.no. If n,l,m are same i.e. same orbital 's' will be differ. It shows that all electrons have a definite place in an atom or their own identity.	
	(c) Electrons are filled in orbitals of an atom according to increasing energies which is in accordance to (n+l) values of electrons. If (n+l)values are same the electron goes to orbital having lower value of n.	
Q.30	(i) equilibrium will shift in forward direction (ii) Equilibrium will shift in backward direction. (iii) Equilibrium will shift in backward direction.	3
Q.31	The ground state and excited state outer electronic configurations of phosphorus (Z = 15) are:Excited state: Ne $3s^1 3p_x^1 3p_y^1 3p_z^1 3d^1$ Phosphorus atom is sp3d hybridized in the excited state. These orbitals are filled by the electron pairs donated by five Cl atoms. The five sp^3d hybrid orbitals are directed towards the five corners of the trigonal bi-pyramidals. Hence, the geometry of PCl_5 can be represented as: There are five P–Cl sigma bonds in PCl_5. Three P–Cl bonds lie in one plane and make an angle of 120° with each other. These bonds are called equatorial bonds. The remaining two P–Cl bonds lie above and below the equatorial plane and make an angle of 90° with the plane. These bonds are called axial bonds. As the axial bond pairs suffer more repulsion	3
Q.32	$P = 5 \times 10^6$ Pa $= 5 \times 10^6 / 10^5$ bar n = 20 T = 300 K R = 0.083 L bar K^{-1} mol^{-1} V_{real} = 800 mL V_{ideal} = nRT/P Putting values , we have V_{ideal} = 1004 mL $Z = V_{real}/ V_{ideal}$= 800/1004 = 0.796	1 1 1
Q.33	a). They have same number of electrons. (b) $Al^{3+}<Mg^{2+}<Na^+<F^-<O^{2-}<N^3$ $^{C)}$Biuntriium But	3
Q.34	a)Energy can neither be created nor destroyed but can be transformed from one form to another. Mathematically$\Delta U = q + w$	1 1

	b)ΔS will be positive i.e., greater than zero.		1
	C) $\Delta U = q - w$, closed system.		1
Q.35	(i)		
	$$E_5 = \frac{-(2.18 \times 10^{-18})}{(5)^2} = \frac{-2.18 \times 10^{-18}}{25}$$ $E_5 = -8.72 \times 10^{-20}$ J		
	(ii) Radius of Bohr's n^{th} orbit for hydrogen atom is given by, $r_n = (0.0529 \text{ nm}) n^2$ For, $n = 5$ $r_5 = (0.0529 \text{ nm}) (5)^2$ $r_5 = 1.3225$ nm		
	OR		OR
	(i)Corrct statement.		
	(ii) $$\Delta x \times \Delta p = \frac{h}{4\pi} \Rightarrow \Delta p = \frac{1}{\Delta x} \cdot \frac{h}{4\pi}$$ Where, Δx = uncertainty in position of the electron Δp = uncertainty in momentum of the electron Substituting the values in the expression of Δp: $$\Delta p = \frac{1}{0.002 \text{ nm}} \times \frac{6.626 \times 10^{-34} \text{ Js}}{4 \times (3.14)}$$ $$= \frac{1}{2 \times 10^{-12} \text{ m}} \times \frac{6.626 \times 10^{-34} \text{ Js}}{4 \times 3.14}$$ $= 2.637 \times 10^{-23}$ Jsm^{-1} $\Delta p = 2.637 \times 10^{-23}$ kgms^{-1} (1 J = 1 kgms^{2}s^{-1}) $\therefore$ Uncertainty in the momentum of the electron = 2.637×10^{-23} kgms^{-1}. Actual momentum $= \dfrac{h}{4\pi_m \times 0.05 \text{ nm}}$ $$= \frac{6.626 \times 10^{-34} \text{ Js}}{4 \times 3.14 \times 5.0 \times 10^{-11} \text{ m}}$$ $= 1.055 \times 10^{-24}$ kgms^{-1} Since the magnitude of the actual momentum is smaller than the uncertainty, the value cannot be defined.		
Q.36	(i) NH_3 and correct explanation (ii) a)Sigma = 3 , pi = 2. b) Sigma = 5 , pi = 1. (iii) Correct reason (iv) Correct reason		1x5
	OR		OR
	(i) Correct three differences (ii) Correct definition and diagrams		3 2
Q.37	$(C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$ $\Delta H = \Sigma$enthalpies of the products$- \Sigma$enthalpies of react		3+2

$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$

$\Delta H = \Sigma$enthalpies of the products– Σenthalpies of reactants.

$-2816 = \{6X\ (-393) + 6(-286)\} - \{\Delta H_f(C_6H_{12}O_6) + 6(0)\}$

$\Delta H_f(C_6H_{12}O_6) = -1258\ kJmol^{-1}$

OR

(i) $\Delta U = w$, wall is adiabatic

(ii) $\Delta U = -q$, thermally conducting walls

(iii) $\Delta U = -w + q$

OR

3+2

PAPER NO 06

BLUE PRINT

CLASS XI
HALF YEARLY

S.NO	Unit	VSA	SA-I	LA-1	LA-2	TOTAL
		(I mark)	(2 mark)	(3 mark)	(5 mark)	
1	Basic concepts in chemistry	1(2)	2(2)	3(1)		9
2	Atomic structure	1(2)		3(1)	5(1)	10
3	Classification of elements and periodicity in properties	1(3)	2(2)	3(1)		10
4	Chemical Bonding	1(4)		3(1)	5(1)	12
5	States of matter	1(3)	2(1)	3(2)		11
6	Thermodynamics	1(3)	2(1)		5(1)	10
7	Chemical Eqiullibrium	1(3)	2(1)	3(1)		8
	TOTAL	20(20)	14(7)	21(7)	15(3)	70(37)

	QUESTION PAPER				
SUBJECT	CHEMISTRY			CLASS	XI
TIME	3HRS			MAX.MARK	70

INSTRUCTIONS:

1. All questions are compulsory.
2. Q. No. 1 –20 are objective type carrying 1 marks each.
3. Q. No. 21- 27 are short answers questions, carrying 2 marks each.
4. Q. No.28- 34 are long answer questions, carrying 3 marks.
5. Q. No.35- 37are very long answers questions of 5 mark each.

Q.1	What is the number of significant figures in 0.000350
	     (A) 3 (B) 6
	     (C) 2 (D) 4
		1

Q.2	Number of atoms present in 1 mole of NH3.
	     (A) 4 NA atoms (B) NA atoms
	     (C) 4 atoms (D) NA/4 atoms
		1

Q.3	What happens when an electron jumps from 1s orbital to 2s orbital of an atom? (A) Energy is released (B) atomic size increasis (C) Energy is absorbed (D) atomic size decreasis	1

Q.4	Which of the following sets of quantum numbers are not possible.
	    (A) n=0, l=0; ml = 0, ms= + ½ (B)n=1, l=0; ml = 0, ms= - ½
	    (C) n=1, l=1; ml =- 0, ms= + ½ (D) n=2, l=1; ml = 0, ms= + ½
		1

Q.5	Increasing order of electronegativities of F, Cl, Br and I is
	     (A) F < Cl < Br < I (B) I < Br < Cl < F
	     (C) Br < I > Cl > F (D) I < Br > Cl < F
		1

Q.6	Which of the following is the most polar bond
	     (A) N–H (B) Cl–H
	     (C) O–H (D) Br–H
		1

Q.7	Electron affinity is highest in (A) F (B) Cl (C) Br (D) I	1
Q.8	The bonds present in N_2O_5 are (a) only ionic (b) covalent and coordinate (c) only covalent (d) covalent and ionic	1
Q.9	Hydrogen bonding is exhibited by (a) all substances containing H atoms (b) molecules in which hydrogen is bonded to F, O or N (c) molecules in which one hydrogen is bonded to F and the other is bonded to Cl (d) all substances containing H and O atoms	1
Q.10	Orthonitrophenol is steam volatile but paranitrophenol is not because (a) orthonitrophenol has intramolecular hydrogen bonding while paranitrophenol has intermolecular hydrogen bonding (b) both ortho- and paranitrophenol have intramolecular hydrogen bonding (c) orthonitrophenol has intermolecular hydrogen bonding and paranitrophenol has intramolecular hydrogen bonding (d) Van der Waals forces are dominant in orthonitrophenol	1
Q.11	The oxygen molecule is paramagnetic because	1

	(a) the number of bonding electrons equals that of the antibonding electrons in the molecular orbitals (b) it contains unpaired electrons in the antibonding molecular orbitals (c) it contains unpaired electrons in the bonding molecular orbitals (d) None of the above	
Q.12	Water drop appears to be spherical in shape due to a)Atmospheric pressure b)Viscosity c)Surface Tension d)Gibbs free energy	1
Q.13	Intermolecular forcepresent between He and He atom a)Intermolecular Hydrogen bond b) Metallic bond c)Vander Waal forces d) Dipole –Dipole interaction.	1
Q.14	The value of compressive factor "Z" for the ideal gas is a) > 1 b) <1 c) Zero d) 1	1
Q.15	_____ property of a system is independent of the amount of material concerned. a) Intensiveb) Extensive c) Physical d) chemical	1
Q.16	A system, which neither exchanges energy nor matter with the surroundings is _____ system. a) open b) closed c) isolated d) all of the above	1
Q.17	The quantity of heat evolved or absorbed during a chemical reaction is called _____. a) Heat or Reaction b) Heat of Formation c) Heat of Combination d) none of the above	1
Q.18	The equilibrium in which reactants are products are in single phase is called _____. a) Homogenous Equilibrium (b) Heterogenous Equilibrium c) Dynamic Equilibrium (d) None of these	1
Q.19	Solubility product constant is denoted by _____. a) Kc (b) KP c)Ksp (d) Ks	1
Q.20	A catalyst _____ the energy of activation. a) increases (b) decreases c) has no effect on (d) None of these	1
Q.21	Define : (i) Molality (ii) Empirical formula	2
Q.22	3.0 g of H2 react with 29.0 g of O2 to form H2O. (i) Which is the limiting reagent? (ii) Calculate the maximum amount of H2O that can be formed?	2

Q.23	What do you understand by isoelectronic species? Name a species that will be isoelectronic with each of the following: (i) O2- (ii) K+	2
Q.24	Account for the following: (i) Electron gain enthalpy of fluorine is less than that of chlorine. (ii) Lithium shows anomalous behaviour as compared to other group members.	2
Q.25	(i) State Dalton's law of partial pressures. (ii) Calculate the density of methane at 2.0 atm pressure at $27^0 C$. $(R = 0.0821\ Latmmol^{-1}K^{-1})$.	2
Q.26	Explain why the entropy of a pure crystalline solid is zero at 0 Kelvin ? State the law on which it is based . OR For the reaction 2 A (g) + B (g) → 2D (g), $\Delta U0 = -10.5$ kJ and $\Delta S0 = -44.1$ J/K. Calculate ΔG^0 for the reaction, and predict whether the reaction may occur spontaneously.	2

Q.27	a) For the reaction: 2A(g) + 2B$_2$(g) ⇌ 2AB$_2$(g), the equilibrium
	constant Kp at 270C is 4.0atm. What is the value of Kc for
	  a) (i) 2AB$_2$ (g) ⇌ 2A (g) + 2B$_2$ (g)
	    (ii) A (g) + B$_2$(g) ⇌ AB$_2$(g) (Given R=0.0821LatmK^{-1}mol^{-1})
	                   OR
	(i) State Le-Chatelier's principle.
	(ii) If Qc > Kc for a reaction, predict the direction in which the reaction will proceed?
		2

Q.28	(a) Write van der Waals equation for n moles of a gas. (b) Under what conditions a real gas would behave ideally? (c) Why does sharp glass edge become smooth on heating it upto its melting point in a flame?	3
Q.29	a) Differentiate between an orbit and an orbital. b) The 4f subshell of an atom contains 10 electrons. What is the maximum number of electrons having same spin in it? c) What is the number of orbitals for n=3? OR a) Write the electronic configuration of Cr^{+3}ion. b) What is Pauli's exclusion principle? Why is it called exclusion principle? c) Explain why exactly half-filled and completely filled orbitals are extra stable?	
Q.30	Account for the following: (i) Electron gain enthalpy of fluorine is less than that of chlorine.	3

	(ii) First ionization enthalpy of boron is less than that of beryllium.	
	(iii) Lithium shows anomalous behaviour as compared to other group members.	
Q.31	(i) Write the general outer electronic configuration of f-block elements. (ii) Among the elements of the third period- Na, Mg, Al, Si, P, S, Cl, Ar; Pick out the element: a) With the highest ionization enthalpy b) With the largest atomic radius c) That is the most reactive non-metal d) That is the most reactive metal.	3
Q.32	a) What is solubility product of a salt? Find out the relationship between the solubility and solubility product of CaF2. b) Predict if the solutions of the following salts are neutral, acidic or basic: NaCl, KBr, NaCN, NH4NO3, NaNO2 and KF OR i) Describe the effect of the following on the equilibrium of the reaction: $2H_2 (g) + CO (g) \longleftarrow CH_3OH (g)$ a) addition of H2 b) addition of CH3OH c) removal of CO d) removal of CH3OH ii) What is meant by the conjugate acid-base pair? Find the conjugate acid/base for the following species: HNO2, CN–, HClO4 and S2–	3
Q.33	a)What is limiting reagent b) Calculate the mass of an atom of carbon(C-12) in grams. Express the result up to three significant figures.	3
Q.34	For the reaction at 298 K, 2A + B → C ΔH = 400 kJ mol–1 and ΔS = 0.2 kJ K–1 mol–1 At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range.	3

Q.35	(a) The combustion of one mole of benzene takes place at 298 Kand 1 atm after
	
	       combustion CO2 (g) and H2O(l) are produced and 3267.0 KJ of heat is librated,
	
	   Calculate the standard enthalpy of formation of benzene. Standard enthalpies of
	
	 formation of CO2(g) and H2O (l) are -393.5 KJmol-1 and -285.83 KJmol-1 respectively.
	
	       (b) Derive $\Delta H + \Delta U = \Delta n_g RT$
	
	OR
		5

	Derive relation between Cp and Cv ?	
	Write short note on the following	
	State Functions	
	Internal Energy	
	First Law of Thermodynamics	
Q.36	a) Define the term Formal charge and calculate the formal charge on each oxygen atom in O3 molecule. (b) Explain the geometry of SF4 molecule on the basis of VSEPR theory. OR a) Write the electronic configuration for molecular orbitals of nitrogen molecule and calculate the bond order of the molecule. b) Compare the bond order, bond length and magnetic behavior of O2, O2-, O2+ and O22- .	5
Q.37	State the following (i) Aufbau Principle (ii) Pauli exclusion principle (iii) Hund's rule of maximum multiplicity. (b)Show that the circumference of the Bohr orbit for hydrogen atom is an integral multiple of the Debroglie wave length associated with it . OR What are quantum numbers? How many electrons in an atom have the following quantum numbers (i) n = 4, ms = -1/2 (ii) n =3, l =0 (2) (b)A golf ball has a mass of 40 g and a speed of 45m/s . If the speed can be measured with with accuracy of 2%. Calculate the uncertainity in the position?	5

MARKING SCHEME			
SUBJECT	CHEMISTRY	CLASS	XI
Q.1	(A)		1
Q.2	(D)		1
Q.3	(C)		1
Q.4	(C)		1
Q.5	(B)		1
Q.6	(C)		1
Q.7	(B)		1
Q.8	(B)		1
Q.9	(B)		1
Q.10	(A)		1
Q.11	(B)		1
Q.12	(C)		1
Q.13	(C)		1
Q.14	(A)		1
Q.15	(A)		1
Q.16	(C)		1
Q.17	(A)		1
Q.18	(A)		1
Q.19	(C)		1
Q.20	(C)		1
Q.21	(i) no. of moles of solute present per kg of solvent (ii) which gives the simplest whole no. ratio present between the different atoms in a compound		2
Q.22	(i) 3 g of H_2 require O_2 = (32 /4) x 3 = 24 g Hydrogen is the limiting reagent. (ii) Water formed = 27 g		2
Q.23	Species having same no. of electrons. (i) Ne (ii) Ar		2
Q.24	(a) Due to smaller size of F electron –electron repulsions are very strong (b)small size,absence of vacant d-orbitals		1+1

Q.25	(i) Statement
	 (ii) d = pM/ RT
	      = 2 x16/0.0821 x 300
	      = 1.3 g L^{-1}
			1
			 1
			 ½
			 ½

Q.26	a) At 0 K, there is a perfectly ordered arrangement of the constituent particles of a pure crystaliine solid, so entropy is taken zero.It is based on third law of thermodynamics. OR Δn_g = 2-3 = -1 ΔH^0 = ΔU^0 + $\Delta n_g RT$ = -12.98 KJ ΔG^0 = ΔH^0 -TΔS^0 = 0.16 KJ .As the value of ΔG^0 is positive the reaction may not occure spontaneously		2

Q.27	a (i) Kc= Kp/(RT)$^{\Delta ng}$=4.0atm/(0.0821LatmK^{-1}mol^{-1}x300K)^2= 6.5x10^{-3}atm^{-1}mol^{2}L^{-2}
	     (iii) Kc= Kp/(RT)$^{\Delta ng}$ =4.0atm/(0.0821LatmK^{-1}mol^{-1}x300K) = 1.6x10^{-1}mol L^{-1}
	                OR
	     (i) Statement
			2

	(ii) Backward	
Q.28	a) Correct equation.	1
	(b) Low pressure and high temperature	1
	(c) To have minimum surface area, hence minimum sur	1

Q.29	a) An orbit is a well defined circular path around the nucleus in which the electron revolves whereas an orbital is a three-dimensional region around the nucleus where there is maximum probability of finding the electron.
	 b) 7 electrons
	 c) 9 orbitals (1 in 3s, 3 in 3p and 5 in 3d)
	 OR
	    a) $4s^0,3d^4$
	    b) Correct statement
	    c) Correct reason
		3

Q.30	a) Due to smaller size of F electron –electron repulsions are very strong (b)) in Be electron is to be removed from fully filled 2s orbital (c) small size, absence of vacant d-orbitals	3
Q.31	i) $ns^{0-2}(n-1)d^{1-10}$ (ii) (a) Argon (b) Sodium (c) Chlorine (d) Sodium	3
Q.32	a) Solubility product of a salt is defined as the product of the molar concentrations of its ions in a saturated solution, each concentration raised to the power equal to the number of ions produced on dissociation of one mole of the electrolyte. $Ksp = [Ca^{+2}][F^-]^2 = s \times (2s)^2 = 4s^3$ b) NaCN, $NaNO_2$, KF solutions are basic NaCl, KBr solutions are neutral NH_4NO_3 solutions is acidic. OR i) a) Equilibrium will shift in the forward direction b) Equilibrium will shift in the backward direction c) Equilibrium will shift in the backward direction d) Equilibrium will shift in the forward direction ii) An acid-base pair which differ by a proton. NO_2^-, HCN, ClO_4^- and H_2S	1 1 1
Q.33	The reactant which gets consumed first or limits the amount of product formed is as limiting reagent b)mass of C =$12/N_A = 1.99*10^{-23}$	3

Q.34	From the expression,
	 $\Delta G = \Delta H - T\Delta S$
	 Assuming the reaction at equilibrium, ΔT for the reaction would be:
	 ($\Delta G = 0$ at equilibrium)
	 $T = \Delta H/\Delta S$
	    = 400kJ mol^{-1}/0.2 $kJK^{-1}mol^{-1}$
	    = 2000 K
	 For the reaction to be spontaneous, ΔG must be negative. Hence, for the given reaction to be spontaneous, T should be greater than 2000 K
		1
		 1
		 1

Q.35	(a) Correct equation
	      Calculation
	      48.51 KJ mol^{-1}
		1
		 1
		 1

	(b) Correct steps of derivation	1
	OR	1
	(a) Correct derivation	OR
	(b) I) State Functions : The variables of functions whose value depend only on the state of a system or they are path independent. For example : pressure (P), volume (V), temperature (T), enthalpy (H), free energy (G), internal energy (U), entropy (S), amount (n) etc.	1
		1
	II) Internal Energy : It is the sum of all kind of energies possessed by the system.	1
		1
	III) First Law of Thermodynamics : "The energy of an isolated system is constant."	1
Q.36	(c) Definition of formal charge	
	(d) Correct calculation of formal charge	1x5
	(e) Correct explanation	
	OR	3
	(c) Correct electronic configuration	
	(d) Correct calculation of bond order	
	(e) Correct comparison of each property	2
Q.37	(i) Correct Statement	3+2
	(ii) Correct statement	
	(iii) Correct statement	
	(b)According to Bohr postulate of angular momentum mvr = nh/2π	
	Or	
	2 π r =nh / mv eq .(i)	
	According to De broglie equation λ = h/mv	
	Substituting this value in equation no (i)	OR
	2 π r = n λ	
	OR	3+2
	Quantum Numbers Definition	
	No of electrons when n = 4 , (16) and when n = 3 , (2)	
	(b)	
	The uncertitity in speed=2% = 45x2/100=0.9 m/s	
	Uncertitity in position =h/4πmxv	
	=6.626x10-34/4x3.14x40x10-3x0.9	
	= 1.46x 10^{-33}m	

PAPER NO 07

QUESTION PAPER HALF YEARLY

CLASS XI

SUBJECT CHEMISTRY

General Instructions:

1. All questions are compulsory.

2. Use log tables if necessary, use of calculators is not allowed.

Q. 1	What will be the molarity of a solution, which contains 5.85 g of NaCl(s) per 500 mL? (i) 4 mol L^{-1} (ii) 20 mol L^{-1} (iii) 0.2 mol L^{-1} (iv) 2 mol L^{-1}	1 MARK
Q. 2	If 500 mL of a 5M solution is diluted to 1500 mL, what will be the molarity of the solution obtained? (i) 1.5 M (ii) 1.66 M (iii) 0.017 M (iv) 1.59 M	1 MARK
Q. 3	The number of atoms present in one mole of an element is equal to Avogadro number. Which of the following element contains the greatest number of atoms? (i) 4g He (ii) 46g Na (iii) 0.40g Ca (iv) 12g He	1 MARK
Q. 4	The empirical formula and molecular mass of a compound are CH_2O and 180 g respectively. What will be the molecular formula of the compound? (i) $C_9H_{18}O_9$ (ii) CH_2O (iii) $C_6H_{12}O_6$ (iv) $C_2H_4O_2$	1 MARK
Q. 5	Total number of orbitals associated with third shell will be _____. (i) 2 (ii) 4 (iii) 9 (iv) 3	1 MARK
Q. 6	The pair of ions having same electronic configuration is _____. (i) Cr^{3+}, Fe^{3+} (ii) Fe^{3+}, Mn^{2+} (iii) Fe^{3+}, Co^{3+} (iv) Sc^{3+}, Cr^{3+}	1 MARK
Q. 7	Consider the isoelectronic species, Na^+, Mg^{2+}, F^- and O^{2-}. The correct order of increasing length of their radii is _____. (i) $F^- < O^{2-} < Mg^{2+} < Na^+$ (ii) $Mg^{2+} < Na^+ < F^- < O^{2-}$ (iii) $O^{2-} < F^- < Na^+ < Mg^{2+}$ (iv) $O^{2-} < F^- < Mg^{2+} < Na^+$	1 MARK
Q. 8	The order of screening effect of electrons of s, p, d and f orbitals of a given shell of an atom on its outer shell electrons is: (i) s > p > d > f (ii) f > d > p > s (iii) p < d < s > f (iv) f > p > s > d	1 MARK
Q. 9	The first ionisation enthalpies of Na, Mg, Al and Si are in the order: (i) Na < Mg > Al < Si (ii) Na > Mg > Al > Si (iii) Na < Mg < Al < Si (iv) Na > Mg > Al < Si	1 MARK
Q. 10	Polarity in a molecule and hence the dipole moment depends primarily on electro negativity of the constituent atoms and shape of a molecule. Which of the following has the highest dipole moment? (i) CO_2 (ii) HI (iii) H_2O (iv) SO_2	1 MARK
Q. 11	The types of hybrid orbitals of nitrogen in NO^{2+}, NO^{3-} and NH_4^+ respectively are expected to be	1 MARK

	(i) sp, sp^3 and sp^2 (ii) sp, sp^2 and sp^3 (iii) sp^2, sp and sp^3 (iv) sp^2, sp^3 and sp	
Q. 12	In which of the following substances will hydrogen bond be strongest? (i) HCl (ii) H$_2$O (iii) HI (iv) H$_2$S	1 MARK
Q. 13	Which of the following property of water can be used to explain the spherical shape of rain droplets? (i) viscosity (ii) surface tension (iii) critical phenomena (iv) pressure	1 MARK
Q. 14	As the temperature increases, average kinetic energy of molecules increases. What would be the effect of increase of temperature on pressure provided the volume is constant? (i) increases (ii) decreases (iii) remains same (iv) becomes half	1 MARK
Q. 15	Thermodynamics is not concerned about_____. (i) energy changes involved in a chemical reaction. (ii) the extent to which a chemical reaction proceeds. (iii) the rate at which a reaction proceeds. (iv) the feasibility of a chemical reaction.	1 MARK
Q. 16	Which of the following is not correct? (i) ΔG is zero for a reversible reaction (ii) ΔG is positive for a spontaneous reaction (iii) ΔG is negative for a spontaneous reaction (iv) ΔG is positive for a non-spontaneous reaction	1 MARK
Q. 17	Acidity of BF$_3$ can be explained on the basis of which of the following concepts? (i) Arrhenius concept (ii) Bronsted Lowry concept (iii) Lewis concept (iv) Bronsted Lowry as well as Lewis concept.	1 MARK
Q. 18	Which of the following will produce a buffer solution when mixed in equal volumes? (i) 0.1 mol dm–3 NH$_4$OH and 0.1 mol dm–3 HCl (ii) 0.05 mol dm–3 NH$_4$OH and 0.1 mol dm–3 HCl (iii) 0.1 mol dm–3 NH$_4$OH and 0.05 mol dm–3 HCl (iv) 0.1 mol dm–3 CH$_4$COONa and 0.1 mol dm–3 NaOH	1 MARK
Q. 19	What will be the correct order of vapour pressure of water, acetone and ether at 30°C. Given that among these compounds, water has maximum boiling point and ether has minimum boiling point? (i) Water < ether < acetone (ii) Water < acetone < ether (iii) Ether < acetone < water (iv) Acetone < ether < water	1 MARK
Q. 20	The state of a gas can be described by quoting the relationship between____. (i) pressure, volume, temperature (ii) temperature, amount, pressure (iii) amount, volume, temperature (iv) pressure, volume, temperature, amount	1 MARK
Q. 21	A compound contains 4.07% hydrogen, 24.27% carbon and 71.66% chlorine. Its molar mass is 98.96 g. What are its empirical formula and molecular formula?	2 MARKS
Q. 22	(a) Why does boron triflouride behave as a Lewis acid? (b) Why NaCl in solid state is non conductor of electricity?	2 MARKS

Q. 23	For the reaction at 298 K:
	    2A (g) +B (g) →2D (g)
	    ΔH°= -10.5kJ/mol and ΔS°= - 44.1 JK^{-1} mol^{-1} Calculate ΔG° for the reaction and
	    predict whether the reaction may or may not occur spontaneously.
	OR
	
	The reaction of cyanamide, NH$_2$CN(s), with dioxygen was carried out in a bomb calorimeter and ΔU was found to be -742.7 kJ mol^{-1} at 298K.
		2 MARKS

	Calculate enthalpy change for the reaction at 298 K. $$NH_2CN\ (s) + 3/2\ O_2(g) \rightarrow N_2(g) + CO_2(g) + H_2O(l)$$	
Q. 24	Account for these: (a) Size of cation is always smaller than the parent atom. (b) Nitrogen has higher ionisation enthalpy than Oxygen. (c) Electron gain enthalpy of Chlorine is more negative than Fluorine.	2 MARKS
Q. 25	The combustion of one mole of benzene takes place at 298K and 1atm. After combustion, CO_2 (g) and H_2O (l) are produced and 3267.0 kJ of heat is liberated. Calculate the standard enthalpy of formation, $\Delta_f H^o$ of benzene. Standard enthalpies of formation of CO_2 (g) and H_2O (l) are -393.5 kJmol^{-1} and -285.83 kJmol^{-1} respectively.	2 MARKS
Q. 26	Discuss position of hydrogen in modern periodic table of elements.	2 MARKS
Q. 27	How does bonding molecular orbital in a molecule of hydrogen differ from its antibonding molecular orbital? **OR** Define hydrogen bond with an example	2 MARKS
Q. 28	(i) Calculate the total pressure in a mixture of 8 gm of dioxygen and 4 gm of hydrogen confined in a vessel of 1dm^3 at 27 ^{o}C (R=0.083 bar dm^3 K^{-1} mol^{-1}) (ii) Critical temperature for carbon dioxide and methane are 31.1^{o}C and -81.9 ^{o}C respectively. Which of these has stronger intermolecular forces and why? **OR** Write postulates of kinetic molecular theory of gas.	3 MARKS
Q. 29	In Sulphur estimation 0.157 g of an organic compound gave 0.4813g of $BaSO_4$. What is the percentage of sulphur in the organic compound?	3 MARKS
Q. 30	Draw Lewis structures for the following molecules and identify the atoms which do not obey octet rule: H_2S, SF_2, BF_3, SO_2, PCl_3, and PCl_5. **OR** Explain O_2 Molecule on the basis of Molecular Orbital Theory.	3 MARKS
Q. 31	Derive Ideal gas equation.	3 MARKS
Q. 32	(a) What is critical volume? (b) What is viscosity? Explain co-efficient of viscosity.	3 MARKS
Q. 33	(a) Why CO_2 has no net dipole moment? (b) Carbon forms covalent compounds whereas lead forms ionic	3 MARKS

	compounds. Why? (c) Why BCl_3 and CCl_4 behave differently towards water?	
Q. 34	(a) For the reaction, $2Cl\,(g) \rightarrow Cl_2\,(g)$. What are the signs of ΔH and ΔS for the reaction? (b) What is the value of ΔG at equilibrium? (c) Why the entropy of perfectly crystalline substance is taken as zero?	3 MARKS

Q. 35	(a) Write the molecular orbital configuration of N_2 molecule. Calculate its bond order and predict its magnetic behavior.
	 (b) What is the state of hybridization of carbon in CO_3^{-2}
	 (c) On the basis of VSEPR theory explain the Geometry of ClF_3 & CH_4
	
	 OR
	
	 (a) Give Correct explanation for each:
	   (i) NH_3 has higher dipole moment than NF_3.
	   (ii) Both the bonds in Ozone have the same Bond length.
	
	   (iii) HF is liquid whereas HCl is gas.
	 (b) Explain the shape of following molecules on the basis of hybridization:
	   (i) NH_3 (ii) SF_6
		5 MARKS

Q. 36	(a) What is the buffer solution? Give an example of an acidic buffer and explain its buffer action. (b) The ionization constant of formic acid is 1.8×10^{-4}. Calculate the ratio of sodium formate and formic acid in a buffer of $_pH4.25$ **OR** (a) State Le chatelier's principle (b) Write conjugate acid and conjugate base of H_2O (c) If solubility product for CaF_2 is 1.7×10^{-10} at 298 K calculate the solubility in mol L^{-1}	5 MARKS
Q. 37	(a) Derive de Broglie equation for microscopic particles. (b) Calculate the wavelength, frequency and wave number of a light wave whose period is 2.0×10^{-10} s. **OR** (a) State Heisenberg's uncertainty principle (b) (i) An atomic orbital has n=3 what are the possible values of l (ii) The mass of an electron is 9.1×10^{-31} Kg. If its K.E. is 3.0×10^{-25} J. Calculate its wavelength	5 MARKS

Q. 1	(iii) 0.2 mol L^{-1}	1
Q. 2	(ii) 1.66 M	1
Q. 3	(iv) 12g He	1
Q. 4	(iii) $C_6H_{12}O_6$	1
Q. 5	(iii) 9	1
Q. 6	(ii) Fe^{3+}, Mn^{2+}	1
Q. 7	(ii) $Mg^{2+} < Na^+ < F^- < O^{2-}$	1
Q. 8	(i) s > p > d > f	1
Q. 9	(i) Na < Mg > Al < Si	1
Q. 10	(iii) H_2O	1
Q. 11	(ii) sp, sp^2 and sp^3	1
Q. 12	(ii) H_2O	1
Q. 13	(ii) surface tension	1
Q. 14	(i) increases	1
Q. 15	(iii) the rate at which a reaction proceeds.	1
Q. 16	(ii) ΔG is positive for a spontaneous	1
Q. 17	(iii) Lewis concept	1
Q. 18	(iii) 0.1 mol dm–3 NH_4OH and 0.05 mol dm–3 HCl	1
Q. 19	(ii) Water < acetone < ether	1
Q. 20	(iv) pressure, volume, temperature, amount	1
Q. 21	Calculation of empirical formula-CH_2Cl Empirical formula mass= 49.5 Calculation of n=2 Molecular formula =n (Empirical formula) =$C_2H_4Cl_2$	1 1
Q. 22	(i) Electron deficient central atom B and thus electron pair acceptor. (ii)Because ions are not free in solid NaCl due to strong ionic bond	1 1
Q. 23	For the reaction ΔG= ΔH-TΔS ΔG=-10.5{-298x(-44.1x10^{-3})} =2641.8J Reaction is non-spontaneous. Or Calculation of Δn$_g$=1+1- 3/2 =1/2 Correct formula substitution of values calculation = -741.4615k J/mol	1 1 1 1
Q. 24	Correct reason	1+1

Q. 25	Ans 48.51 kJmol^{-1}	1
	For each correct step ½ mark	1
Q. 26	Two points of resemblance with Alkali metals and Halogen.	1+1
Q. 27	Antibonding orbital has higher energy.	1+1
	OR	
	Correct definition with example	1+1
Q. 28	(i) Pressure, P=nRT/V P=56.025 bar	1.5
	ii) Correct answer and explanation	1.5
	OR	
	Correct Postulates	1+1+1
Q. 29	Weight of Sulphur in $BaSO_4$= (32/233) X 0.4813	1
	% of Sulphur =weight of Sulphur x100/Mass of sample of Organic compound	1
	Percentage of Sulphur=(32/233) X(0.4813/0.57) X100= 42.17%	1
Q. 30	Correct Lewis dot Structure.	3
	OR	
	Molecular Orbital Configuration, Energy Diagram, Bond Order	1+1+1
Q. 31	At constant T and n V α 1/P (Boyle's Law)	1
	At constant P and n V α T (Charle's Law)	
	At constant T and PV α n (Avogadro's Law)	1
	V α nT /P	
	V = RnT/P	1
	PV=nRT	
Q. 32	(a) The volume occupied by 1 mole of gas at its critical temperature.	1
	(b) It is the force of friction offered by one layer of liquid to another layer when they slip over one another while liquid flows.	1
	It is the force of friction offered by one layer of unit area to another layer which is unit distant from each other. F= -$\eta A\frac{du}{dz}$	1
Q. 33	Correct answer for each	1+1+1
Q. 34	(i) ΔH=-ve Δ S=-ve	1
	(ii) ΔG_r=0 at equilibrium	1
	(iii) Due to orderly arrangement of atoms.	1
Q. 35	(i) a).Correct Electronic configuration	1
	Bond order =3	1
	Diamagnetic	1
	b). sp^2	1
	(ii) ClF_3: T shape CH_4 : Tetrahedral	1
	Correct diagram	

	OR	
	(a) (i) correct reason.	1
	(ii) correct reason	1
	(iii)correct reason	1
	(b)Pyramidal/correct diagram	1
	Octahedral/correct diagram	1
Q. 36	Define example and action (The ions of buffer solution converts H^+ and OH^- ions of acid and base into weak electrolyte like acetic acid)	2+1
	(b) $pK_a = -\log(1.8X10^{-4})= 3.74$	1
	Log(salt/acid)= pH- pK_a= 4.25-3.74 =0.51 and antilog of 0.51= 3.24	1
	OR	
	(a) Correct answer	1
	(b) Conjugate acid H_3O^+ conjugate base OH^-	1+1
	(c) $Ksp = X^X Y^Y= S^{X+Y}$; here X= 1 and Y= 2 $Ksp= 1^1 X 2^2 =4S^3$ $S= (1.7X10^{-10}/4)^{1/3}= 3.5 X 10^{-4}mol/L$	2
Q. 37	(a) Derivation by using quantum theory and Einstien equation	2
	(b) Frequency =1/T=1/2.0 X10^{-10} =5X10^{9}s^{-1}	1
	Wavelength= C/Frequency= 6.0X10^{-2} m	1
	Wave number=i/wavelength=16.66 m^{-1}	1
	OR	
	(a) Correct answer	1
	(b) l=0,1,2	1
	(c) K.E.= 1/2mv^2, v=(2K.E./m)$^{1/2}$=812m/s Wavelength=H/mv=8967X10^{-10}m	
		2
		1

S.N.	CHAPTER	MCQ(1M)	SQ(2M)	SQ(3M)	LQ(5M)	Total
1	Some basic concepts of Chemistry	4(4)	2(1)	3(1)		9
2	STRUCTRUE OFATOM	2(2)		3(1)	5(1)	10
3	Classification of Elements and Periodicity in Properties	3(3)	4(2)	3(1)		10
4	Chemical bonding and molecular structure	3(3)	4(2)		5(1)	12
5	States of matter	2(2)		9(3)		11
6	Thermodynamics	3(3)	4(2)	3(1)		10
7	Equillibrium	3(3)			5(1)	8
	TOTAL	**20(20)**	**14(7)**	**21(7)**	**15(3)**	**70**

PAPER NO 08

BLUE PRINT XI CHEM (2019-20)

	1 MARK	2 MARKS	3 MARKS	5 MARKS	Total
Some basic concepts of Chemistry	3		2		9
Structure of Atom	2	1	2		10
Periodic Classification	3	2	1		10
Chemical Bonding	2	1	1	1	12
States of Matter	4	1		1	11
Thermodynamics	3	1		1	10
Chemical Equilibrium	3	1	1		8
Total	20	14	21	15	70

General Instructions:

6) All questions are compulsory.
7) Q.no.1 to 20 are very short answer questions (MCQs) and carry 1 mark each.
8) Q.no. 21 to 27 are short answer questions and carry 2 marks each.
9) Q.no.28 to 34 are short answer questions and carry 3 marks each.
10) Q.no.35 to 37 are long answer questions and carry 5 marks each.

1	If the concentration of glucose (C6 H 12 O 6) in blood is 0.9 g L–1, what will be themolarity of glucose in blood? (i) 5 M (ii) 50 M (iii) 0.005 M (iv) 0.5 M	1
2	The empirical formula and molecular mass of a compound are CH2O and 180 g respectively. What will be the molecular formula of the compound? (i) C9H18O9 (ii) CH 2 O (iii) C 6 H 12 O 6 (iv) C2H4O2	1
3	If the density of a solution is 3.12 g mL–1, the mass of 1.5 mL solution in significant figures is _____. (i) 4.7g (ii) 4680 × 10–3g (iii) 4.680g (iv) 46.80g	1
4	The conclusion that every additional electron enters the orbital with lowest possible energy has been drawn from (A) Pauli's exclusion principle (B) Hund's rule (C) Aufbau principle (D) de-Broglie's equation.	1
5	The total number of electrons in a subshell designated by azimuthal quantum number, l is given as (A) 2 l + 1 (B) l2 (C) 4 l + 2 (D) 2l + 2	1
6	A purple coloured solid halogen is _____. 1. Chlorine 2. Bromine 3. Iodine 4. Astatine	1
7	Four elements along a period have atomic number (11, 13, 16 and 17). The most metallic among these has an atomic number of _____. 1. 11 2. 12 3. 16 4. 17	1
8	The modern periodic table is given by _____ 1. Mendeleev 2. Einstein 3. Bohr 4. Mosley	1

9	**Which of the following species exhibits diamagenticbehaviour?** 1) O_2 2) O_2^+ 3) NO 4)O_2^{2-}	1
10	**The compound which contains both ionic and covalent bonds is** 1) CH_4 2) H_2O 3) KCN 4) KCl	1
11	**As the temperature increases, average kinetic energy of molecules increases. What would be the effect of increase of temperature on pressure provided the volume is constant?** **(i) increases (ii) decreases (iii) remains same (iv) becomes half**	1
12	**What is SI unit of viscosity coefficient (η)? (i) Pascal (ii) Nsm–2 (iii) km–2 s (iv) N m–2**	1
13	**With regard to the gaseous state of matter which of the following Which of the following property of water can be used to explain the spherical shape of rain droplets?** **(i) viscosity (ii) surface tension (iii) critical phenomena (iv) pressure**	1
14	**A person living in Shimla observed that cooking food without using pressure cooker takes more time. The reason for this observation is that at high altitude: (i) pressure increases (ii) temperature decreases (iii) pressure decreases (iv) temperature increases**	1
15	The enthalpy of neutralisation of HCl and NaOH is (a) zero (b) – 57.3kJ/mol (c) + 57.3kJ/mol (d) cannot be predicted	1
16	A system absorbs 500J of heat and does 200J of work. What is the change in internal energy? a) -700 J b)-300J c)700J d) 300 J	1
17	For the process to occur under adiabatic conditions, the correct condition is: (a) $\Delta T = 0$ (b) $\Delta p= 0$ (c) $q = 0$ (d) $w = 0$	1
18	Chemical equilibrium is dynamic in nature because (a) The equilibrium in maintained quickly (b) Conc. of reactants and products become same at equilibrium (c) Conc. of reactants and products are constant but different (d) Both forward and backward reactions occur at all times with same speed	1
19	The unit of equilibrium constant for the reaction $N_2 + 3H_2 \longrightarrow 2NH_3$ (a) $mol^{-2} L^2$ (b) mol /L (c) $mol^2 L^{-2}$ (d) L /mol	1
20	In the reaction, if pressure increases then the equilibrium constant would $N_2(g) + O_2(g) \longrightarrow 2NO (g)$ (a) increases (b) decreases (c) remains unchanged (d) sometime increases sometime decreases	1
21	The energy associated with the first orbit in H-atom is $-2.17 * 10^{-18}$ J /atom. What is the energy associated with fifth orbit.	2

22	Q 23. Account for the following : (i) Out of Li and Be, which one has higher 2nd I.E. Why ? (ii) Out of F and Cl which one has more negative electron gain enthalpy. Why ?	2
23	i) What is the basic difference between the term Electron gain enthalpy and Electronegativity? (ii) Oxygen has lower ionization enthalpy than Nitrogen and Fluorine. Why?	2
24	Discuss the shapes of following orbitals on the basis of VSEPR model $SiCl_4$, BF_3	2
25	. i) Why drops of liquid assume spherical shape. ii) In terms of Charles Law why $-273^{o}C$ is the lowest possible temperature	2
26	Enthalpy of combustion of $CO(g)$,CO_2,N_2O and N_2O_4 are -110,-393,81 and 9.7 kJ/mol respectively. Find the value of Δ H for the reaction N_2O_4 (g) + 3CO (g) ------------- N_2O (g) + 3 CO_2 (g)	2

27	Dihydrogen gas is obtained from natural gas by partial oxidation with steam as per the endothermic equation
	 CH_4(g) + H_2O (g) ------------CO(g) + 3 H_2 (g)
	       a) Write expression for Kp for the above reaction
	
	       b) How will the value of Kp and composition of equilibrium mixture get affected by
	
	          i) Increasing the pressure
		2

28	3.0 g of H_2 react with 29.0 g of O_2 to form H_2O. (i) Which is the limiting reagent? (ii) Calculate the maximum amount of H_2O that can be formed? (iii) Calculate the amount of the reactant left unreacted.	3
29	**a)A compound contains 4.07% Hydrogen, 24.27% Carbon and 71.65% Chlorine . Its molar mass is 98.96g/mol . Calculate its empirical formula**	3
30	**Explain :(a) Pauli's Exclusion Principle.** **(b) Aufbau Principle.** **(ii) Draw structure of d $_{x2-\ y2}$orbital .** **OR** **. (i)Calculate uncertainity in position of an electron moving with a velocity of 600m/s with accuracy of 20% .**	3
31	**(ii) If kinetic energy for a metal is 1.98×10^{-19} J . Calculate the threshold frequency of an e- emitted when radiation of frequency 1.0×10^{15} S^{-1} hits the metal . (2+3)**	3
32	**(i) What do you mean by diagonal relationship ? Write two similarities between lithium and magnesium**	3
33	**On the basis of molecular orbital theory explain why O_2 is paramagnetic but N_2 is diamagnetic. Also tell which is more stable and why ? (3)** **OR** **On the basis of hybridization explain the structure of C_2H_2 .Also write down bond angle and bond length .** **(3)**	3

34	(a) A mix of N_2 , H_2 and NH_3 with molar conc. $3x10^{-3}$ M , $1x10^{-3}$ M ,and $2x 10^{-3}$ M respectively.was prepared at 500 K .At this temp.the value of Kc for the reaction $N_2 + 3H_2 \longrightarrow 2NH_3$ is 61. Predict whether at this stage the conc. Of ammonia will decrease or increase ?	3

35	The combustion of one mole of benzene takes place at 298 K and 1 atm after
	         combustion $CO_{2(g)}$ and $H_2O_{(l)}$ are produced and 3267.0 KJ of heat is librated,
	        Calculate the standard enthalpy of formation of benzene. Standard enthalpies of
	        formation of $CO_{2(g)}$ and $H_2O_{(l)}$ are -393.5 $KJmol^{-1}$ and -285.83 $KJmol^{-1}$respectively.(3)
	    (b) Derive $\Delta H + \Delta U = \Delta n_g RT$
	(2)
	OR
	    (a) For the reaction at 298 K $2A + B \rightarrow C$ $\Delta H = 400$ kj mol^{-1} and $\Delta S = 0.2$ kj K^{-1} mol^{-1}
	
	At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range.
	(3)
	    (b) For the reaction $2 Cl_{(g)} \rightarrow Cl_{2(g)}$ what are sign of ΔH and ΔS
	    (2)
		5

36	a) Define the term Formal charge and calculate the formal charge on S in HSO_4^- and Cl in $HClO_4$(b) Explain the geometry of SF_4 and ClBr3 molecule on the basis of VSEPR theory.
	OR
	      b. Write the electronic configuration for molecular orbitals of nitrogen molecule and calculate the bond order of the molecule.
	            (b)Compare the, bond length and magnetic behavior of O_2, O_2^-, O_2^+ and O_2^{2-} .
		5

37	3. (i) What will be the pressure exerted by a mixture of 3.2 g of **5** methane and 4.4 g of carbon dioxide contained in a 9 dm^3 flask at 27 °C ? (ii) Derive the gas equation PV = nRT from gas laws. Find out values of R in SI system. **OR** (1 (a) Write Van der Waals equation for n moles of a gas. (b) Under what conditions a real gas would behave ideally? (c) Why does sharp glass edge become smooth on heating it upto its melting point in a flame? (2) At 0°C, the density of a certain oxide of a gas at 2 bar is same as that of dinitrogen at 5 bar. What is the molecular mass of the oxide?	5

MARKING SCHEME

1 C

2C

31

4C

5C

6C

7A

8A

9C

10B

11C

12C

13D

14 A

15D

16B

17C

18D

19A

20C

Ans 21

For H-atom =En=-2.18x10^{-18}/n^2 1

     For fifth orbit n=5, so E =-8.72X10^{-20} J   1

Ans 22: i) Li, because of stable electronic configuration (1S^2).   1

     ii) Cl , F being small in size possess interelectronic repulsion.   1

Ans 23 (i) Definition   1

(ii) Nitrogen has half filled orbital and fluorine has higher effective nuclear

charge

ans 24   Correct Shape

ans 25   i)   Due to surface tension   1

ii) At this temperature, volume of gas becomes equal to zero.

Ans26 .

Δ H = (Sum of enthalpies of formation of product) – (sum of enthalpies of   formation of
reactant)   1/2

= (81 + 3(-393)) -(9.7 + 3(-110))   1/2

= -777.7 kJ

Ans 27 Kp= P_{CO} X $P_{H_2}^3$/ P $_{CH4}$ X P_{H2O} 1

i)   Equilibrium will shift in backward direction

Ans 28 i) 3 g of H_2 require O_2 = (32 /4) x 3 = 24 g
Hydrogen is the limiting reagent.
(ii) Water formed = 27 g
(iii) O_2 left unreacted = 5g

Ans 29

Element	%	Atomic Mass	Atomic ratio	Simple At. ratio
C	24.27	12	24.27/12 =2.01	2.01/2.01 =1
H	4.07	1	4.07/1 = 4.07	4.07/2.01 2
Cl	71.65	35.5	71.65/35.5 = 2.01	2.01/2.01 =1

So Empirical formula is CH_2Cl

ANS 30 i)(a) No two electrons in an orbital can have same spin.   or

No two e- in an atom can have same set of all the four quantum numbers .

(b) Electrons are arranged in different orbitals in the order of increasing energy .

(ii) Drawing shape of d x^2- y^2 orbital

OR

Δ x * m Δ v = h /4π

$\Delta x * 9.1 * 10^{-31} * 600 * 20/100 = 6.626 * 10^{-34}$

$\Delta x = 6.626 * 10^{-34} / 9.1 * 10^{-31} * 120$

$\Delta x = 6.1 \times 10^{-5}$ m

ANS 31) 10th e- is present in 2p subshell.

$n = 2$, $l = 1$, $ml = -1 , 0 , +1$ $ms = -1/2$ or $+1/2$

(ii) $h(v - vo) = K.E.$

$(v - vo) = 1.98 * 10^{-19} / 6.626 * 10^{-34}$

$(v - vo) = 3 * 10^{14}$

$(10 - 3) * 10^{14} = 7 * 10^{14}$ Hz

ANS 32 (i) The similarity in the properties of diagonally opposite elements is known as diagonal relationship .

Any two similarities between Li and Mg .

ANS 33 $N_2 \rightarrow \sigma 1s^2 \sigma*1s^2 \sigma 2s^2 \sigma*2s^2 \; \pi 2px^2 = \pi 2py^2 \; \sigma 2pz^2$

   B. O. $= 1/2(N_b - N_a)$ B.O. $= \frac{1}{2}(10 - 4) = 3$

$O_2 \rightarrow \sigma 1s^2 \sigma*1s^2 \sigma 2s^2 \sigma*2s^2 \sigma 2pz^2 \; \pi 2px^2 = \pi 2py^2 \; \pi*2px^1 = \pi*2py^1$
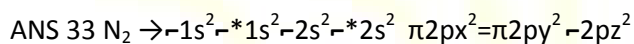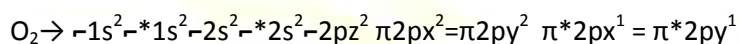
   B. O. $= 1/2(N_b - N_a)$ B.O. $= \frac{1}{2}(10 - 6) = 2$

As N2 has no unpaired e-s so is diamagnetic but O2 has two unpaired electrons in π -antibonding M.O. so is paramagnetic .

The B.O. of N_2 is 3 and that of O_2 is 2 . Higher the B.O. higher is the stability so N_2 is more stable than O_2 .

   (a) ANS 34 $Qc = [NH_3]^2 / [N_2][H]^3$

$Qc = [2x 10^{-3}]^2 / [3x10^{-3} M][1x10^{-3}]$

$Qc = 4x10^{-3} / 3$

$Qc = 1.3x10^{-3}$

As Kc is greater than Qc so the reaction will go in forward direction and yield of NH_3 will increase .

   (b) ANS 35 Correct equation

Calculation

48.51 KJ mol^{-1}

   (b) Correct steps of derivation

OR

   (a) Correct formula

     Putting vale

   2000K

ΔH = -ive ΔS=-ive

ANS 36 (a)   Definition of formal charge

Correct calculation of formal charge

(b)   Correct explanation

OR

(a)   Correct electronic configuration

Correct calculation of bond order

   (b) Correct comparison of each property

ANS 37CORRECT UNITS ,DERIVATION
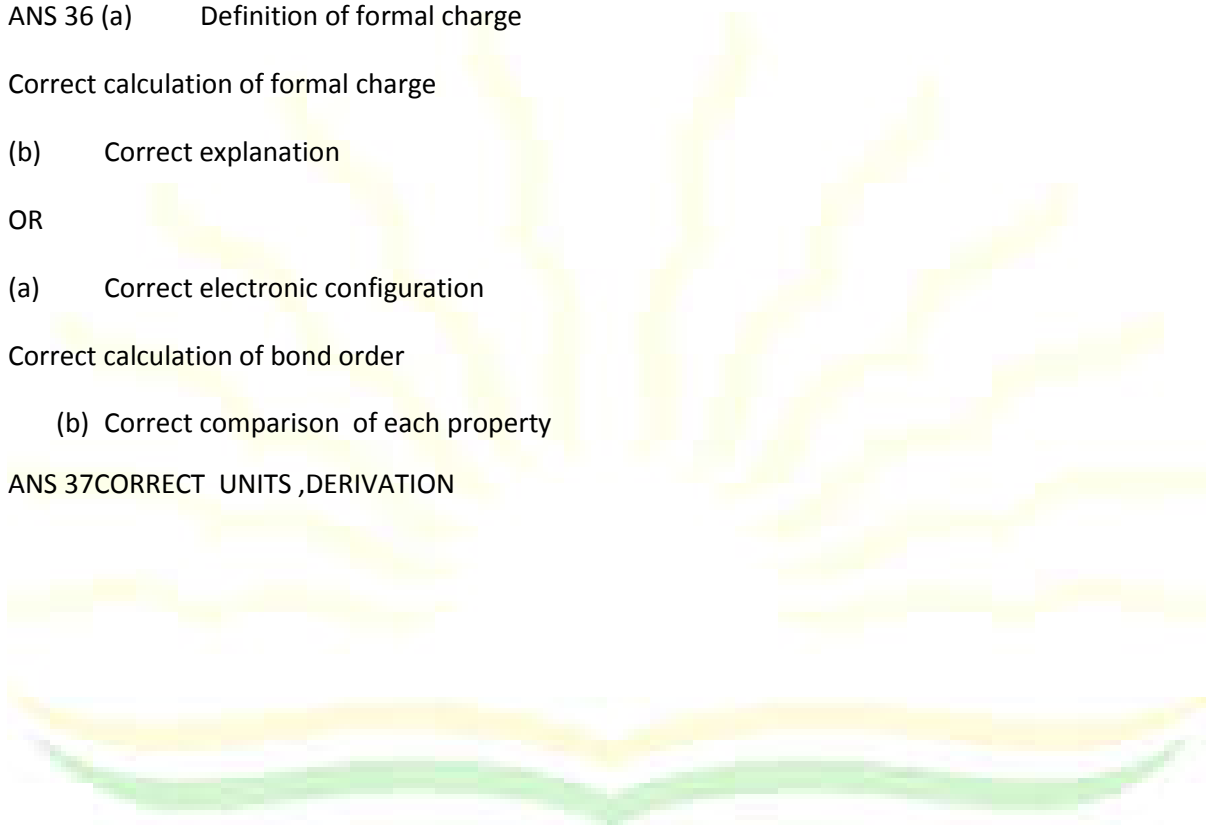
CLASS XI

CHEMISTRY

SESSION ENDING EXAMINATION

BLUE PRINT

QUESTION PAPER

MARKING SCHEME

KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION
SESSION ENDING EXAMINATIONS
CHEMISTRY- XI 2019-20

Blue print

S.No.	Unit	VSA (1 Mark)	SA (2 Marks)	LA-I (3 Marks)	LA-II (5 Marks)	Total
1	Some Basic Concepts of Chemistry	1(1)	2(1)			11
2	Structure of Atom	1(1)	2(1)		5(1)	
3	Classification of Elements and Periodicity in Properties	1(1)		3(1)		4
4	Chemical Bonding and Molecular Structure	1(1)	2(1)	3(1)		
5	States of Matter: Gases and Liquids	1(1)		3(1)		21
6	Chemical Thermodynamics	1(1)	2(1)	3(1)		
7	Equilibrium	1(2)		3(1)		
8	Redox Reactions	1(1)	2(1)			
9	Hydrogen	1(1)				16
10	s -Block Elements	1(1)	2(1)		5(1)	
11	p -Block Elements	1(1)		3(1)		
12	Organic Chemistry: Some basic Principles and Techniques	1(3)		3(1)	5(1)	
13	Hydrocarbons	1(2)	2(1)			18
14	Environmental Chemistry	1(3)				
	Total	20X1=20	7X2=14	7X3=21	3X5=15	70(37)

KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION
SESSION ENDING EXAMINATIONS
CHEMISTRY- XI 2019-20
Question Paper

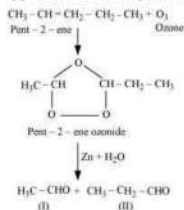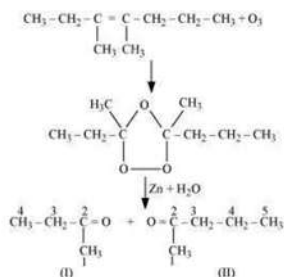MM 70   Time 3hours

Instructions:
(i)   Answer all the questions.
(ii)   Questions 1 to 20 are very short answer type or MCQ and carry one mark each. Answer them in one word or in one sentence.
(iii)   Questions 21 to 27 are short answer type and carry 2 marks each. Answer them in 20 words.
(iv)   Questions 28 to 34 are short answer type and carry 3 marks each. Answer them in 30 words.
(v)   Questions 35 to 37 are long answer type and carry 5 marks each. Answer them in 50 to 60 words.
(vi)   There will be no overall choice in the question paper. However, 33 % internal choices will be given in all the sections.
(vii)   Use log table wherever needed. Use of calculator or any other electronic item is strictly prohibited.

1.   Which of the following property of water can be used to explain the spherical shape of rain droplets?
     (i) viscosity   (ii) surface tension
     (iii) critical phenomena   (iv) pressure

2.   Which of the following is not a general characteristic of equilibria involving physical processes?
     (i) Equilibrium is possible only in a closed system at a given temperature.
     (ii) All measurable properties of the system remain constant.
     (iii) All the physical processes stop at equilibrium.
     (iv) The opposing processes occur at the same rate and there is dynamic but stable condition.

3.   The enthalpies of elements in their standard states are taken as zero. The enthalpy of formation of a compound
     (i) is always negative   (ii) is always positive
     (iii) may be positive or negative   (iv) is never negative

4.   Which of the following options does not represent ground state electronic configuration of an atom?
     (i) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$ (ii) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$
     (iii) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ (iv) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

5.   The first ionisation enthalpies of Na, Mg, Al and Si are in the order:
     (i) Na < Mg > Al < Si   (ii) Na > Mg > Al > Si
     (iii) Na < Mg < Al < Si   (iv) Na > Mg > Al < Si

6.   We know that the relationship between Kc and Kp is $Kp = Kc (RT)^{\Delta n}$
     What would be the value of Δn for the reaction
     $NH_4Cl (s) \rightleftharpoons NH_3 (g) + HCl (g)$
     (i) 1   (ii) 0.5
     (iii) 1.5   (iv) 2

7.   What is the correct order of decreasing stability of the following cations.

     (i) II > I > III   (ii) II > III > I
     (iii) III > I > II   (iv) I > II > III

8. E^o values of some redox couples are given below. On the basis of these values choose the correct option. E^o values: $Br_2/Br^- = +1.90$; $Ag^+ /Ag(s) = +0.80$ $Cu^{2+}/Cu(s) = +0.34$; $I_2(s)/I^- = + 0.54$
     (i) Cu will reduce Br^- (ii) Cu will reduce Ag
     (iii) Cu will reduce I^- (iv) Cu will reduce Br_2

3

9. The IUPAC name for
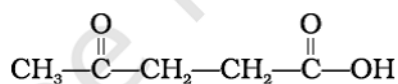
$$CH_3-\overset{\overset{O}{\|}}{C}-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-OH$$

   is _____.
   (i) 1-hydroxypentane-1,4-dione   (ii) 1,4-dioxopentanol
   (iii) 1-carboxybutan-3-one   (iv) 4-oxopentanoic acid

10. Some of the Group 2 metal halides are covalent and soluble in organic solvents. Among the following metal halides, the one which is soluble in ethanol is
   (i) $BeCl_2$ (ii) $MgCl_2$
   (iii) $CaCl_2$ (iv) $SrCl_2$

11. What will be the molarity of a solution, which contains 5.85 g of NaCl(s) per 500 mL?
   (i) 4 mol L^{-1} (ii) 20 mol L^{-1}
   (iii) 0.2 mol L^{-1} (iv) 2 mol L^{-1}

12. Which of the following is a Lewis acid ?
   (i) $AlCl_3$ (ii) $MgCl_2$
   (iii) $CaCl_2$ (iv) $BaCl_2$

13. Covalent bond can undergo fission in two different ways. The correct representation involving a heterolytic fission of CH3—Br is

   (i) $CH_3-Br \longrightarrow \overset{\oplus}{CH_3} + Br^{\ominus}$

   (ii) $CH_3-Br \longrightarrow \overset{\oplus}{CH_3} + Br^{\ominus}$

   (iii) $CH_3-Br \longrightarrow \overset{\ominus}{CH_3} + Br^{\oplus}$

   (iv) $CH_3-Br \longrightarrow \overset{\cdot}{CH_3} + \overset{\cdot}{Br}$

14. Photochemical smog occurs in warm, dry and sunny climate. One of the following is not amongst the components of photochemical smog, identify it.
   (i) NO_2 (ii) O_3
   (iii) SO_2 (iv) Unsaturated hydrocarbon

15. Which of the following will not show geometrical isomerism?

   (i)
   $$\begin{matrix} F \\ \diagdown \\ Cl \diagup \end{matrix} C=C \begin{matrix} H \\ \diagup \\ \diagdown D \end{matrix}$$

   (ii)
   $$\begin{matrix} F \\ \diagdown \\ Cl \diagup \end{matrix} C=C \begin{matrix} F \\ \diagup \\ \diagdown Cl \end{matrix}$$

   (iii)
   $$\begin{matrix} H_3C \\ \diagdown \\ H_5C_2 \diagup \end{matrix} C=C \begin{matrix} C_2H_5 \\ \diagup \\ \diagdown CH_3 \end{matrix}$$

   (iv)
   $$\begin{matrix} CH_3 \\ \diagdown \\ CH_3 \diagup \end{matrix} C=C \begin{matrix} CH_3 \\ \diagup \\ \diagdown C_2H_5 \end{matrix}$$
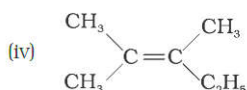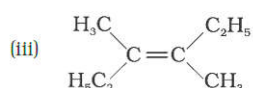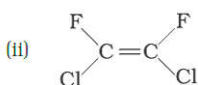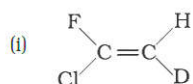
16. The gaseous envelope around the earth is known as atmosphere. The lowest layer of this is extended upto 10 km from sea level, this layer is _____.
   (i) Stratosphere   (ii) Troposphere
   (iii) Mesosphere   (iv) Hydrosphere

17. Which of the following hydrides is electron-precise hydride?
   (i) B_2H_6 (ii) NH_3

4

(iii) H_2O (iv) CH_4

18. Arrange the following hydrogen halides in order of their decreasing reactivity with propene.

    (i) HCl > HBr > HI   (ii) HBr > HI > HCl

    (iii) HI > HBr > HCl   (iv) HCl > HI > HBr

19. Which molecule/ion out of the following does not contain unpaired electrons?

    (i) N_2^+ (ii) O_2

    (iii) O_2^{2-} (iv) B_2

20. Biochemical Oxygen Demand, (BOD) is a measure of organic material present in water. BOD value less than 5 ppm indicates a water sample to be _____.

    (i) rich in dissolved oxygen.   (ii) poor in dissolved oxygen.

    (iii) highly polluted.   (iv) not suitable for aquatic life.

21. Given that:

    $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g): \Delta_r H^\theta = -92.4 kJmol^{-1}$
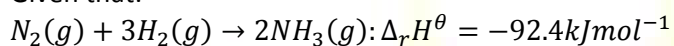
    What is the standard enthalpy of formation of NH_3 gas?

    OR

    For the reaction at 298 K

    2A + B $\longrightarrow$ C

    $\Delta H = 400$ kJmol$^-$ $and \Delta S = 0.2$ kJK$^-$mol$^-$.

    At what temperature will the reaction become spontaneous considering ΔH and ΔS to be constant over the temperature range?

22. Explain the reason for the following observations:

    (a) Beryllium and Magnesium do not impart colour to flame where as other alkaline earth metals do so. Why?

    b) LiI is more soluble than KI in ethanol.

23. Write IUPAC names of the products obtained by the ozonolysis of the following compounds : (i) Pent-2-ene (ii) 3,4-Dimethyl-hept-3-ene

24. Which out of NH_3 and NF_3 has higher dipole moment and why ?

25. Balance the following redox reactions by ion – electron method :

    (a) MnO^{4-} (aq) + I$^-$ (aq) $\rightarrow$ MnO_2 (s) + I_2(s) (in basic medium)

26. Calculate energy of one mole of photons of radiation whose frequency is 5×10^{14}Hz.

27. Determine the molecular formula of an oxide of iron in which the mass per centof iron and oxygen are 69.9 and 30.1 respectively.

    OR

    Calculate the concentration of nitric acid in moles per litre in a sample whichhas a density, 1.41 g mL^{-1} and the mass per cent of nitric acid in it being 69%.

28. (a) What would be the IUPAC name andsymbol for the element with atomicnumber 120?

    (b) Explain why Be has higher Δ_i H than B.

    (c) How would you justify the presence of 18elements in the 5th period of the Periodic Table?

29. Calculate the standard enthalpy of formation of $CH_3OH(l)$ from thefollowing data:

    $$CH_3OH\ (l) + \frac{3}{2}\ O_2(g) \rightarrow CO_2(g) + 2H_2O(l)\ ;\ \Delta_r H^\circ = -726\ kJ\ mol^{-1}$$

    $$C(g) + O_2(g) \rightarrow CO_2(g)\ ;\ \Delta_c H^\circ = -393\ kJ\ mol^{-1}$$

    $$H_2(g) + \frac{1}{2}\ O_2(g) \rightarrow H_2O(l)\ ;\ \Delta_f H^\circ = -286\ kJ\ mol^{-1}.$$
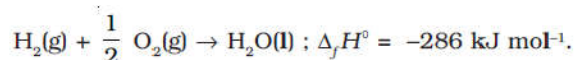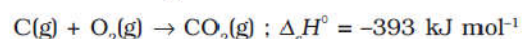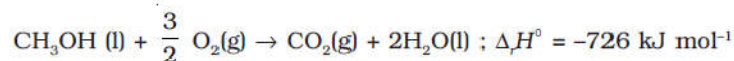
30. On the basis of VSEPR theory draw the structure and tell the shape of :

    (i)XeF_4 (ii)ClF_3 (iii) H_2O

31. At 25°C and 760mm of Hg pressure a gas occupies 600ml volume .What will be its pressure at a height where temperature is 10°C and volume of the gas is 640 ml.

    OR

A neon-dioxygen mixture contains70.6 g dioxygen and 167.5 g neon. Ifpressure of the mixture of gases in thecylinder is 25 bar. What is the partialpressure of dioxygen and neon in themixture ?

32. Explain by giving an example.

(i)Wurtz reaction (ii)Markovnikov's rule. (iii) Decaboxylation

33. What happenswhen?

(i) Borax is heated strongly?

(ii) Boric acid is added to water?

(iii) Aluminum is treated with dilute NaOH?

34. A sample of HI (g) is placed in a flask at a pressure of 0.2atm. At equilibrium the partial pressure of HI (g) is 0.04 atm. What is K_p for the given equilibrium?

$2HI (g) \rightleftharpoons H_2 (g) + I_2 (g)$

OR

Explain the following terms by giving suitable examples:

(a) Common ion effect

(b) Homogenous equilibrium

(c) Conjugate acid-base pair

35. (i) Define an orbital.

(ii)What is meant by photoelectric effect?

(iii)The threshold frequency for a metal is 7.0×10^{14} s^{-1}. Calculate the kinetic energy of an electron emitted when radiation of frequency v $=1.0 \times 10^{15}$ s^{-1} hits the metal.

OR

(a)States Heisenberg's Uncertainty Principle

(b)What designations are given to the orbitals having

(i) n = 3, l = 1 (ii) n = 2, l = 0

(c) Which quantum number determines

(i) Energy of electron (ii) Orientation of orbitals.

(d) What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition, n = 4 to n =2 of He^+ spectrum?

1. 36. (a) Which of the following carbocation is most stable ?

(a) $(CH_3)_3C.\overset{-}{C}H_2$ (b) $(CH_3)_3\overset{+}{C}$ (c) $CH_3CH_2\overset{+}{C}H_2$ (d) $CH_3\overset{+}{C}H CH_2CH_3$

(b)In the Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of:

(c)Explain the reason for the fusion of an organic compound with metallic sodium for testing nitrogen, sulphur and halogens.

(d)0.3780 g of an organic chloro compound gave 0.5740 g of silver chloride in Carius estimation. Calculate the percentage of chlorine present in the compound.

OR

(a)Write bond line formulas for : (i)Isopropyl alcohol (ii) 2,3-Dimethyl butanal

(iii) Heptan-4-one.

(b)Explain why chloroacetic acid is more acidic than acetic acid.

37. Give reasons for each:

(i) BeO is insoluble but $BeSO_4$ Is soluble in water.

(ii)Be & Mg do not impart color to the flame .

(iii)Gypsum is added in the final stages of preparation of cement.

(iv)Alkali metals give deep blue color when dissolved in liquid ammonia.

(v)Li Forms oxide Na forms peroxide & K forms superoxide

OR
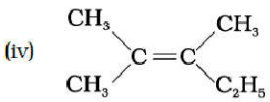
(i)Write the balanced equation for the reaction of:

(a)Na_2O_2 and water (b) Na_2O and CO_2

(ii)Write the various steps involved in the Solvay process for the preparation of Na_2CO_3

Markimg Scheme

MM 70   Time 3hours

Q.No.	Answer	Marks
1.	(ii) surface tension	1
2.	(iii) All the physical processes stop at equilibrium.	1
3.	(iii) may be positive or negative	1
4.	(ii) $1s^2\, 2s^2\, 2p^6\, 3s^2\, 3p^6\, 3d^9\, 4s^2$	1
5.	(i) Na < Mg > Al < Si	1
6.	(iv) 2	1
7.	(i) II > I > III	1
8.	(iv) Cu will reduce Br_2	1
9.	(iv) 4-oxopentanoic acid	1
10.	(i) $BeCl_2$	1
11.	$0.2\ mol\ L^{-1}$	1
12.	(i) $AlCl_3$	1
13.	(ii) $CH_3 - \overset{\frown}{Br} \longrightarrow \overset{\oplus}{CH_3} + \overset{\ominus}{Br}$	1
14.	(iii) SO_2	1
15.	(iv)	1
16.	(ii) Troposphere	1
17.	(iv) CH_4	1
18.	(iii) HI > HBr > HCl	1
19.	(iii) O_2^{2-}	1
20.	(i) rich in dissolved oxygen.	1

21. (a) $\Delta rH^\theta = 2\Delta_f H^\theta$

$$\Delta_f H^\theta = \frac{\Delta rH^\theta}{2} = \frac{-92.4}{2}\, kJmol^{-1} = -46.2 kJmol^{-1}$$

                                        1

OR

$\Delta G = \Delta H - T\Delta S$ 1

$\Delta G = -ve$ (Since reaction is spontaneous)   ½

$\Delta H - T\Delta S < 0$ ½

$$T > \frac{\Delta H}{\Delta S}\ ,\ T > \frac{400\ kJmol^{-1}}{0.2\ kJK^{-1}mol^{-1}} = 2000K$$ 1

Reaction will be spontaneous above 2000K.

22.	(a)	Be, Mg have high ionization enthalpy.	1
	(b)	Li I is more covalent than KI.	1
23.	(i)		1

(i) Pent-2-ene undergoes ozonolysis as:

$CH_3 - CH = CH_2 - CH_2 - CH_3 + O_3$
Pent – 2 – ene   Ozone

$H_3C - CH$ $CH - CH_2 - CH_3$
Pent – 2 – ene ozonide

$| Zn + H_2O$

$H_3C - CHO + CH_3 - CH_2 - CHO$
(I)   (II)

The IUPAC name of Product (I) is ethanal and Product (II) is propanal.

(ii)

$CH_3 - CH_2 - C = C - CH_2 - CH_2 - CH_3 + O_3$
        CH_3 CH_3

H_3C O CH_3
$CH_3 - CH_2 - C$ $C - CH_2 - CH_2 - CH_3$
        $O — O$

$| Zn + H_2O$

$CH_3 - CH_2 - C = O$ + $O = C - CH_2 - CH_2 - CH_3$
          CH_3 CH_3
          (I)   (II)

The IUPAC name of Product (I) is butan-2-one and Product (II) is Pentan-2-one.

1

24.   In case of NH_3 the orbital dipole due to lone pair is in the same direction as the resultant dipole moment of the N – H bonds, whereas in NF_3 the orbital dipole is in the direction opposite to the resultant dipole moment of the three N–F bonds. The orbital dipole because of lone pair decreases the effect of the resultant N – F bond moments, which results in the low dipole moment of NF_3.

2

25.

(a) Step 1: The two half reactions involved in the given reaction are:

Oxidation half reaction: $\overset{-1}{I}_{(aq)} \longrightarrow \overset{0}{I}_{2(s)}$

Reduction half reaction: $\overset{+7}{MnO^-_{4(aq)}} \longrightarrow \overset{+4}{MnO_{2(aq)}}$
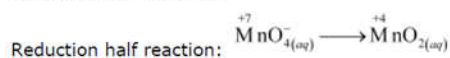
Step 2:

Balancing I in the oxidation half reaction, we have:

$2I^-_{(aq)} \longrightarrow I_{2(s)}$

Now, to balance the charge, we add 2 e⁻ to the RHS of the reaction.

$2I^-_{(aq)} \longrightarrow I_{2(s)} + 2e^-$

Step 3:

In the reduction half reaction, the oxidation state of Mn has reduced from +7 to +4. Thus, 3 electrons are added to the LHS of the reaction.

$MnO^-_{4(aq)} + 3e^- \longrightarrow MnO_{2(aq)}$
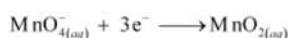
Now, to balance the charge, we add 4 OH⁻ ions to the RHS of the reaction as the reaction is taking place in a basic medium.

$MnO^-_{4(aq)} + 3e^- \longrightarrow MnO_{2(aq)} + 4OH^-$

Step 4:

8

In this equation, there are 6 O atoms on the RHS and 4 O atoms on the LHS. Therefore, two water molecules are added to the LHS.

$$MnO_{4(aq)}^- + 2H_2O + 3e^- \longrightarrow MnO_{2(aq)} + 4OH^-$$
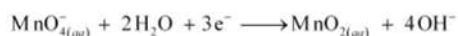
Step 5:

Equalising the number of electrons by multiplying the oxidation half reaction by 3 and the reduction half reaction by 2, we have:

$$6I_{(aq)}^- \longrightarrow 3I_{2(s)} + 6e^-$$

$$2MnO_{4(aq)}^- + 4H_2O + 6e^- \longrightarrow 2MnO_{2(s)} + 8OH_{(aq)}^-$$
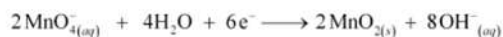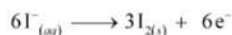
Step 6:

Adding the two half reactions, we have the net balanced redox reaction as:

$$6I_{(aq)}^- + 2MnO_{4(aq)}^- + 4H_2O_{(l)} \longrightarrow 3I_{2(s)} + 2MnO_{2(s)} + 8OH_{(aq)}^-$$

26. Energy (E) of one photon is given by theexpression

$E = h\nu$ ½

$h = 6.626 \times 10^{-34}$ J s

$\nu = 5 \times 1014$ s^{-1} (given)

$E = (6.626 \times 10^{-34}$ J s$) \times (5 \times 10^{14}$ s$^{-1})$

$= 3.313 \times 10^{-19}$ J   1/2

Energy of one mole of photons

$= (3.313 \times 10^{-19}$ J$) \times (6.022 \times 10^{23}$ mol$^{-1})$ ½

$= 199.51$ kJ mol^{-1} ½

27. Mass percent of iron (Fe) = 69.9% (Given)

Mass percent of oxygen (O) = 30.1% (Given)

Number of moles of iron present in the oxide $= \dfrac{69.90}{55.85}$

$= 1.25$

Number of moles of oxygen present in the oxide $= \dfrac{30.1}{16.0}$

$= 1.88$

Ratio of iron to oxygen in the oxide,

$= 1.25 : 1.88$

$= \dfrac{1.25}{1.25} : \dfrac{1.88}{1.25}$

$= 1 : 1.5$

$= 2 : 3$

∴ The empirical formula of the oxide is Fe₂O₃.

Empirical formula mass of Fe₂O₃ = [2(55.85) + 3(16.00)] g

Molar mass of Fe₂O₃ = 159.69 g

$\therefore n = \dfrac{\text{Molar mass}}{\text{Emprical formula mass}} = \dfrac{159.69 \text{ g}}{159.7 \text{ g}}$

$= 0.999$

$= 1 \text{(approx)}$

Molecular formula of a compound is obtained by multiplying the empirical formula with *n*.

Thus, the empirical formula of the given oxide is Fe₂O₃ and *n* is 1.

Hence, the molecular formula of the oxide is Fe₂O₃.

OR

Mass percent of nitric acid in the sample = 69 % [Given]

Thus, 100 g of nitric acid contains 69 g of nitric acid by mass.

Molar mass of nitric acid (HNO_3)

$= \{1 + 14 + 3(16)\}$ g mol^{-1}

$= 1 + 14 + 48$

$= 63$ g mol^{-1}

$\therefore$ Number of moles in 69 g of HNO_3

$= \dfrac{69\,g}{63\,g\,mol^{-1}}$

$= 1.095\,mol$

Volume of 100g of nitric acid solution

$= \dfrac{\text{Mass of solution}}{\text{density of solution}}$

$= \dfrac{100\,g}{1.41\,g\,mL^{-1}}$

$= 70.92\,mL = 70.92 \times 10^{-3}\,L$

Concentration of nitric acid

$= \dfrac{1.095\,mole}{70.92 \times 10^{-3}\,L}$

$= 15.44\,mol/L$

28. (a) Ubn and Unbinilium. ½+1/2

(b) an s-electron is attracted to the nucleus more than a p-electron. In beryllium, the electron removed during the ionization is an s-electron whereas the electron removed during ionization of boron is a p-electron. The penetration of a 2s-electron to the nucleus is more than that of a 2p-electron; hence the 2p electron of boron is more shielded from the nucleus by the inner core of electrons than the 2s electrons of beryllium.

1

(c) When n = 5, l = 0, 1, 2, 3. The order in which the energy of the available orbitals 4d, 5s and 5p increases is 5s < 4d < 5p. The total number of orbitals available are 9. The maximum number of electrons that can be accommodated is 18; and therefore 18 elements are there in the 5th period.

1

29. Calculate the standard enthalpy of formation of $CH_3OH_{(l)}$ from the following data:
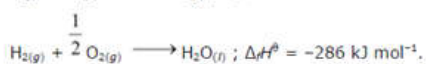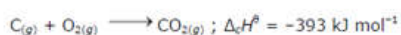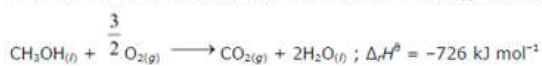
$CH_3OH_{(l)} + \dfrac{3}{2} O_{2(g)} \longrightarrow CO_{2(g)} + 2H_2O_{(l)} ; \Delta_r H^\theta = -726$ kJ mol^{-1}

$C_{(g)} + O_{2(g)} \longrightarrow CO_{2(g)} ; \Delta_c H^\theta = -393$ kJ mol^{-1}

$H_{2(g)} + \dfrac{1}{2} O_{2(g)} \longrightarrow H_2O_{(l)} ; \Delta_f H^\theta = -286$ kJ mol^{-1}.

Answer

The reaction that takes place during the formation of $CH_3OH_{(l)}$ can be written as:

$C_{(s)} + 2H_2O_{(g)} + \dfrac{1}{2} O_{2(g)} \longrightarrow CH_3OH_{(l)}$ (1)

The reaction (1) can be obtained from the given reactions by following the algebraic calculations as:

Equation (ii) + 2 × equation (iii) – equation (i)

$\Delta_f H^\theta [CH_3OH_{(l)}] = \Delta_c H^\theta + 2\Delta_f H^\theta [H_2O_{(l)}] - \Delta_r H^\theta$
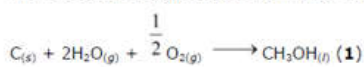
$= (-393$ kJ mol$^{-1}) + 2(-286$ kJ mol$^{-1}) - (-726$ kJ mol$^{-1})$

$= (-393 - 572 + 726)$ kJ mol^{-1}

$\therefore \Delta_f H^\theta [CH_3OH_{(l)}] = -239$ kJ mol^{-1}

30. (i) XeF_4

1

10
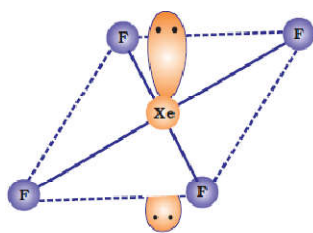
(b) Square planar

(ii) ClF_3
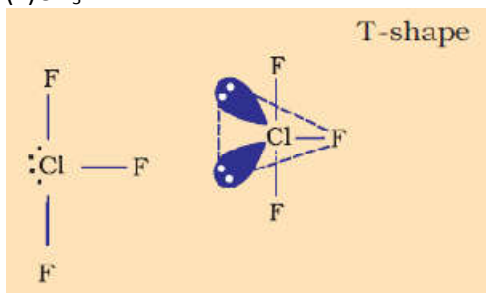
T-shape

(iii) H_2O
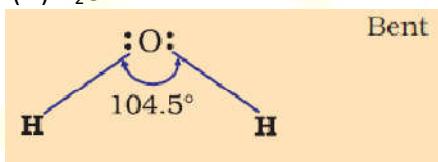
Bent

31.	According to Combined Gas Law –	
	$p_1V_1/T_1 = p_2V_2/T_2$	1
	$p_2 = p_1V_1T_2/T_1V_2$	
	$p_2 = (760 \times 600 \times 283)/(640 \times 298)$	1
	$= 676.6 \text{mm Hg}.$	1

OR

Number of moles of dioxygen = 70.6 g/32gmol^{-1} = 2.21 mol ½

Number of moles of neon = 1167.5g/20gmol^{-1} = 8.375 mol ½

Mole fraction of dioxygen 2.21/(2.21+ 8.3752.21) = 2.21/10.585 = 0.21 ½

mole fraction of neon = 1− 0.21 = 0.79 ½

Partial pressure = mole fraction of a gas x total pressure

⇒ Partial pressure of oxygen = 0.21 × (25 bar) ½

= 5.25 bar

Partial pressure of neon = 0.79 × (25 bar) ½

= 19.75 bar

32.

(a) $CH_3Cl + 2Na + CH_3Cl \rightarrow CH_3 - CH_3 + 2NaCl$ 1

(b) $CH_3 - CH = CH_2 + HBr \rightarrow CH_3 - CH - CH_3$ 1
$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad |$$
$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\; Br$$

(c) $CH_3COONa + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$ 1

33.

(i) $Na_2B_4O_7 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 + 10H_2O$ 1

$$Na_2B_4O_7 \xrightarrow{Heat} 2NaBO_2 + B_2O_3$$

(ii) $B(OH)_3 + H_2O \rightarrow [B(OH)_4]^- + H^+$ 1
1

(iii) $2Al + 2NaOH + 6H_2O \rightarrow Na[Al(OH)_4] + 3H_2O$

34.
$$2HI\ (g) \leftrightharpoons H_2\ (g) + I_2\ (g)$$

Initial   0.2atm   0   0

At eqbm   (0.2-$2x$) x x

Given $0.2 - 2x = 0.04$

$$2x = 0.16$$
$$x = 0.08$$

1
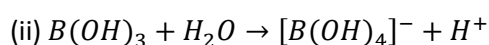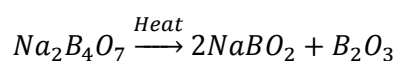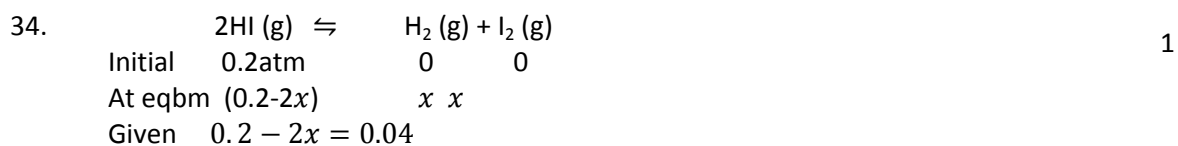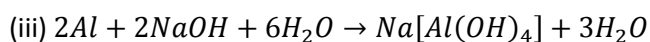
$$K_P = \frac{(P_{H_2})(P_{I_2})}{(P_{HI})^2} = \frac{0.08 \times 0.08}{(0.04)^2}$$

1

$$K_P = 4$$

1

Or

(a) Common ion effect: The suppression in the dissociation a weak electrolyte by the the addition of a strong electrolyte having a common ion is called common ion effect.
eg.

$NH_4OH \rightleftharpoons NH_4^+ + OH^-$
weak electrolyte
$NH_4Cl \rightarrow NH_4^+ + Cl^-$
Strong electrolytecommon ion

½

½

½

(b) Homogenous equilibrium: All reactants and products are in the same phase
e.g. $N_2(g) + 3H_2(g) \rightleftharpoons NH_3(g)$

½

(c) Conjugate acid base pair: It differs by one proton.
$HCl(aq) + H_2O\ (l) \rightleftharpoons H_3O^+(aq) + Cl^-(aq)$
Acid   Base   Conjugate   Conjugate base
acid

½
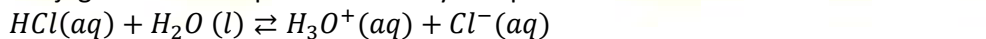
½

35. i.It is the space around nucleus where the probability of finding an electron is maximum

ii.When electrons (or electric current) are ejected when certain metals (for example potassium, rubidium, caesium etc.) are exposed to a beam of light of suitable frequency

iii.Kinetic energy = $1/2m_e v^2 = h(v - v_0)$

=1.988 ×10^{-19} J

Or

i.It states that it is impossible to determine simultaneously, the exact position and exact momentum (or velocity) of an electron.

ii.3p, 2s

iii. n and m

iv. n=2 to n=1 (correct formula and substittion)

36. (a) $(CH_3)_3C^+$ 1
(b) $Fe_4[Fe(CN)_6]_3.xH_2O$ 1
(c) To convert N, S, P and halogens present in the organic compound to their sodium salts.   1
(d)

Given that,
Mass of organic compound is 0.3780 g.
Mass of AgCl formed = 0.5740 g
1 mol of AgCl contains 1 mol of Cl.
Thus, mass of chlorine in 0.5740 g of AgCl   1

$$= \frac{35.5 \times 0.5740}{143.32}$$
$$= 0.1421g$$

$\therefore$ Percentage of chlorine $= \frac{0.1421}{0.3780} \times 100 = 37.59\%$ 1

Hence, the percentage of chlorine present in the given organic chloro compound is 37.59%.

OR

(a)(i)

Isopropyl alcohol   1

(ii)
2, 3–dimethyl butanal   1

(iii)

     1

13

Heptan-4-one

$H_3C - CH_2 - CH_2 - \overset{\overset{\displaystyle O}{\|}}{C} - CH_2 - CH_2 - CH_3$
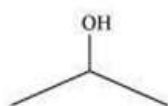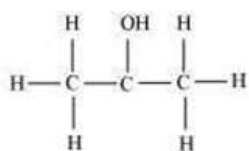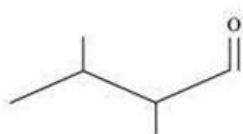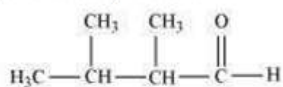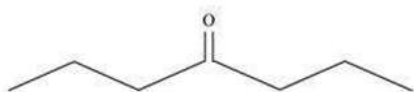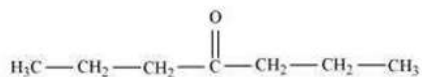
2

(b) Electron withdrawing groups increase the acidity of carboxylic acids by stabilising the conjugate base through delocalisation of the negative charge by inductive and/or resonance effects.

37.   Correct Reason

(i) BeO is covalent & $BaSO_4$ is ionic

(ii) Small size &high ionization energy

(iii) To slow down the process of setting of cement& impart greater strength.

(iv) Due to the formation of ammoniated electron

(v) Smaller cation can stablise smaller anion & larger cation can stablise larger anion.

1
1
OR   1

(i)(a) NaOH +H_2O_2
1
(b) Na_2CO_3 1

(ii) Correct steps in Solvay Process

1
In Solvay process, CO_2 is passed through brine saturated with ammonia .when   1
$NaHCO_3$ being sparingly soluble gets precipitated.
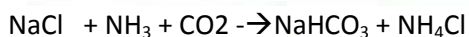
NaCl + NH_3 + CO2 -→$NaHCO_3$ + NH_4Cl 3

Sodium bicarbonate thus formed is filtered, dried and then heated when sodium carbonate isObtained.

2 $NaHCO_3$ ------> Na_2CO_3 + CO_2 + H_2O
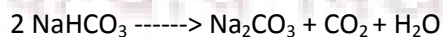
CO_2 needed for the reaction shown in eq.(i) is prepared by heating calcium carbonate and the quicklime,CaO thus formed is dissolved in water to form slaked lime, $Ca(OH)_2$.NH_3 needed for the purpose is prepared by heating NH_4Cl

14

PAPER NO 02

BLUE PRINT

S.No.	Unit	VSA (1 Mark)	SA (2 Marks)	LA-I (3 Marks)	LA-II (5 Marks)	Total
1	Some Basic Concepts of Chemistry	1	1			11
2	Structure of Atom	1	1		1	
3	Classification of Elements and Periodicity in Properties	1		1		4
4	Chemical Bonding and Molecular Structure	1	1	1		
5	States of Matter: Gases and Liquids	1		1		21
6	Chemical Thermodynamics	1	1	1		
7	Equilibrium	2		1		
8	Redox Reactions	1	1			16
9	Hydrogen	1				
10	s -Block Elements	1	1		1	
11	p -Block Elements	1		1		
12	Organic Chemistry: Some basic Principles and Techniques	3		1	1	18
13	Hydrocarbons	2	1			
14	Environmental Chemistry	3				
	Total	**20X1=20**	**7X2=14**	**7X3=21**	**3X5=15**	**70(37)**

SUB: CHEMISTRY   MM:70   TIME:3HRS

INSTRUCTION

ALL QUESTIONS ARE COMPULSORY.

QUESTIONS 1 TO 20 ARE MCQ OF 1MARKS EACH.

QUESTIONS 21 TO 27 ARE OF 2 MARKS EACH.

QUESTIONS 28 TO 34 ARE OF 3 MARKS EACH.

QUESTION 35 TO 37 ARE OF 5 MARKS EACH.

1.How many number of significant figures are there in 123?

a) 3   b) 2   c) 1   d) all of the above

2.   When atoms of the gold sheet are bombarded by a beam of á -particles, only a few á-particles get deflected whereas most of them go straight undeflected. This is because
(A)   The force of attraction on a-particles by the oppositely charged electron is not sufficient
(B)   The nucleus occupies much smaller volume as compared to the volume of atom
(C)   The force of repulsion on fast moving a-particles is very small
(D)   The neutrons in the nucleus do not have any effect on a –particles

3. The family of elements having seven electrons in the outermost shell is _____.
  1. Alkali metals   2. Alkaline earth metals
  3. Halogens   4. Noble gases

4 **Most ionic bond is present in**
  1) LiH 2) HF 3) CsH 4) HI

5 Maximum deviation from ideal gas behaviour is expected from which of the following gases

 (a) H_2
(b) N_2
(c) CH_4
(d) NH_3

6. Which of the following is an extensive property

  a) Molar heat capacity
  b) Temperature
  c) Enthalpy

  d) All of these

7.In what manner will increase of pressure affect the equation $C(s) + H2O(g) \rightarrow CO(g) + H2(g)$ -

    (A) Shift in the forward direction

16

(B) Shift in the reverse direction

(C) Increase in the yield of H2

(D) No effect

8. Which of the following will shift the reaction

$PCl3(g) + Cl2(g) \rightarrow PCl5(g)$ to the left side-

(A) Addition of PCl5

(B) Increase in pressure

(C) Decrease in temperature

(D) Catalyst

9. Old paintings can be restored through an oxidizing agent

A. H_2S
B. H_2O_2
C. H_2PO_4
D. H_3O

10. The method which can be used for removal of temporary &permanent hardness of water is

(a) Decantation   (b) Distillation   (c) Boiling   (d) Filteration

11 Thereducingpowerofametaldependsonvariousfactors.Suggestthefactor whichmakesLi,thestrongestreducingagentinaqueoussolution.

(i) Sublimationenthalpy
(ii) Ionisationenthalpy
(iii) Hydrationenthalpy
(iv) Electron-gainenthalpy

12. Which of the following is an amphotericoxide.

a)MgO   (b)Al_2O_3 (c) Cl_2O_7 (d)Ti_2O_2

13. What is the value of carbon carbon(C-C) bond length in ethyne?

(a) 154pm   (b) 123pm   (c) 134pm   (d) 120pm

14. Pi bonding can occur by the overlapping of

(a) s orbitals   (b) p orbitals   (c) sp^2 orbitals   (d) sp orbitals

15. In C_6H_6 and C_2H_4 , the bond angle H-C-H are respectively

(a) 120˙,120˙   (b) 120˙, 90˙   (c) 120˙, 109˙28''   (d) 180˙, 109˙28''

16. Total possible number of chain isomers for the molecular formula of C_5H_{12} would be

(a) 3   (b) 2   (c) 4   (d) 5

17. 3-chlorobutane and 2-chlorobutane are

(a) positional isomers   (b) chain isomers

(c) geometrical   (d) none

18. Which of the following gases is not a greenhouse gas?

(a) CO   (b) O_3 (c) CH_4 (d) H_2O vapours

19. Which of the following pollutant cannot be degraded by natural process?

(a) DDT   (b) Nuclear waste   (c) Heavy metals   (d) All of the above

20. Which of the following is not amongst the components of photochemical smog. Identify it?

(a) NO_2 (b) O_3 (c) SO_2 (d) Unsaturated hydrocarbon

21.How many grams of NaOH should be dissolved to make 100 ml of 0.15 M NaOH solution?

22. Write the correct set of four quantum no for the valence electron of Potassium atom(Z=19)

23. Draw the structure of BeCI2 (vapour).

24. For the reaction $2Cl(g) \rightarrow Cl_2(g)$, What will be the sign of $\triangle H$ and $\triangle S$?

25. Balance the following redox reaction by ion electron method in basic medium.

$$MnO_4^{-1} (aq) + I^- \rightarrow MnO_2(s) + I_2(s)$$
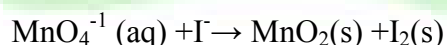
26 Consider the following species:
        $N^{3-}, O^{2-}, F^-, Na^+, Mg^{2+}$ and Al^{3+}
   (i) What is common in them .
   (ii) Arrange them in the order of increasing ionic radii.
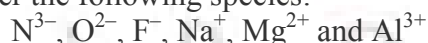
27 How many sigma and Pi bonds are present in

$$CH_2=CH—C\equiv CH$$

28. Define electron gain Enthalpy. Which having more electron gain enthalpy F or Cl and explain?

29. Compare the relative stability of the following species and indicate their magnetic properties;
O_2, O_2^{2-}, O_2^+.

30. What will be minimum pressure required compressing 500dm^3 of air at 1 bar to 200 dm^3 at 30° C?

31. Calculate the enthalpy of formation of benzene from data

$C_6H_6 + 15/2\ O_2 \rightarrow 6H_2O + 3\ H_2O$ $\qquad\qquad\qquad$ $\triangle_c H^0 = -3266.0KJ$

$C + O_2 \rightarrow CO_2$ $\triangle_f H^0 = -393.1KJ$

$H_2 + ½\ O_2 \rightarrow H_2O$ $\qquad\qquad\qquad$ $\triangle_f H^0 = -286.0KJ$
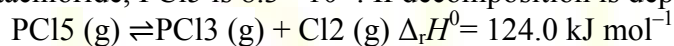
32. At 473 K, equilibrium constant Kc for decomposition of phosphorus Pentachloride, PCl5 is 8.3×10^{-3}. If decomposition is depicted as,
   $PCl5\ (g) \rightleftharpoons PCl3\ (g) + Cl2\ (g)$ $\Delta_r H^0 = 124.0\ kJ\ mol^{-1}$
   a) Write an expression for Kc for the reaction.
   b) What is the value of Kc for the reverse reaction at the same temperature?

33. Give suitable reason for the following:

   (i)$[SiF_6]^{2-}$ is known whereas $[SiCl_6]^{2-}$ not

(ii)In group 14, the tendency for catenation decreases with increasing atomic no

34. (a) Which of the following carboanion is more stable and why?
   (i) $(CH_3)_3CCH_2^{\ominus}$
   (ii) $CH_3C^{\ominus}HCH_2CH_3$
   (iii) $CH_3CH_2CH_2^{\ominus}$
   (b)Why is $O_2NCH_2O^-$ is expected to be more stable than $CH_3CH_2O^-$
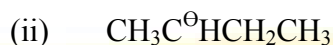
35. (a) Explain the following reaction with examples

   i) Wurtz reaction.

   ii) Friedal-craft alkylation reaction.

   (b)An alkene A on ozonolysis gives a mixture of ethanal and pentan-3-one write the structure of compound A
   (c)Give a chemical test to distinguish between ethane and ethyne

OR

   a. Write the suitable reason for the following:
      (i)C-C bond length in benzene ring is 139 pm which is in between C-C (single bond)154pm and C=C (double bond) 133pm
      (ii)Trans – 2-butene has higher melting point than cis – isomer.

19

b. Draw cis and trans isomers of 1,2-Dicloroethene.
c. How will you carry out following conversions :
    (i)Ethyne to benzene
    (ii)propene to 2-bromo propane

36. a) Draw the structure of B_2H_6.

 b) What happens when

        (i) Boric acid is added to water
        (ii)Aluminium is treated with dilute NaOH

c) Give suitable reason for the following:

        (i)$[SiF_6]^{2-}$ is known whereas $[SiCl_6]^{2-}$ not
        (ii)In group 14, the tendency for catenation decreases with increasing atomic no.

                                OR

    (a)Complete the following chemical equation:
    heat
    (i) $Fe_2O_3+3CO\rightarrow$
    (ii) $CaCO_3 + 2HCl\rightarrow$
    (b)Write a brief account for the following:

     (i) Diamond is covalent yet it has high melting point.

     (ii) Atomic radius of gallium (135pm) is less than that of Aluminium (143pm).

     (iii)Graphite is a good conductor of electricity but but diamond is insulator

37i.Explain Dual behaviour of matter.
ii. State de Broglie's relation. Give its mathematical expression.
iii. What will be the wavelength of a ball of mass 0.1 kg moving with a velocity of 10 m s −1?
iv. The mass of an electron is 9.1 X 10 kg. If its K.E. is 3.0 X10 −25 J, calculate its wavelength.
v. Calculate the mass of a photon with wavelength 3.6 Å.

OR

1.) The velocity associated with a proton moving in a potential difference of 1000 V is 4.37 ×
105ms–1. Ifthe hockey ball of mass 0.1 kg is moving with this velocity,Calculate the wavelength
associated with this velocity.
II). If the velocity of the electron in Bohr's first orbit is 2.19 × 106ms–1, calculate
the de Brogliewavelength associated with it.

MARKING SCHEME

1 A

2 B

3.C

4.C

5.D

6.c

7.b

8.a

9.b

10.c

11.c

12.b

13.d

14.b

15.a

16.a

17.a

18.b

19.d

20.c

21. Molarity = W_B/M_B x 1000/vol. of sol. in ml.

1/2

M_B = 23+16+1 = 401/2

W_B = 0.15 x 40 x 100/1000 = .6g ½+½

22. n=4,l=0,m=0,s=+½

23. Correct structure

24 △H is –ve and △S is –ve)

25. Oxidation half I^-(aq)   →I_2 (s)

      Reduction half MnO_4^{1-} (aq)→ MnO_2(s)

6I^-(aq) + 2MnO_4^- +4H_2O(l)→3I_2(s) + 2MnO_2(s) + 8OH^-
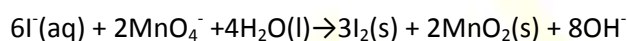
26(i) the same number of electrons (10 electrons). Hence, the given species are isoelectronic species.
(ii) $Al^{3+}< Mg^{2+}< Na^+< F^-< O^{2-}< N^{3-}$
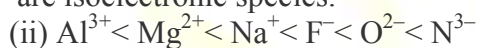
27) No. of σ bonds= 7

No. of π bonds=3

28 Correct definition and correct Explanation.

29 There are 16 electrons in a molecule of dioxygen, 8 from each oxygen atom.
The molecular electronic configuration of oxygen molecule can be written as:

$$[\sigma-(1s)]^2[\sigma^*(1s)]^2[\sigma(2s)]^2[\sigma^*(2s)]^2[\sigma(1p_z)]^2[\pi(2p_x)]^2[\pi(2p_y)]^2[\pi^*(2p_x)]^1[\pi^*(2p_y)]^1$$
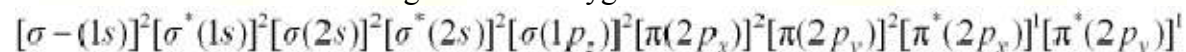
Bond Order = 2, Paramagnetic
O_2^+

$$KK[\sigma(2s)]^2[\sigma^*(2s)]^2[\sigma(2p_z)]^2[\pi(2p_x)]^2[\pi(2p_y)]^2[\pi^*(2p_x)]^1$$
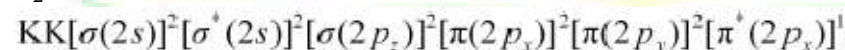
Bond Order = 2.5, Paramagnetic
O_2^{2-}

$$KK[\sigma(2s)]^2[\sigma^*(2s)]^2[\sigma(2p_z)]^2[\pi(2p_x)]^2[\pi(2p_y)]^2[\pi^*(2p_x)]^2[\pi^*(2p_y)]^2$$
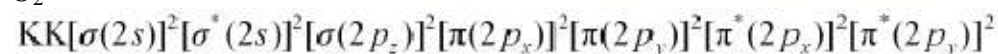
Bond Order = 1.5, Diamagnetic
Stability: $O_2^{2-}< O_2<O_2^+$

30. P1 = 1bar. V1 = 500dm^3
P2 = ? V2 =200 dm^3 & temp. constant 30^{oC}
So by Boyle's low P1V1 = P2 V2
1 x 500 = P2 x 200
P2 = 500 / 200
 = 2.5 bar
.

31.. $\triangle_f H^0$ (C_6H_6) = -3218 kJ/mol

32. $K_c = [PCl_3][Cl_2] / [PCl_5]$
(b) 120.48

33. (i) due to small size of F silicon can accommodate six F atom while size of chlorine is big silicon cannot accommodate six chlorine atom

(ii) from top to bottom atomic size increases the bond strength decrease

34a. $CH_3CH_2CH_2^-$ because increase in no. of alkyl gp. shows more +I effect thereby increasing e$^-$density and decreasing stability .   2

b. Because of electron withdrawing nature of NO_2 1

35. a.(i) $2R-X + 2Na \rightarrow R-R + 2NaX$

(ii) $C_6H_6 + CH_3Cl \xrightarrow{\text{(anhyd.) AlCl}_3} C_6H_5CH_3 + HCl$

   b. $CH_3-CH_2-C=CH-CH_3$
                          |
CH_2-CH_3
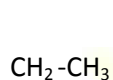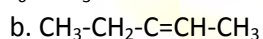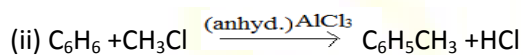
   c. Ethyne gives white ppt with ammonical silver nitrate while ethane do not give test / any other correct answer

OR

a. (i) due to resonance
   (ii) molecule of trans isomer can fit more tightly into one another
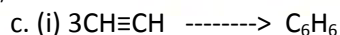
Red hot(Cu)
   c. (i) $3CH \equiv CH$ --------> C_6H_6
   HBr
      (ii) $CH_3CH = CH_2 \rightarrow CH_3-CH-CH_3$
|
Br
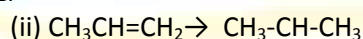
37iii). $\lambda = h/mv = 6.6 \times 10^{-34}/0.1 \times 10 = 6.6 \times 10^{-34}m$

iv) $KE = \frac{1}{2} mv^2 = 3 \times 10^{-25}$; $v^2 = 6 \times 10^{-25} = 60 \times 10^{-26} \Rightarrow v = 7.746 \times 10^{-13}m/s$
$\lambda = h/mv = 6.6 \times 10^{-34}/9.1 \times 10^{-31} \times 7.746 \times 10^{-13} = 9.363 \times 10^{-12}m$

v) $v = 3 \times 10^8 m/s$

$\lambda = h/mv = 6.6 \times 10^{-34}/m \times 3 \times 10^8$
$m = h/v \lambda = 6.6 \times 10^{-34}/3 \times 10^8 \times 3.6 \times 10^{-10} = 6.11 \times 10^{-33}kg$

OR

I) $\lambda = h/mv = 6.6 \times 10^{-34}/0.1 \times 4.37 \times 10^5 = 1.51 \times 10^{-38}m$

II) $\lambda = h/mv = 6.6 \times 10^{-34}/9.1 \times 10^{-31} \times 2.19 \times 10^6 = 3.3 \times 10^{-10}m$

PAPER NO 03

Max. Time: 3hrs   **Max. Marks=70**

Sl.No	Name of the Chapter	VSA	SA-I	SA-II	VB	LA	Total	WEIGHTAGE
1	Basic concepts of Chemistry		2(1)	3(1)			5(2)	11(4)
2	Structure of Atom			6(2)			6(2)	
3	Classification of Elements & Periodic properties				4(1)		4(1)	4(1)
4	Chemical Bonding		2(1)	3(1)			5(2)	21(9)
5	States of Matter	1(1)		3(1)			4(2)	
6	Thermodynamics	1(1)	2(1)	3(1)			6(3)	
7	Chemical equilibrium	1(1)				5(1)	6(2)	
8	Redox Reactions			3(1)			3(1)	16(5)
9	Hydrogen			3(1)			3(1)	
10	S – Block elements			3(1)			3(1)	
11	p- Block elements		2(1)			5(1)	7(2)	
12	Organic Chemistry-Basic principles and techniques	1(1)		6(2)			7(3)	18(7)
13	Hydrocarbon	1(1)	2(1)			5(1)	8(3)	
14	Environmental Chemistry			3(1)			3(1)	
	TOTAL	5(5)	10(5)	36(12)	4(1)	15(3)	70(26)	70(26)

1. A measured temperature on Fahrenheit scale is 200 °F. What will this reading

be on Celsius scale?

(i) 40 °C

(ii) 94 °C

(iii**) 93.3 °C**

(iv) 30 °C

2. If 500 mL of a 5M solution is diluted to 1500 mL, what will be the molarity of
the solution obtained?
(i) 1.5 M
(ii) 1.66 M
(iii) 0.017 M
(iv) 1.59 M

3. Which of the following terms are unitless?

(i) Molality

(ii) Molarity

(iii) Mole fraction

(iv) Mass percent

4. In which of the following pairs, the ions are iso-electronic?

(i) Na^+, Mg^{2+}

(ii) Al^{3+} , O^-

(iii) Na^+, O^{2-}

(iv) N^{3-}, Cl^-

5. Which of the following statements concerning the quantum numbers are

correct?

(i) Angular quantum number determines the three dimensional shape of

the orbital.

(ii) The principal quantum number determines the orientation and energy

of the orbital.

(iii) Magnetic quantum number determines the size of the orbital.

(iv) Spin quantum number of an electron determines the orientation of the

spin of electron relative to the chosen axis.

6. Which of the following is responsible to rule out the existence of definite paths

or trajectories of electrons?

(i) Pauli's exclusion principle.

(ii) Heisenberg's uncertainty principle.

(iii) Hund's rule of maximum multiplicity.

(iv) Aufbau principle.

7. Species having same bond order are :

(i) N2

(ii) N2-

(iii) **F2++**

(iv) **O2-**

3. Which of the following property of water can be used to explain the spherical
   shape of rain droplets?
   (i) viscosity
   (ii) surface tension
   (iii) critical phenomena
   (iv) pressure
4. The enthalpies of elements in their standard states are taken as zero. The
   enthalpy of formation of a compound
   (i) is always negative
   (ii) is always positive
   (iii) **may be positive or negative**
   (iv) is never negative
   10. We know that the relationship between Kc
   and Kp is
   Kp = Kc
   (RT)Δ n
   What would be the value of Δn for the reaction
   NH4Cl (s) -- NH3 (g) + HCl (g)
   (i) 1
   (ii) 0.5

(iii) 1.5
(iv) **2**

11. Identify the correct statement (s) in relation to the following reaction:
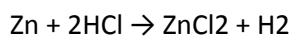
Zn + 2HCl → ZnCl2 + H2
(i) Zinc is acting as an oxidant
(ii) Chlorine is acting as a reductant
(iii) Hydrogen ion is acting as an oxidant
(iv) Zinc is acting as a reductant

12. Which of the following hydrides is electron-precise hydride?
(i) B2H6
(ii) NH3

(iii) H2O

(iv) CH4

13. The reducing power of a metal depends on various factors. Suggest the factor which makes Li, the strongest reducing agent in aqueous solution.
(i) Sublimation enthalpy
(ii) Ionisation enthalpy
(iii) Hydration enthalpy
(iv) Electron-gain enthalpy

14. Dry ice is
(i) Solid NH3
(ii) Solid SO2
(iii) Solid CO2
(iv) Solid N2

15. Nucleophile is a species that should have
(i**) a pair of electrons to donate**
(ii) positive charge
(iii) negative charge
(iv) electron deficient species

16. Arrange the following in decreasing order of their boiling points.
(A) n–butane (B) 2–methylbutane
(C) n-pentane (D) 2,2–dimethylpropane
(i) A > B > C > D
(ii) B > C > D > A
(iii) D > C > B > A
(iv) C > B > D > A

17.What is the oxidation state of oxygen in OF2
(i)1
(ii)-1

(iii) 0

(iv)+2

18.What is the shape of H2O2

(I) bent

(ii) trigonal planar

(iii) open book like structure

(iv)linear

19. What is the hybridization of carbon in C2H2

(I) sp

(ii) sp2

(iii) sp3

(iv)sp3d

20. Element having lowest Ionisation enthalpy is

(I) Na

(ii) K

(iii) Rb

(iv)Cs

21.(a)Definemolarityofasolution.

(b)Ifthedensityofmethanolis0.793kgL–1,whatisitsvolumeneeded formaking2.5L ofits0.25Msolution?

Givethenameandsymbol ofan element which is isoelectronic with S2-ion.

22. 6.(a)Howmanyelectrons in an atom may have n=4,ms=-1/2?

(b)WritetheelectronicconfigurationofFe^{2+} .

OR

Usings,p,dandfnotations,describetheorbitalwiththefollowingquantumnumbers:
(i)n=1,l=0(ii)n=3,l=1(iii)n=4,l=2(iv)n=4,l=3

23. Calculate the number of electrons which will together weigh one gram.

Mass of one electron = 9.10939×10^{-31} kg

∴ Number of electrons that weigh 9.10939×10^{-31} kg = 1

Number of electrons that will weigh 1 g = $(1 \times 10^{-3}$ kg)

$$= \frac{1}{9.10939 \times 10^{-31} \text{ kg}} \times \left(1 \times 10^{-3} \text{ kg}\right)$$

= $0.1098 \times 10^{-3 + 31}$

= 0.1098×10^{28}

= 1.098×10^{27}

28. Which out of NH_3 and NF_3 has higher dipole moment and why?
Answer:
In both molecules i.e., NH_3 and NF_3, the central atom (N) has a lone pair electron and there are three bond pairs. Hence, both molecules have a pyramidal shape. Since fluorine is more electronegative than hydrogen, it is expected that the net dipole moment of NF_3 is greater than NH_3. However, the net dipole moment of NH_3 (1.46 D) is greater than that of NF_3 (0.24 D).
This can be explained on the basis of the directions of the dipole moments of each individual bond in NF_3 and NH_3. These directions can be shown as:
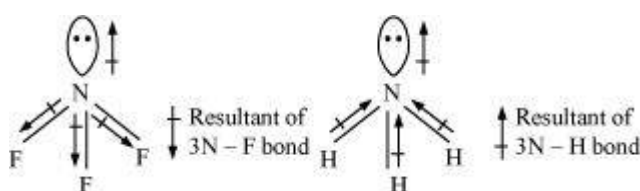
Thus, the resultant moment of the N–H bonds add up to the bond moment of the lone pair (the two being in the same direction), whereas that of the three N – F bonds partly cancels the moment of the lone pair.

Hence, the net dipole moment of NF_3 is less than that of NH_3.

OR

Is there any change in the hybridisation of B and N atoms as a result of the following reaction?

$BF_3 + NH_3 \rightarrow F_3B.NH_3$

Answer:
Boron atom in BF_3 is *sp^2* hybridized. The orbital picture of boron in the excited state can be shown as:
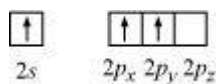
Nitrogen atom in NH_3 is *sp^3* hybridized. The orbital picture of nitrogen can be represented as:
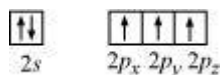
After the reaction has occurred, an adduct $F_3B{\cdot}NH_3$ is formed as hybridization of 'B' changes to *sp^3*. However, the hybridization of 'N' remains intact.

29. he first ionization enthalpy values (in kJmol^{-1}) of group 13 elements are :

B	Al	Ga	In	Tl
801	577	579	558	589

How would you explain this deviation from the general trend?

On moving down a group, ionization enthalpy generally decreases due to an increase in the atomic size and shielding. Thus, on moving down group 13, ionization enthalpy decreases from B to Al. But, Ga has higher ionization enthalpy than Al. Al follows immediately after *s*–block elements, whereas Ga follows after *d*–block elements. The shielding provided by *d*-electrons is not very effective. These electrons do not shield the valence electrons very effectively. As a result, the valence electrons of Ga experience a greater effective nuclear charge than those of Al. Further, moving from Ga to In, the ionization enthalpy decreases due to an increase in the atomic size and shielding. But, on moving from In to Tl, the ionization enthalpy again increases. In the periodic table, Tl follows after 4*f* and 5*d* electrons. The shielding provided by the electrons in both these orbitals is not very effective. Therefore, the valence electron is held quite strongly by the nucleus. Hence, the ionization energy of Tl is on the higher side.

30. Calculate the standard enthalpy of formation of $CH_3OH_{(l)}$ from the following data:
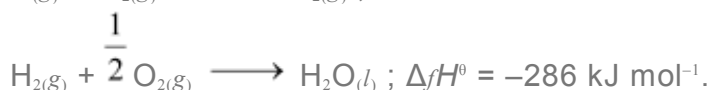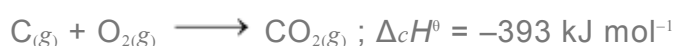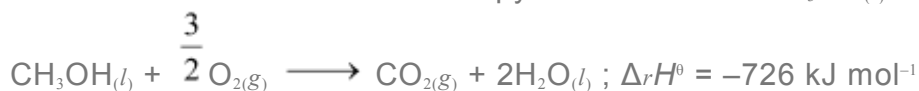
$CH_3OH_{(l)} + \dfrac{3}{2} O_{2(g)} \longrightarrow CO_{2(g)} + 2H_2O_{(l)}$; $\Delta_rH^\theta = -726$ kJ mol^{-1}

$C_{(g)} + O_{2(g)} \longrightarrow CO_{2(g)}$; $\Delta_cH^\theta = -393$ kJ mol^{-1}

$H_{2(g)} + \dfrac{1}{2} O_{2(g)} \longrightarrow H_2O_{(l)}$; $\Delta_fH^\theta = -286$ kJ mol^{-1}.

Answer:

The reaction that takes place during the formation of $CH_3OH_{(l)}$ can be written as:

$C_{(s)} + 2H_2O_{(g)} + \dfrac{1}{2} O_{2(g)}$
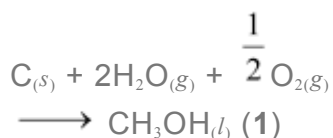
$\longrightarrow CH_3OH_{(l)}$ (**1**)

The reaction (**1**) can be obtained from the given reactions by following the algebraic calculations as:

Equation (ii) + 2 × equation (iii) – equation (i)

$\Delta_fH^\theta [CH_3OH_{(l)}] = \Delta_cH^\theta + 2\Delta_fH^\theta [H_2O_{(l)}] - \Delta_rH^\theta$

= (–393 kJ mol^{-1}) + 2(–286 kJ mol^{-1}) – (–726 kJ mol^{-1})

= (–393 – 572 + 726) kJ mol^{-1}

∴ $\Delta_f H^\theta$ [CH$_3$OH$_{(l)}$] = −239 kJ mol^{-1}

31. Discuss the various reactions that occur in the Solvay process.

Solvay process is used to prepare sodium carbonate.

When carbon dioxide gas is bubbled through a brine solution saturated with ammonia, sodium hydrogen carbonate is formed. This sodium hydrogen carbonate is then converted to sodium carbonate.

Step 1: Brine solution is saturated with ammonia.

$$2NH_3 + H_2O + CO_2 \longrightarrow (NH_4)_2 CO_3$$
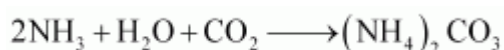
This ammoniated brine is filtered to remove any impurity.

Step 2: Carbon dioxide is reacted with this ammoniated brine to result in the formation of insoluble sodium hydrogen carbonate.

NH3+H2O+CO2→NH4HCO3NaCl+NH4HCO3→NaHCO3+NH4Cl

Step 3: The solution containing crystals of NaHCO$_3$ is filtered to obtain NaHCO$_3$.
Step 4: NaHCO$_3$ is heated strongly to convert it into NaHCO$_3$.

$$2NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$$
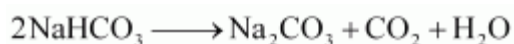
Step 5: To recover ammonia, the filtrate (after removing NaHCO$_3$) is mixed with Ca(OH)$_2$ and heated.

Ca(OH)2+2NH4Cl→2NH3+2H2O+CaCl2
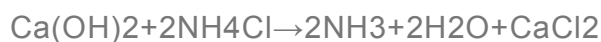
The overall reaction taking place in Solvay process
is $2NaCl + CaCO_3 \longrightarrow Na_2CO_3 + CaCl_2$

OR

How would you explain the following observations?

(i) BeO is almost insoluble but BeSO$_4$ in soluble in water,
(ii) BaO is soluble but BaSO$_4$ is insoluble in water,

(iii) LiI is more soluble than KI in ethanol.
Answer:
(i) BeO is almost insoluble in water and BeSO$_4$ is soluble in water. Be^{2+} is a small cation with a high polarising power and O^{2-} is a small anion. The size compatibility of Be^{2+} and O^{2-} is high. Therefore, the lattice energy released during their formation is also very high. When BeO is dissolved in water, the hydration energy of its ions is not sufficient to overcome the high lattice energy. Therefore, BeO is insoluble in water. On

the other hand, SO_4^{2-} ion is a large anion. Hence, Be^{2+} can easily polarise SO_4^{2-} ions, making $BeSO_4$unstable. Thus, the lattice energy of $BeSO_4$ is not very high and so it is soluble in water.

(ii) BaO is soluble in water, but $BaSO_4$ is not. Ba^{2+} is a large cation and $O^{2-}$is a small anion. The size compatibility of Ba^{2+} and O^{2-} is not high. As a result, BaO is unstable. The lattice energy released during its formation is also not very large. It can easily be overcome by the hydration energy of the ions. Therefore, BaO is soluble in water. In $BaSO_4$, Ba^{2+} and SO_4^{2-} are both large-sized. The lattice energy released is high. Hence, it is not soluble in water.

(iii) LiI is more soluble than KI in ethanol. As a result of its small size, the lithium ion has a higher polarising power than the potassium ion. It polarises the electron cloud of the iodide ion to a much greater extent than the potassium ion. This causes a greater covalent character in LiI than in KI. Hence, LiI is more soluble in ethanol.

32. What happens when

(a) Borax is heated strongly,

(b) Boric acid is added to water,

(c) Aluminium is treated with dilute NaOH,

(a) When heated, borax undergoes various transitions. It first loses water molecules and swells. Then, it turns into a transparent liquid, solidifying to form a glass-like material called borax bead.

$$Na_2B_4O_7 \cdot 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{\Delta} 2NaBO_2 + B_2O_3$$

Borax   Sodium   Boric

               metaborate   anhydride
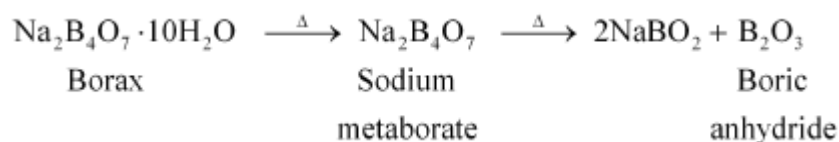
(b) When boric acid is added to water, it accepts electrons from $^-$OH ion.

$$B(OH)_3 + 2HOH \longrightarrow [B(OH)_4]^- + H_3O^+$$
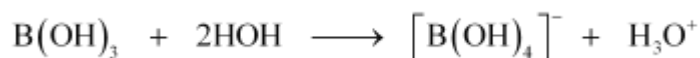
(c) Al reacts with dilute NaOH to form sodium tetrahydroxoaluminate(III). Hydrogen gas is liberated in the process.

$$2\,Al_{(s)} + 2\,NaOH_{(aq)} + 6\,H_2O_{(l)} \longrightarrow 2\,Na^+[Al(OH)_4]^-_{(aq)} + 3\,H_{2(g)}$$

33. 23.(a)Drawthestructureofeclipsedandstaggeredformofethane.

(b)Drawthecis-andtrans-formofbut-2-ene.

(c)Drawtheresonatingstructureofphenol.

34.

35. (a) write short notes on -:
(i) common ion effect   (ii) P_H
(iii) Heterogeneous equilibrium
(b)A sample of HI (g) is placed in a flask at a pressure of 0.2 atm .At equilibriumpartial pressure of HI (g) is 0.04 atm. What is Kp for the given equilibrium reaction?

$$2HI\ (g) \leftrightarrow H_2\ (g)\ +\ I_2\ (g)$$

OR

(a) What are the application of equilibrium constant.
(b) Write expression for Kc for the reaction

$$CaCO_{3\ (s)} \leftrightarrow CaO_{(s)} + CO_{2(g)}$$

(c) Discuss the effect of catalyst & addition of inert gas at constant pressure forthe reaction

$$2SO_2\ (g)\ +\ O_2\ (g)\ \leftrightarrow\ 2SO_3\ (g)$$

                                                    1

(a)   (i) Suppression of degree of dissociation of weak electrolyte in presence of similar type of ion is called common ion effect   1
      (ii)Negative logarithm of Hydrogen ion concentration is called P^H 1
      (iii) Equilibrium in which reactants and products are in two or more than two phases
   (b)

	2HI (g) $\leftrightarrow$	H_2 (g) +	I_2 (g)	
Initial preassure	0.2 atm	0 atm	0 atm	½
At Equilibrium	0.04 atm	0.16/2 atm = 0.08 atm	0.16/2 atm = 0.08 atm	

$Kp = P(H_2) \times P(I_2) / P^2(HI)$ ½
   $= 0.08 \times 0.08 / (0.04)^2$ 1
$Kp\ = 4.0$

OR

Applications of equilibrium constant
   (i)   predicting the extent of reactions   1+1
   (ii)   predicting direction of reactions
   if Q = K the reaction is in equilibrium
   Q > K reaction will proceed in backward direction
   Q < K reaction will proceed in forward direction
(b) Kc = (CO_2)g   1
(c) (i)No effect of catalyst

1. 36. (a) Write the IUPAC names of the product obtained by the ozonolysis offollowing compounds.
(i)Hex-2-ene (ii) 2-Ethyl but –1-ene
(b) Why is Wurtzreactionnot preferred for alkanes containing odd number ofcarbonatoms ? Illustrate your answer by taking one example.

(a) Complete the following equations-

(i) $CH_3\text{-}CH\text{=}C\text{-}CH_3$ + H_2O $\xrightarrow{\ H^+/Hg^{++}\ }$

          |
         CH_3

(ii) $CH_3\text{-}CH_2\text{-}CH\text{=}CH_2$ + HBr $\xrightarrow{\ Peroxide\ }$

(iii) C_6H_6 + Cl_2 $\xrightarrow{\ AlCl_3\ }$
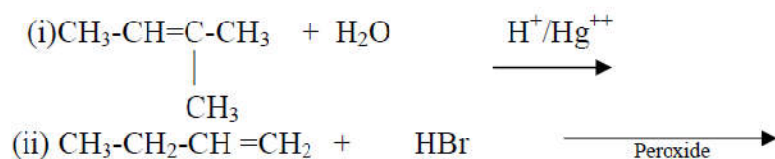
(b) What are the necessary conditions for any system to be aromatic ?

(a)
(i) Ethanal & Butanal   1
(ii) Pentan-2-one & methanal   1
(b) for alkanes containing odd number of carbon atoms a mixture of
two alkyl halide has to be used since two alkyl halide can react in   3
three different ways therefor e gives mixture of three alkane.
$CH_3\text{-}Br$ + $Br\text{-}CH_2\text{-}CH_3$ → $CH_3\text{-}\text{-}CH_2\text{-}CH_3$
$CH_3\text{-}Br$ + $Br\text{-}CH_3$ → $CH_3\text{-}CH_3$
$CH_3\text{-}CH_2\text{-}Br$ + $Br\text{-}CH_2\text{-}CH_3$ → $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_3$

OR

(a)   (i) $CH_3\text{-}CH_2C(OH)\text{-}CH_3$ 1
                |
               CH_3 1
   (ii) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2Br$
   (iii)

                        1
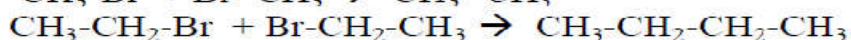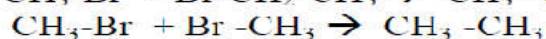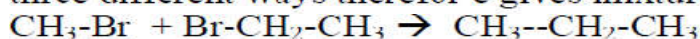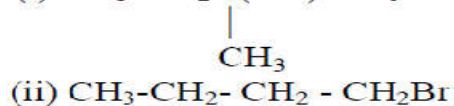
(b) (i) it should have a single cyclic cloud of delocalized pi
electrons above and below the plane of the molecule   2
     (ii) It should be planner
     (iii) it should have 2,6,10,14 pi electrons

37. (a) write short notes on -:
(i) common ion effect   (ii) P_H
(iii) Heterogeneous equilibrium
(b) A sample of HI (g) is placed in a flask at a pressure of 0.2 atm .At
equilibriumpartial pressure of HI (g) is 0.04 atm. What is Kp for the given equilibrium
reaction?
   2HI (g)   ↔ H_2 (g) + I_2 (g)

OR

(a) What are the application of equilibrium constant.
(b) Write expression for Kc for the reaction

$$CaCO_{3\,(s)} \leftrightarrow CaO_{(s)} + CO_{2(g)}$$

(c) Discuss the effect of catalyst & addition of inert gas at constant pressure for the reaction

$$2SO_2\,(g) + O_2\,(g) \leftrightarrow 2SO_3\,(g)$$

1

(a) (i) Suppression of degree of dissociation of weak
electrolyte in presence of similar type of ion is called
common ion effect   1
(ii) Negative logarithm of Hydrogen ion concentration is
called P^H 1
(iii) Equilibrium in which reactants and products are in two
or more than two phases

(b)

	2HI (g)	$\leftrightarrow$	H_2 (g) +	I_2 (g)	
Initial preassure	0.2 atm		0 atm	0 atm	½
At Equilibrium	0.04 atm		0.16/2 atm	0.16/2 atm	
			= 0.08 atm	= 0.08 atm	

$Kp = P(H_2) \times P(I_2) / P^2(HI)$ ½
$= 0.08 \times 0.08 / (0.04)^2$ 1
$Kp = 4.0$

OR

Applications of equilibrium constant
(i)   predicting the extent of reactions   1+1
(ii)   predicting direction of reactions
if Q = K the reaction is in equilibrium
Q > K reaction will proceed in backward direction
Q < K reaction will proceed in forward direction
(b) $Kc = (CO_2)g$ 1
(c) (i) No effect of catalyst

MARKING SCHEME

1. (iii)
2. (ii)
3. (iii)(iv)
4. (i)(iii)
5. (i)
6. (ii)
7. (iii)(iv)
8. (ii)
9. (iii)
10. (iv)
11. (iii)(iv)
12. (iv)
13. (iii)
14. (iii)
15. (i)(iii)
16. (iv)
17. (iv)
18. (iii)
19. (i)
20. (iv)
21.
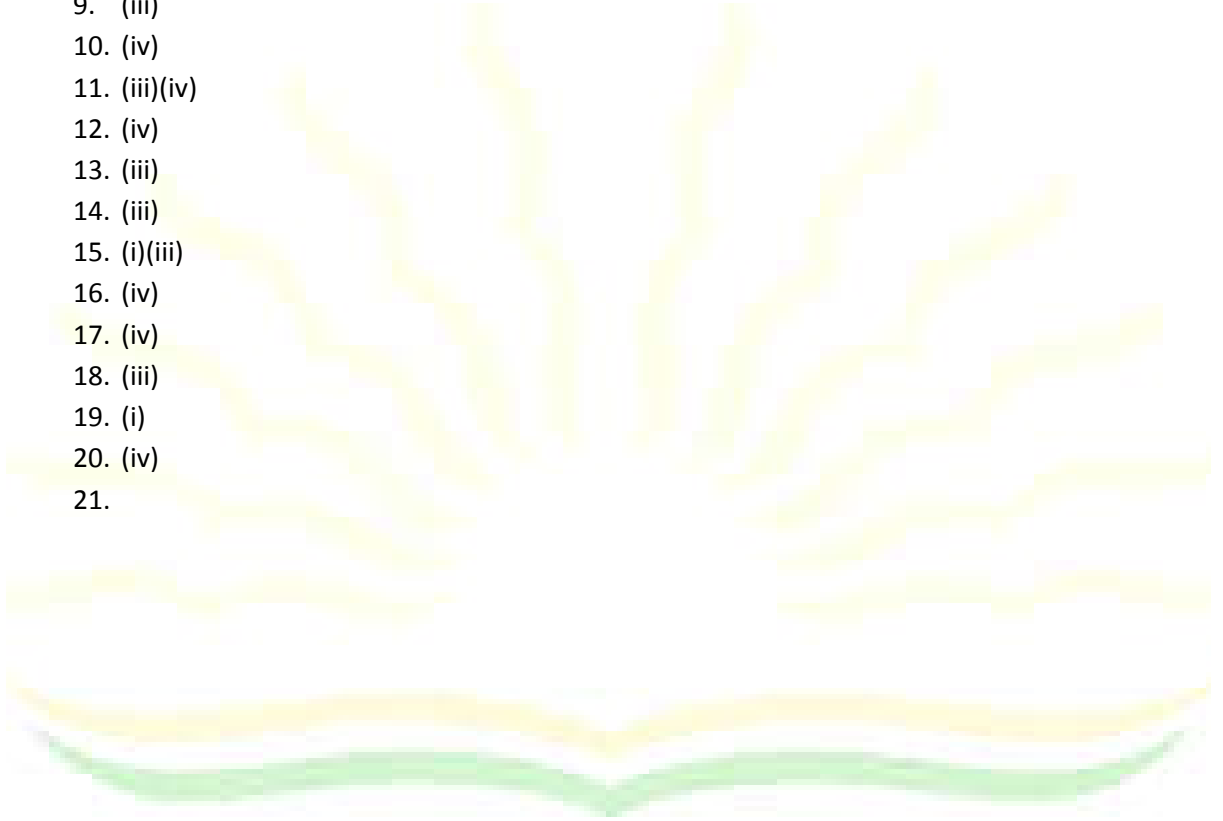
KENDRIYA VIDYALAYA SANGATHAN, JAMMU REGION
SESSION ENDING EXAMINATION 2019-20
SUBJECT-CHEMISTRY
CLASS-XI

PAPER NO 04

CLASS XI
SESSION ENDING EXAMINATION
BLUE PRINT

S.No	Unit	1 M	2M	3M	5M	Total marks
1	Basic concepts of Chemistry	3	1			5
2	Structure of Atom	2	2			6
3	Classification of Elements	1		1		4
4	Chemical Bonding &Molecular Structure	2		1		5
5	States of Matter	1	2			5
6	Thermodynamics	2		1		5
7	Equilibrium	1			1	6
8	Redox reaction	2	1			4
9	Hydrogen	2	1			4
10	S block elements	1		1		4
11	P block elements	1		1		4
12	Basic principles of organic Chemistry	2			1	7
13	Hydro carbons			1	1	8
14	Environmental Pollution			1		3
	Total No.of Questions &Marks	20	7	7	3	37(70)

SESSION ENDING EXAMINATION

CHEMISTRY CLASS : XI

TIME:3hrs
M.marks:70

GENERAL INSTRUCTIONS:
1. All questions are compulsory.
2. Questions No. 1 to 20 are very short answer questions of 1 mark each.
3.Questions No. 21o27 are very short answer questions of 2 marks each.
4. Questions No. 28 to 34 are short answer questions of 3 marks each.
5. Questions No.35 to 37 carry   5 marks each
6. Use log tables if necessary.

1. What will be the molarity of a solution, which contains 5.85 g of NaCl(s) per 500 mL?

(i) 4 mol L–1

(ii) 20 mol L–1

(iii) **0.2 mol L–1**

(iv) 2 mol L–1

2. The empirical formula and molecular mass of a compound are CH2O and

180 g respectively. What will be the molecular formula of the compound?

(i) C9H18O9

(ii) CH2O

(iii**) C6H12O6**

(iv) C2H4O2

3. Total number of orbitals associated with third shell will be _____.

(i) 2

(ii) 4

(iii) 9

(iv) 3

4. Orbital angular momentum depends on _____.

(i) l

(ii) n and l

(iii) n and m

(iv) m and s

5. The number of atoms present in one mole of an element is equal to Avogadro number. Which of the following element contains the greatest number of atoms?

(i) 4g He

(ii) 46g Na

(iii) 0.40g Ca

(iv) 12g He

6. The elements in which electrons are progressively filled in 4f-orbital are called

(i) actinoids

(ii) transition elements

(iii) **lanthanoids**

(iv) halogens

7. In which of the following molecule/ion all the bonds are not equal?

(i) XeF4

(ii) BF4-

(iii) **C2H4**

(iv) SiF4

8.Which molecule/ion out of the following does not contain unpaired electrons?

(i) N2+

(ii) O2

(iii) O2-

(iv) B2

9. A person living in Shimla observed that cooking food without using pressure cooker takes more time. The reason for this observation is that at high altitude:

(i) pressure increases

(ii) temperature decreases

(iii) **pressure decreases**

(iv) temperature increases

10. The state of a gas can be described by quoting the relationship between___.

(i) pressure, volume, temperature

(ii) temperature, amount, pressure

(iii) amount, volume, temperature

(iv) **pressure, volume, temperature, amount**

11. In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

(i) $q = 0$, $\Delta T \neq 0$, $w = 0$

(ii) $q \neq 0$, $\Delta T = 0$, $w = 0$

(iii**) $q = 0$, $\Delta T = 0$, $w = 0$**

(iv) $q = 0$, $\Delta T < 0$, $w \neq 0$

12. Acidity of BF_3 can be explained on the basis of which of the following concepts?

(i) Arrhenius concept

(ii) Bronsted Lowry concept

(iii) **Lewis concept**

(iv) Bronsted Lowry as well as Lewis concept.

13. Which of the following elements does not show disproportionation tendency?

(i) Cl

(ii) Br

(iii) F

(iv) I

14. Which of the following is not an example of redox reaction?

(i) $CuO + H_2 \longrightarrow Cu + H_2O$

(ii) $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$

(iii) $2K + F_2 \longrightarrow 2KF$

(iv) **$BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$**

15.Hydrogen peroxide is _____.

(i) an oxidising agent

(ii) a reducing agent

(iii) **both an oxidising and a reducing agent**

(iv) neither oxidising nor reducing agent

16.Which of the following compounds is used for water softening?

(i) $Ca_3(PO4)_2$

(ii) Na_3PO_4

(iii) **Na6P6O18**

(iv) Na2HPO4

17. When sodium is dissolved in liquid ammonia, a solution of deep blue colour

is obtained. The colour of the solution is due to

(i) **ammoniated electron**

(ii) sodium ion

(iii) sodium amide

(iv) ammoniated sodium ion

18. The principle involved in paper chromatography is

(i) **Adsorption**

(ii) Partition

(iii) Solubility

(iv) Volatility

19.Nucleophile is a species that should have

(i) **a pair of electrons to donate**

(ii) positive charge

(iii) **negative charge**

(iv) electron deficient species

20.Which of the following is a Lewis acid ?

(i) AlCl3

(ii) MgCl2

(iii) CaCl2

(iv) BaCl2

21.The density of 3 M solution of NaCl is 1.25 g mL^{-1}. Calculate molality of the solution.?

22Calculate energy of one mole of photons of radiation whose frequency is 5 ×10^{14} Hz.?

23. Define

1) Aufbau principal?

2) Hunds rule?

24 . At 25°C and 760 mm of Hg pressure a gas occupies 600 mL volume. What will be its pressure at a height where temperature is 10°C and volume of the gas is 640 mL

25 .The threshold frequency for a metal is 7.0 ×1014 s–1. Calculate the kinetic energy of an electron emitted when radiation of frequency v =1.0 ×1015 s–1 hits the metal?

OR

(i) Define an orbital?

(ii)What is meant by photoelectric effect?

26   Balance the following reaction: Cr2O72- +Fe2+ -----Cr2+ +Fe 3+ in   acidic medium.

OR

What is salt bridge ?Write its twofunction also.

27a) H_2O_2 should be stored in wax lined bottle why?

b) Give one method for removal of temporary & permanent hardness of   water.

28). (a) How would you explain the fact that first ionisation enthalpy of sodium is lower than that of magnesium but its second ionisation enthalpy is higher than that of magnesium?

(b) Explain why the electron gain enthalpy of fluorine is less negative than that of chlorine.

OR

(a) Consider the following species :

N^{3-}, O^{2-}, F^{-}, Na^{+}, Mg^{2+} and Al^{3+}

(i) What is common in them?

(ii) Arrange them in the orderof increasing ionic radii.

(b) In terms of period and group where would you locate the element with Z =14?

29. (a) Explain why PCl_5 is trigonal bipyramidal whereas IF_5 is square pyramidal
(b) Discuss the shape of the following molecules using the VSEPR model:
(i) $BeCl_2$ (ii) H_2O (iii)PCl_5

OR

(a) Which out of NH_3 and NF_3 has higher dipole moment and why ?
(b) What is hybridization? Discuss the shape of the following molecules on the basis of hybridization:
(i) SF_6 (ii) $SiCl_4$
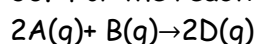
30. For the reaction
$2A(g)+ B(g)\rightarrow 2D(g)$
$\Delta U=-10.5kJ$ and $\Delta S =-44.1JK^{-1}$
Calculate ΔGo for the reaction and predict whether the reaction may occur spontaneously.

31..(a) Account for the following.-
(i) Na and K impart colour to the flame but Mg does not.
(ii) Lithium is the best reducing agent in aqueous solution.
(iii) Li_2CO_3 decomposes at a lower temperature
32 .Write the balance equation for the following:
        i) BF_3 + LiH →
ii) B_2H_6 + H_2O →
iii) Al   +   NaOH   →
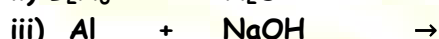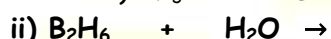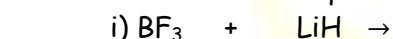
33.Explain giving suitable reactions:
        (a)Markovnikov's rule
        (b)Wurtz reaction.
          (c)β – elimination.
34..Write a brief note on the following environmental terms:
        i) Photochemical smog ii) Eutrophication iii) Green Chemistry.
35. (a) At equilibrium, the concentrations of N_2=3.0 × 10^{-3}M, O2 = 4.2 × 10^{-3}M and NO= 2.8 × 10^{-3}M in a sealed vessel at 800 K. what will be K_c for the reaction
$N_2(g) + O_2(g)$ $2NO(g)$
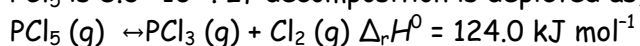
(b) At 473 K, equilibrium constant Kc for decomposition of phosphorus pentachloride, PCl_5 is 8.3 ×10^{-3}. If decomposition is depicted as,
$PCl_5 (g)$ ↔$PCl_3 (g) + Cl_2 (g)$ Δ_rH^0 = 124.0 kJ mol^{-1}
(i) Write an expression for $K_c$for the reaction.
(ii) What is the value of $K_c$for the reverse reaction at the same temperature ?
OR
(a) What do you understand by (i) Common ion effect (ii) Buffer solution
(b). State Le Chatelier's principle. Describe the effect of :

36 a) Write about Markownikoff's rule and peroxide effect.

    b) convert   i) Sodium ethanoate to methane.

                    ii) Benzene to Toluene

                    iii) Ethyne to Benzene

[or]

a)   Why organic compounds fused with sodium metal for detection of nitrogen,sulphur & halogen by Lassaigne's test?

b)   Write the functional isomers of the compound having molecular formula C_3H_6O and their IUPAC name.

c)   Why is wurtz reaction not preferable for preparation of alkanes containing odd no.of carbon atoms?

37. (i)Explain giving suitable reactions: 5

          (a) Markovnikov's rule

          (b) Wurtz reaction.

          (c) β – elimination.

    (ii)   An alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one. Write structure and IUPAC name of 'A'.

OR

    a) Convert :

        i) Benzene to p-nitrobromobenzene

        ii) Ethyl chloride to ethene.

    b) Give mechanism of addition of HBr to propene.

    c) Write a note on Friedel-Crafts alkylation.

केन्द्रीय विद्यालय संगठन

•	0.2 mol L–1	1mark
•	C6H12O6	1mark
•	9	1mark
•	I	1mark
•	12g He	1mark
•	lanthanoids	1mark
•	C2H4	1mark
•	Correct answer	1mark
•	pressure decreases	1mark
•	pressure, volume, temperature, amount	1mark
•	q = 0, ΔT = 0, w = 0	1mark
•	Lewis concept	1mark
•	Correct answer	1mark
•	BaCl2 + H2SO4 ⟶ BaSO4 + 2HCl	1mark
•	both an oxidising and a reducing agent	1mark
•	) Na6P6O18	1mark
•	ammoniated electron	1mark
•	Adsorption	1mark
•	a pair of electrons to donate	1mark
•	AlCl3	1mark
•	$M = 3$ mol L^{-1} Mass of NaCl in 1 L solution = 3 × 58.5 = 175.5 g Mass of 1L solution = 1000 × 1.25 = 1250 g (since density = 1.25 g mL^{-1}) Mass of water in solution = 1250 –175.5 = 1074.5 g Molality = No. of mole/Mass of sovent(kg) = 3 mol/1.0745kg **= 2.79 m**	2mark
•	Energy (*E*) of one photon is given by the expression *E* = *hv*	2mark

	$h = 6.626 \times 10^{-34} J\ s$ $v = 5 \times 1014\ s^{-1} (given)$ $E = (6.626 \times 10^{-34} J\ s) \times (5 \times 10^{14} s^{-1})$ $= 3.313 \times 10^{-19} J$ *Energy* of one mole of photons $= (3.313 \times 10^{-19} J) \times (6.022 \times 10^{23} mol^{-1})$ **$= 199.51\ kJ\ mol^{-1}$**	
•	1)Correct answer 2)Correct answer	2mark
•	Correct use of formula and correct substitution Correct calculations and Correct answer	2mark
•	Kinetic energy $= 1/2 m_e v^2 = h(v - v0\ )$ $= 1.988 \times 10^{-19} J$ OR i.correct definition ii.correct statement	2mark
•	Identification of oxidation and reduction Balancing of redox reaction $6\ Fe^{2+} Cr_2 O_7{}^{2-}$---------------🡪 $6 Fe^{3+} + 2 Cr^{3+} 14\ H_2 O$ OR correct definition and correct function	2mark
•	.a)Because $H_2 O_2$ undergo violent self oxidation in presence of air b)Correct answer	2mark
•	a) The first ionization enthalpy of sodium is more than that of magnesium. This is primarily because of two reasons: (i) The atomic size of sodium is greater than that of magnesium. (ii) The effective nuclear charge of magnesium is higher than that of sodium. However, the second ionization enthalpy of sodium is higher than that of magnesium. This is because after losing an electron, sodium attains the stable noble gas configuration. On the other hand, magnesium, after losing an electron still has one electron in the 3s-orbital. In order to attain the stable noble gas configuration, it still has to lose one more electron. (b) This is because the atomic size of F is smaller than that of Cl. In F, the electron will be added to quantum level n = 2,and will experience more inter electronic repulsions but in Cl, the electron is added to quantum level n = 3. Therefore, there are less electron-electron repulsions in Cl and an additional electron can be accommodated easily. OR (a)(i) Each of the given species (ions) has the same number of electrons (10 electrons). Hence,the given species are	3mark

46

	isoelectronic. (ii) The ionic radii of isoelectronic species increases with a decrease in the magnitudes of nuclear charge. The arrangement of the given species in order of their increasing nuclear charge is as follows: $N^{3-} < O^{2-} < F^- < Na^+ < Mg^{2+} < Al^{3+}$ Nuclear charge = +7 +8 +9 +11 +12 +13 Therefore, the arrangement of the given species in order of their increasing ionic radii is as follows: $Al^{3+} < Mg^{2+} < Na^+ < F^- < O^{2-} < N^{3-}$ (b) Z=14 ($1s^2 2s^2 2p^6 3s^2 3p^2$) ; it belongs to p-block, Period = 3rd; Group = 10+4 = 14th	
•	(a) correct reason (b) (i) AB_2 Linear (ii) AB_2L_2 Bent (iii) AB_5 TriagonalBipyramidal with shapes <center>OR</center> (a) In both molecules i.e NH $_3$and NF $_3$, the central atom (N) has a lone pair electron and there are three bond pairs. Hence, both molecules have a pyramidal shape. The net dipole moment of NH$_3$(1.46 D) is greater than that of NF $_3$(0.24 D). This can be explained on the basis of directions of the dipole moments of each individual bond in NH$_3$ and NF $_3$. These directions can be shown with diagrams. Thus, the resultant moment of the N-H bonds add up to the bond moment of the lonepair (the two being in the same direction),	3mark
•	**Correct formula($\Delta H^o = \Delta U^o + \Delta n_g RT$ and $\Delta G^o = \Delta H^o + T\Delta S^o$)** <center>Correct calculation</center> <center>Correct answer(ΔH^o=-12.98Kj, ΔG^o=0.16Kj) **Since , $\Delta G^o$is positive the reaction will be non spontaneous**</center>	3mark
•	.(i) Correct reason. (ii) Correct reason. **(iii) Correct reason**	3mark
•	.1)correct reaction .2)correct reaction .3)correct reaction	3mark
•	1)correct definition correct reaction 2)correct definition correct reaction 3)correct definition correct reaction	3mark
•	1)correct definition 2)correct definition 3)correct definition	3mark
•	(i) addition of H_2 (ii) addition of CH_3OH (iii) removal of CO (iv) removal of CH_3OH on the equilibrium of the reaction: $2H_2(g) + CO (g) \leftrightarrow CH_3OH (g)$ (a) For the reaction equilibrium constant, Kc can be written as,	5mark

	$$K_c = [NO]^2/[N_2][O_2]$$	
	$K_c = 0.622$	
	(b) (i) $K_c = [PCl_{3(g)}][Cl_{2(g)}]/[PCl_{5(g)}]$	
	(ii) $K_c' = 1/K_c = 1/8.3 \times 10^{-3} = 1.20 \times 10^2$	
	OR	
	(a) Correct statements	
	(b) It states that a change in any of the factors that determine the equilibrium conditions of a system will cause the system to change in such a manner so as to reduce or to counteract the effect of the change.	
	(a) Forward direction (b) Backward direction	
	(c) Backward direction (d) Forward direction	

•	Correct equation
	    Correct conversion
	•To covert the covalent bond in to ionized state
	      $NaCn, Na_2S \&NaX$
	•CH_3CH_2CHO PROPANAL
	     CH_3COCH_3 PROPANONE
	   C) Because alkyl group of two compounds combined together to form hydrocarbon.
		5mark

•	i.correct explanation with reaction ii. correct structure, 3-ethylpent-2-ene or i.correct reaction ii.correct mechanism iii.correct reaction	5mark

PAPER NO 05

Q 1 As the temperature increases, average kinetic energy of molecules increases. What would be the effect of increase of temperature on pressure provided the volume is constant?

(i) increases(ii) decreases (iii) remains same (iv) becomes half

Q 2 Which of the following options does not represent ground state electronic configuration of an atom?

    (i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8\ 4s^2$ (ii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^9\ 4s^2$

(iii) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$ (iv) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^1$

Q 3 The order of screening effect of electrons of s, p, d and f orbitals of a given shell of an atom on its outer shell electrons is:

(i) s> p > d > f (ii) f > d > p > s (iii) p < d < s > f (iv) f > p > s > d

Q 4Which of the following species has tetrahedral geometry?

(i) BH_4^- (ii) NH_2^- (iii) CO_3^{2-} (iv) H_3O^+

Q 5 What is SI unit of viscosity coefficient (η)?

(i) Pascal (ii) Nsm^{-2} (iii) $km^{-2}\ s$ (iv) $N\ m^{-2}$

Q 6 The enthalpies of elements in their standard states are taken as zero. The enthalpy of formationof a compound

(i) is always negative (ii) is always positive

(iii) may be positive or negative (iv) is never negative

Q 7 For the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI\ (g)$, the standard free energy is $\Delta GV > 0$.

The equilibrium constant (K) would be _____.

(i) K = 0 (ii) K > 1 (iii) K = 1 (iv) K < 1

Q 8 Which of the following is not an example of redox reaction?

(i) $CuO + H_2 \rightarrow Cu + H_2O$ (ii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

(iii) $2K + F_2 \rightarrow 2KF$ (iv) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Q 9 Radioactive elements emit α, β and γ rays and are characterised by their halflives.

The radioactive isotope of hydrogen is

(i) Protium (ii) Deuterium

(iii) Tritium (iv) Hydronium

Q 10 Metal carbonates decompose on heating to give metal oxide and carbon dioxide. Which of the metal carbonates is most stable thermally?

(i) $MgCO_3$ (ii) $CaCO_3$(iii) $SrCO_3$(iv) $BaCO_3$

Q 11 Which of the following oxides is acidic in nature?

(i) B_2O_3 (ii) Al_2O_3 (iii) Ga_2O_3 (iv) In_2O_3

Q 12 The principle involved in paper chromatography is

(i) Adsorption (ii) Partition (iii) Solubility (iv) Volatility

Q13 Which of the following gases is not a green house gas?

(i) CO (ii) O_3 (iii) CH_4 (iv) H_2O vapour

Q14 Which of the following is the correct IUPAC name?

(i) 3-Ethyl-4, 4-dimethylheptane

(ii) 4,4-Dimethyl-3-ethylheptane

(iii) 5-Ethyl-4, 4-dimethylheptane

(iv) 4,4-Bis(methyl)-3-ethylheptane

Q 15 Which of the carbonates given below is unstable in air and is kept in CO_2 atmosphere to avoid decomposition.

(i) $BeCO_3$ (ii) $MgCO_3$ (iii) $CaCO_3$ (iv) $BaCO_3$

Q 16 Catenation i.e., linking of similar atoms depends on size and electronic configuration of atoms. The tendency of catenation in Group 14 elements follows the order:

(i) C > Si >Ge>Sn(ii) C >> Si >Ge ≈ Sn

(iii) Si > C >Sn>Ge (iv) Ge>Sn> Si > C

Q 17 The state of a gas can be described by quoting the relationship between___.

(i) pressure, volume, temperature (ii) temperature, amount, pressure

(iii) amount, volume, temperature (iv) pressure, volume, temperature, amount

Q 18In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following.

(i) q = 0, ΔT ≠ 0, w = 0 (ii) q ≠ 0, ΔT = 0, w = 0

(iii) q = 0, ΔT = 0, w = 0 (iv) q = 0, ΔT < 0, w ≠ 0

Q 19 Which of the following is not an actinoid?

(i) Curium (Z = 96) (ii) Californium (Z = 98)

(iii) Uranium (Z = 92) (iv) Terbium (Z = 65)

Q 20 In NO_3^- ion, the number of bond pairs and lone pairs of electrons on nitrogen atom are

(i) 2, 2   (ii) 3, 1   (iii) 1, 3 (iv) 4, 0

Q 21 (i) Write the IUPAC name and Symbol of the element with atomic number 120 .

(ii) What are isoelectronic species? Give example.

Q 22 7Using s, p, d, f notations, describes the orbital with the following quantum numbers

(a)n=4,l=2 (b)n = 5, l=3

Q23 .(i)State Le Chatelier'sprincipl

(ii)Indicate the direction in which the equilibrium will shift when:

2SO2 (g) + O2(g) ⇌ 2SO3(g) + heat
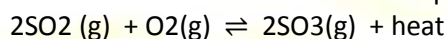
(a)Pressure is increased.   (b) Concentration of SO2 is increased

Q 24 What happens when   a) Sodium metal is dropped in water?

b) Sodium metal is heated in free supply of air?

Q 25 .On the basis of VSEPR theory draw the structure and tell the shape of :

(i)XeF4   (ii)ClF3

Q 26 (i)Explain giving suitable reactions:

(a)Markovnikov's rule   (b)Wurtz reaction.

Q 27 .Write a brief note on the following environmental terms:

(i) Photochemical smog   ii) Eutrophication

Q 28(1) State Dalton's law of partial pressure.

(2) Acation is always smaller than their parent atom

(3)Write the correct set of four quantum no for the valence electron of Potassium atom(Z=19)

Q29 (a) Common ion effect (b) Homogenous equilibriu (c) Conjugate acid-base pair

Q 30 Calculate the oxidation number of each sulphur atom in the following compounds:

(a) $Na_2S_2O_3$ (b) $Na_2S_4O_6$ (c) Na_2SO_3

Q 31 Why does hard water not form lather with soap?

Q 32 Write the names of isotopes of hydrogen.State the ratio of their atomic masses.

Q 33 Which of the following compounds will not exist as resonance hybrid. Give reason for your answer :

(i) CH_3OH (ii) R—$CONH_2$ (iii) $CH_3CH = CHCH_2NH_2$

Q 34 Match the following reactants in Column I with the corresponding reaction products in Column II.

Column I Column II

(i) Benzene + Cl_2 3AlCl ▯▯▯▯→ (a) Benzoic acid

(ii) Benzene + CH_3Cl 3AlCl ▯▯▯▯→ (b) Methyl phenyl ketone

(iii) Benzene + CH3COCl 3 AlCl 𝗑𝗑𝗑𝗑→ (c) Toluene

(iv) Toluene 4 KMnO /NaOH 𝗑𝗑𝗑𝗑𝗑𝗑→ (d) Chlorobenzene

(e) Benzene hexachloride

Q35 According to de Broglie, matter should exhibit dual behaviour, that is both particle and wave like properties. However, a cricket ball of mass 100 g does not move like a wave when it is thrown by a bowler at a speed of 100 km/h. Calculate the wavelength of the ball and explain why it does not show wave nature.

Q 36 Write a relation between ΔG and Q and define the meaning of each term and answer the following :
(a) Why a reaction proceeds forward when Q < K and no net reaction occurs when Q = K. (b) Explain the effect of increase in pressure in terms of reaction quotient Q. for the reaction : $CO (g) + 3H_2 (g) \rightleftharpoons CH_4 (g) + H_2O (g)$

Q 37 An alkyl halide $C_5H_{11}Br$ (A) reacts with ethanolic KOH to give an alkene 'B', which reacts with Br_2 to give a compound 'C', which on dehydrobromination gives an alkyne 'D'. On treatment with sodium metal in liquid ammonia one mole of 'D' gives one mole of the sodium salt of 'D' and half a mole of hydrogen gas. Complete hydrogenation of 'D' yields a straight chain alkane. Identify A,B, C and D. Give the reactions invovled

MARKING SCHEME

Q No	Answer	Marks
Q 1	I	1
Q 2	II	1
Q3	I	1
Q4	I	1
Q5	II	1
Q6	III	1
Q7	IV	1
Q8	IV	1
Q9	III	1
Q10	IV	1
Q11	I	1
Q12	II	1
Q13	I	1
Q14	II	1
Q15	I	1
Q16	II	1
Q17	IV	1
Q18	III	1
Q19	IV	1
Q20	IV	1
Q21	(i)Symbol – UbnIUPAC name - unbinilium(ii)Atoms and ions which contain the same number	1

	of electrons. Example : O^{2-}, F^-, Na^+ and Mg^{2+}	1
Q22	4d (b) 5f	1 1
Q23	(i) It states that a change in any of the factors that determine the equilibrium conditions of a system will cause the system to change counteract the effect of the change.. (ii) (a)Forward (b)Forward	1 1
Q24	i. $2Na + 2H_2O \rightarrow 2Na+ + 2OH- + H_2$ ii. $2Na + O_2 \rightarrow Na_2O_2$ (peroxide)	1 1
Q25	Square planar , T-shaped ,bent shape.	1+1
Q26	i.a) The rule states that negative part of the addendum (adding molecule) gets attached to that carbon atom which possesses lesser number of hydrogen atoms. b) Alkyl halides on treatment with sodium metal in dry ethereal (free from moisture) solution give higher alkanes. This reaction is known as Wurtz reaction $$CH_3Br + 2Na + CH_3Br \xrightarrow{\text{Dry ether}} CH_3CH_3 + NaBr$$	1 1
Q27	(i) Photochemical smog occurs in warm, dry and sunny climate. The main components of the photochemical smog result from the action of sunlight on unsaturated hydrocarbons and nitrogen oxides produced by automobiles and factories. Photochemical smog has high concentration of oxidising agents and is, therefore, called as oxidising smog. (ii)The process in which nutrient enriched water bodies support a dense plant population, which kills animal life by depriving it of oxygen and results in subsequent loss of biodiversity is known as **Eutrophication**	1 1
Q28	1.The total pressure exerted by the mixture of non-reactive gases is equal to the sum of the partial pressures of individual gases i.e., the pressures which these gases would exert if they were enclosed separately in the same volume and under the same conditions of temperature. 2. Due to more effective nuclear charge 3.n=4,l=0,m=0,s=+½	1 1 1
Q29	Common ion effect: The suppression in the dissociation a weak electrolyte by the the addition of a strong electrolyte having a common ion is called common ion effect. $$NH_4OH \leftrightharpoons NH_4^+ + OH^-$$ *weak electrolyte* $$NH_4Cl \rightarrow NH_4^+ + Cl^-$$ Strong electrolyte common ion Homogenous equilibrium: All reactants and products are in the same phase e.g. $N_2(g) + 3H_2(g) \leftrightharpoons 2NH_3(g)$ Conjugate acid base pair: It differs by one proton. $$HCl(aq) + H_2O\ (l) \leftrightharpoons H_3O^+(aq) + Cl^-(aq)$$ *Acid* Base Conjugate Conjugate base acid	1 1 1
Q30	(a) +2 (b) +5, 0, 0, +5 (c) +4	1 1 1
Q31	Hard water contain calcium and magnesium salts Which forms scum Insoluble solid forms	1 1 1
Q32	H,D & T Ratio 1:2:3	1+1 +1
Q33	CH3OH; Any possible contributing structure will have charge separation and incomplete octet of electrons on atoms. So the structure will be unstable due to high energy. e.g., .	1 1 1
Q34	(i) $\rightarrow$ (d) (ii) $\rightarrow$ (c) (iii) $\rightarrow$ (b)	1

Q35		1
	$\lambda = h/mv$	1
	m = 100 g = 0.1 kg.	1
	v = 100 km/hr	1
	h = 6.626 × 10–34 Js	1
	= 238.5 × 10–36m–1	

Since the wavelength is very

= 238.5 × 10–36m–1

Since the wavelength is very small, the wave nature cannot be detected.

Q36	ΔG = ΔGV + RT lnQ ΔGV = Change in free energy as the reaction proceeds ΔG =	1
	Standard free energy change	1
	Q = Reaction quotient	1
	R = Gas constant	1
	T = Absolute temperature Since ΔGV = – RT lnK	1

∴ΔG = – RT lnK + RT lnQ = RT ln

Q K

If Q < K, ΔG will be negative. Reaction proceeds in the forward direction. If Q = K, ΔG = 0, no net reaction.

[Hint: Next relate Q with concentration of CO, H2, CH4 and H2O in view of reduced volume (increased pressure). Show that Q < K and hence the reaction proceeds in forward direction.]

Q37	C5H11Br ⬚⬚⬚⬚→ alc.KOH Alkene (C5H10) ⬚⬚⬚⬚→ 2 2 Br in CS C5H10Br2	
	(A) (B) (C)	1
	⬚⬚⬚⬚→ C5H8 3 Na–liq.NH ⬚⬚⬚⬚→ C5H7–Na + 12H2	1
	D (Alkyne) Sodium alkylide	1
	The reactions suggest that (D) is a terminal alkyne. This means triple bond is at the	1
	end of the chain. It could be either (I) or (II).	1

CH3— CH2—CH2—CH2 ≡CH (I)

Since alkyne 'D' on hydrogenation yields straight chain alkane, therefore structure I is the structure of alkyne (D). Hence, the structures of A, B and C are as follows :

(A) CH3—CH2—CH2—CH2—CH2Br

(B) CH3—CH2—CH2—CH CH2

(C) CH3—CH2—CH2—CH (Br)—CH2Br

PAPER NO 06

S.No.	Unit	VSA (1 Mark)	SA (2 Marks)	LA-I (3 Marks)	LA-II (5 Marks)	Total
1	Some Basic Concepts of Chemistry	1	1(2)			11
2	Structure of Atom	1			1	
3	Classification of Elements and Periodicity in Properties	1		1		4
4	Chemical Bonding and Molecular Structure	1	1	1		
5	States of Matter: Gases and Liquids	1		1		
6	Chemical Thermodynamics	1	1	1		21
7	Equilibrium	2		1		
8	Redox Reactions	1	1			
9	Hydrogen	1	1			
10	s -Block Elements	1			1	16
11	p -Block Elements	1		1		
12	Organic Chemistry: Some basic Principles and Techniques	3			1	
13	Hydrocarbons	2	1	1		18
14	Environmental Chemistry	3				
Total		20X1=20	7X2=14	7X3=21	3X5=15	70(37)

CHEMISTRY (THEORY)
CLASS XI

Time allowed: 3 Hours   **Maximum Marks: 70**

General instructions:

1.   All questions are compulsory.

2.   Marks for each question are indicated against it.

3.   Question numbers 1 to 20are very short answer question and carries 1 mark each.

4.   Question numbers 21 to 27 are short answer question and carry 2 marks each.

5.   Question numbers 28 to 34 are also short answer question and carries 3mark each.

6.   Question numbers 35 to 37 are long answer questions and carries 5marks each.

7.   Use log tables, if necessary. Use of calculators is **not** allowed.

1. What will be the molarity of a solution, which contains 5.85 g of NaCl(s) per 500 mL?

 (i) 4 mol L^{-1} (ii) 20 mol L^{-1} (iii) 0.2molL^{-1} (iv) 2 molL-I

2. Total number of orbitals associated with third shell will be _____.

(i) 2 (ii) 4 (iii) 9 (iv) 3

3. Consider the isoelectronic species, Na^+, Mg^{2+}, F^- and O^{2-}. The correct order of increasing length of their radii is _____.

 (i) $F^- < O^{2-} < Mg^{2+} < Na^+$ (ii) $Mg^{2+} < Na^+ < F^- < O^{2-}$ (iii) $O^{2-} < F^- < Na^+ < Mg^{2+}$ (iv) $O^{2-} < F^- < Mg^{2+} < Na^+$

4. Hydrogen bonds are formed in many compounds e.g., H2O, HF, NH3 . The boiling point of such compounds depends to a large extent on the strength of hydrogen bond and the number of hydrogen bonds. The correct decreasing order of the boiling points of above compounds is :

(i) HF > H2O > NH3

ii) H2O > HF > NH3

(iii) NH3 > HF > H2O

 (iv) NH3 > H2O > HF

5. What is SI unit of viscosity coefficient (η)?

 (i) Pascal (ii) Nsm–2 (iii) km–2 s (iv) N m–2

6. Which of the following is not correct?

(i) ΔG is zero for a reversible reaction (ii) ΔG is positive for a spontaneous reaction (iii) ΔG is negative for a spontaneous reaction (iv) ΔG is positive for a non-spontaneous reaction

7.What will be the correct order of vapour pressure of water, acetone and ether at 30°C. Given that among these compounds, water has maximum boiling point and ether has minimum boiling point? (i) Water < ether < acetone (ii) Water < acetone < ether (iii) Ether < acetone < water (iv) Acetone < ether < water

8.In which of the following reactions, the equilibrium remains unaffected on addition of small amount of argon at constant volume?

(i) H_2 (g) + I_2 (g) $\rightleftharpoons$ 2HI (g) (ii) PCl_5 (g) $\rightleftharpoons$ PCl_3 (g) + Cl_2 (g) (iii) N_2 (g) + $3H_2$ (g) $\rightleftharpoons$ $2NH_3$ (g) (iv) The equilibrium will remain unaffected in all the three cases.

9. Which of the following elements does not show disproportionation tendency?

(i) Cl (ii) Br (iii) F (iv) I

10. The oxide that gives H_2O_2 on treatment with dilute H_2SO_4 is —

(i) PbO_2 (ii) BaO_2 .$8H_2O$ + O_2 (iii) MnO_2 (iv) TiO_2

11. Metals form basic hydroxides. Which of the following metal hydroxide is the least basic?

(i) $Mg(OH)_2$ (ii) $Ca(OH)_2$ (iii) $Sr(OH)_2$ (iv) $Ba(OH)_2$

12. The exhibition of highest co-ordination number depends on the availability of vacant orbitals in the central atom. Which of the following elements is not likely to act as central atom in MF_6^{3-} ?

(i) B (ii) Al (iii) Ga (iv) In

13.The IUPAC name for
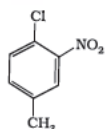
(i) 1-Chloro-2-nitro-4-methylbenzene

(ii) 1-Chloro-4-methyl-2-nitrobenzene

(iii) 2-Chloro-1-nitro-5-methylbenzene

(iv) m-Nitro-p-chlorotoluene

14.What is the correct order of decreasing stability of the following cations.
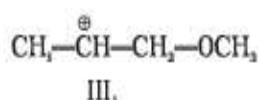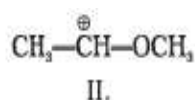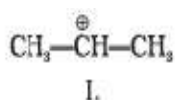
I. II. III.

(i) II > I > III (ii) II > III > I (iii) III > I > II (iv) I > II > III

15.During hearing of a court case, the judge suspected that some changes in the documents had been carried out. He asked the forensic department to check the ink used at two different places. According to you which technique can give the best results?

(i) Column chromatography (ii) Solvent extraction (iii) Distillation (iv) Thin layer chromatography

16.Arrange the following in decreasing order of their boiling points.

(A) n–butane (B) 2–methylbutane (C) n-pentane (D) 2,2–dimethylpropane

(i) A > B > C > D

(ii) B > C > D > A

(iii) D > C > B > A

(iv) C > B > D > A

17. Arrange the halogens F_2 , Cl_2 , Br_2 , I_2 , in order of their increasing reactivity with alkanes.

(i) $I_2 < Br_2 < Cl_2 < F_2$ (ii) $Br_2 < Cl_2 < F_2 < I_2$ (iii) $F_2 < Cl_2 < Br_2 < I_2$ (iv) $Br_2 < I_2 < Cl_2 < F_2$

18Which of the following gases is not a green house gas?

(i) CO (ii) O_3 (iii) CH_4 (iv) H_2O vapour

19. Photochemical smog occurs in warm, dry and sunny climate. One of the following is not amongst the components of photochemical smog, identify it.

(i) NO_2 (ii) O_3 (iii) SO_2 (iv) Unsaturated hydrocarbon

20. Which of the following statements is not true about classical smog?

(i) Its main components are produced by the action of sunlight on emissions of automobiles and factories. (ii) Produced in cold and humid climate. (iii) It contains compounds of reducing nature.

(iv) It contains smoke, fog and sulphur dioxide

21.Define law of multiple proportions? Give one example.

22.Clalculate the molarity of NaOH in the solution prepared by dissolving its 4g in enough water to form 250 ml of the solution.

23.(a) Define the dipole moment of a molecule.
(b) Draw the shape of SF_4 molecule.

      OR

Discuss the formation of SF6 molecule on the basis of hubridisation.

(b) Calculate the volume occupied by 8.8g of CO_2 gas at 31.1°C and 1 bar
          pressure. [R = 0.083 bar LK^{-1} mol^{-1}]

24 Balance the following equation by ion electron method:
$Cr_2O_7^{-2}(aq) + SO_2(g) \dashrightarrow Cr^{+3}(aq) + SO_4^{-2}(aq)$ (IN ACIDIC MEDIUM)

or

Assign oxidation no. of S in H_2SO_4 and N in NO_3^-

25. Givereasons:

(a) LiCl is more covalent thanKCl

(b) In aqueous solution Li^+ has lowestmobility.

26. Account for the following

i) Benzene is extra – ordinary stable through it contains three double bonds.

ii) Out of toluene , benzene , m-dinitrobenzene , toluene will undergo nitration most easily.

27.Among the second period elements the actual ionization enthalpies are in the order

Li < B < Be < C < O < N < F < Ne.

Explain why (i) Be has higher Δi H than B (ii) O has lower Δi H than N and F?

28.) Calculate the bond order of $O_2, O_2^+, O_2^-, O_2^{2-}$ species and compare the

bond enthalpy of them. Indicate their magnetic properties.

Or

(I) What is meant by the term bond order?

(II) Why Be_2 does not exists?

(iii) Dipole moment of BF_3 is zero

29. At 25^oC and 760mm of Hg pressure a gas occupies 600ml volume .What will be its pressure at a height where temperature is 10^oC and volume of the gas is 640 ml.

Or

(a)Why liquids diffuse slowly as compared to gases?

(b) A mixture of dihydrogen and dinitrogen at 1 bar pressure contains 20% by weight of H^2. Calculate partial pressure of H_2.

30.Calculate the standard enthalpy change for the reaction
$$OF_2(g) + H_2O\ (g) \rightarrow O_2(g) + 2HF(g)$$
at 298 K .Given that enthalpies of formation of $OF_2(g), H_2O(g), HF(g)$
are +20, -250 and 270 kJ/mol respectively.
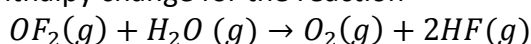
31.. (i)State Le Chatelier's principle

ii) Indicate the direction in which the equilibrium will shift when:
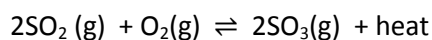
$2SO_2 (g) + O_2(g) \rightleftharpoons 2SO_3(g) + heat$
(a) Pressure is increased.
(b) Concentration of SO_2 is increased.
(c) Concentration of SO_3 is increased.
(d) Temperature is increased.

32. Give reasons :
(a) Graphite is used as Lubricant.
(b) Boron is unable to form BF_6^{3-} ion.
(c) HF acid cannot be stored in glass containers.

33. How will you convert benzene into-
(i) p-nitrobromobenzene (ii) m- nitrochlorobenzene (iii) p – nitrotoluene
34 1. Consider the following species

N^{3-}, O^{2-}, F- ,Mg^{2+} Al^{3+}
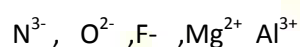
(a) What is common in them
(b) Arrange them in the order of increasing radii

2. Why are cation smaller than anion

35. (i) What happenswhen
(a) Sodium metal is dropped inwater?
(b) Sodium metal is heated in free supply ofair?
(c) Sodium peroxide dissolves inwater
(ii) Give reason: a) Alkali metals dissolve in ammonia to form conducting solutions

b) Potassium carbonate cannot be prepared by Solvay's process. Why?

Or
(i) Explain the reason for the following observations:
(a) Beryllium and Magnesium do not impart colour to flame where as other alkaline earth metals do.
(b) LiI is more soluble than KI in ethanol.
(c) Solubility of alkaline earth metal hydroxides in water increase down the group
ii)) Discuss the various reactions that occur in the Solvay process for
manufacture of sodium carbonate.
36.) Explain , giving reasons, which of the following sets of quantum numbers are not possible.

(1) n=0, l=0; m_l = 0, ms= + ½   (3) n=1, l=1; ml = 0, m_s= - ½

(2) n=1, l=0; m_l =- 0, ms= + ½   (4) n=2, l=1; ml = 0, m_s= + ½

(b) State (a) Hund's Rule of maximum Multiplicity

(c) .calculate the uncertainty in the position of an electron if the uncertainty in its velocity is 5.7 x 10^5 m/s.

Or

. (a)What is the lowest value of n that allows g orbitals to exist?

(b)An electron is in one of the 3d orbitals, Give the possible values of n,l and m_l for this electron.

(c)How much energy is required to ionise a hydrogen atom if an electron occupies n=5 orbit ?Compare your answer with ionisation energy of H –atom (energy required to remove the electron from n==1 orbit)

37.From the structures given below, answer thequestions
  (i) $CH_3 - CH_2 - CH (OH) - CH_3$
  (ii) $(CH_3)_2 - C (OH) - CH_3$
  (iii) $CH_3 - CH_2 - CH_2 - CH_2 - OH$
  (iv) $CH_3 - O (CH_3) - CH - CH_3$
  (v) $CH_3 - O - CH_2 - CH_2 - CH_3$
  (vi) $CH_3 - CH_2 - O - CH_2 - CH_3$
  (vii) $CH_3 - CH (CH_3) - CH_2 - OH$
  (a) The pair of compounds that represent chainisomerism.
  (b) The pair of compounds that represent positionisomerism.
  (c) The pairs of compounds which are functional groupisomers.
  (d) The compounds that form pairs ofmetamers.
  (e) Distinguish between position and functional isomerism with anexample.
     Or
 (a) Identify the functional groups in thefollowing:
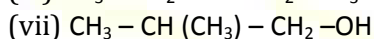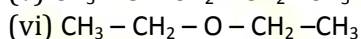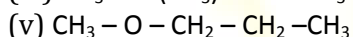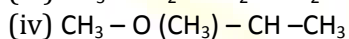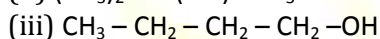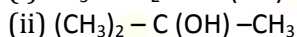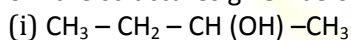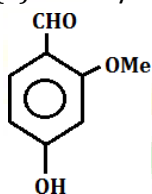
 (b) Draw the bond notation ofheptan-4-one.
 (c) Give the possible isomers for monosubstituted
 (d) Give the possible isomers for di substitutedbenzene?

Marking scheme

1.iii2.93.ii4.i5.ii6.ii7.ii8.iv9.iii10.ii11.i12.i13.iii

14.i15.iv16.iv17.i18.i19.iii20.i

21. correct def   (1)   correct example (1)

22.Molarity = No. of moles of solute/Volume of solution in litres

$\qquad$ = Mass of NaOH/Molar mass of NaOH/0.250L $\qquad$ (1)

$\quad$=4g/40g/0.250L = 0.1mol/0.250L

$\quad$=0.4 M $\qquad$ (1)

23.**(a) Correct definition.** $\qquad$ **(1)**

(b) for diagram (see-saw)

OR

SP_3d^2 . $\qquad$ (1)

 Correct explaination $\qquad$ (1)

24. Correct balanced equation

$Cr_2O_7^{-2}$(aq)+3 SO_2(g) +2H$^+$--- $\rightarrow$ 2Cr^{+3}(aq)+3SO$_4^{-2}$(aq) +H$_2$O $\qquad$ (1)
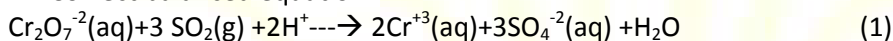
$\qquad$ or

$\quad$ O.S. Of S = +6 N= +5 $\qquad$ (1)

25.(a) According to Fajan's rule smaller the size of cation and larger the size of anion greater is the

covalent character of ionic bond. Li is small in size than K, thus Li$^+$ has a high charge density. Thus

polarizing power of Li$^+$ is higher than K$^+$, hence LiCl is more covalent thanKCl. $\qquad$ (1)

$\quad$ (b) Smaller the size of ion greater is the degree of hydration. In aqueous medium Li$^+$ gets heavily

$\qquad$ hydrated. Thus mobility of hydrated Li$^+$ is low. $\qquad$ (1)

26.(i) Due to resonance, there is delocalization of π electrons. $\qquad$ (1)
(ii) In toluene, CH$_3$- group is electron releasing group increasing the electron density at o- and p- positions
of benzene. Hence, facilitates the attack of electrophile at these positions . $\qquad$ (1)
27.i) Be has higher Δ$_i$H than B because Be has stable electronic configuration 1s^{2}2s^2, moreover in Be the
electron to be removed is 2s-electron which is more penetrated to the nucleus as compared to 2p-
electron of B. $\qquad$ (1)
(ii) Δ$_i$H of N is higher than O due to its stable half filled electronic configuration. Δ$_i$H of F is higher than O
due to high nuclear charge. $\qquad$ (1)

28.**) bond order of** O_2, O_2^+, O_2^-, O_2^{2-} **are 2, 2.5, 1.5, 1 respectively.** $\qquad$ (1)

bond enthalpy : $O_2^+ > O_2 > O_2^-, \ O_2^{2-}$

$\quad$ **paramagnetic :** $O_2, \ O_2^+, \ O_2^-$ (1)

$\quad$ **diamagnetic   :** O_2^{2-}

$\qquad$ or

i)Bond order is defined as one half of the difference between the number of electrons present in the bonding and anti-bonding orbitals of a molecule.
ii) Due to zero bond order
iii) Due to zero dipole moment.

29.According to Combined Gas Law –
$p_1V_1/T_1 = p_2V_2/T_2$ (1)
$p_2 = p_1V_1T_2/T_1V_2$
$p_2 = 760 \times 600 \times 283 / 640 \times 298$ (1)
   =676.6mm Hg.
Or
(a)In liquids the molecules are less free than in a gas. i. e intermolecular forces in liquid are greater than in gas   (1)

(b)The mixture of H_2 and O_2 contain 20% H_2 means 20 gm H_2 & 80gm O_2

$n_2 (H_2) = 20/2 == 10$ moles   (½)

$n(O_2)$ 80/32=2.5   (½)

$P(H_2) = n_2 (H_2) / n_2 (H_2) + n(O) \times P(total) == .8$ bar   (1)

30. $\Delta_rH^\ominus = [2 \times \Delta_fH^\ominus HF] – [\Delta_fH^\ominus OF_2(g)] + \Delta_fH^\ominus[H_2 O(g)]$ (1)
   =   2(-270) – (20- 250)   (1)
   =   - 310 kJ   (1)
31.(i) Correct definition.   (1)
(ii) (a)Forward   (b)Forward   (1)
(c)backward   (d)backward.   (1)
32.(a) Slippery due to weak Van der Waals force between hexagonal layers.   (1)
(b)   due to absence of vacant d-orbital, boron cannot expand its covalency   (1)
    above 4. (1)

    (c) HF reacts with SiO2 of glass and forms SiF4 and H2O (or) correct reaction.   (1)
33 (i)
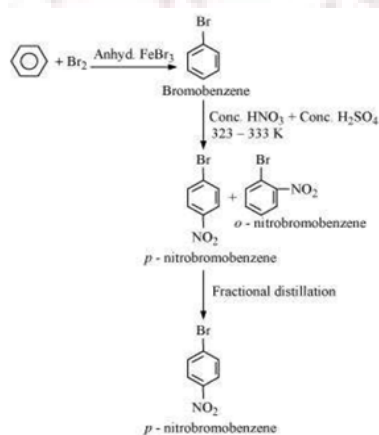
                                                                                                                            (1)

(ii)
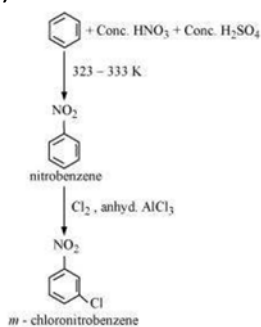
(1)

iii)
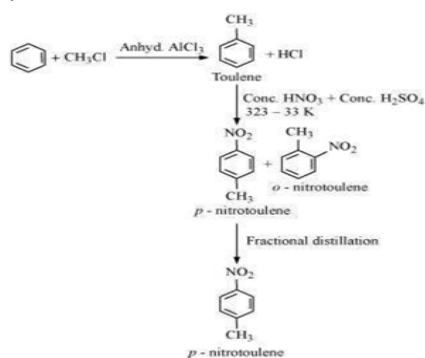
(1)

34. (a) All of them are isoelectronic species   (1)
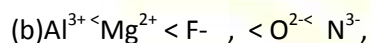
   (b) $Al^{3+} < Mg^{2+} < F^- , < O^{2-} < N^{3-}$,   (1)

(2) cations are formed by loss of electron hence smaller radii   (1)

35. (a)(a) Sodium hydroxide and hydrogen gas will be formed which will catchfire
   $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$ (1)
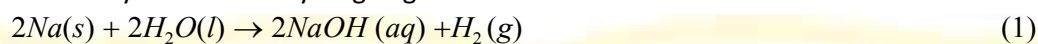
   (b) Sodium peroxide isformed   (1)
   $2Na + O_2 \rightarrow Na_2O_2$
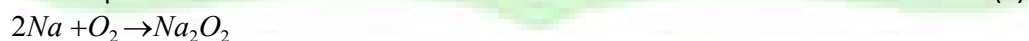
   (c) Sodium hydroxide and hydrogen peroxide areformed
   $Na_2O_2 + 2H_2O \rightarrow 2NaOH + H_2O_2$ (1)

(ii) a) Alkali metals dissolve in ammonia to form conducting solutions as:

$M + (x + y)NH_3 \rightarrow [M(NH_3)_x]^+ + [e(NH_3)_y]^-$ (1)
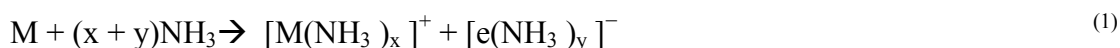
It is due to the ammoniated electron.

b) Unlike sodium carbonate, potassium carbonate is soluble in water and does not form precipitate.   (1)

Or

63

(i) (a) Be, Mg have high ionization enthalpy. (1)

 (b) Li I is more covalent than KI. (1)

 (c) Lattice enthalpy decreases much more than the hydration enthalpy (1)

(ii)(a) $2NH_3 + H_2O + CO_2 \longrightarrow (NH_4)_2 CO_3$

   $(NH_4)_2 CO_3 + H_2O + CO_2 \longrightarrow 2NH_4 HCO_3$ (1)

$NH_4 HCO_3 + NaCl \longrightarrow NaHCO_3 + NH_4Cl$ (½)

$NaHCO_3 \xrightarrow{\quad heat \quad} Na_2 CO_3 + CO_2 + H_2O$
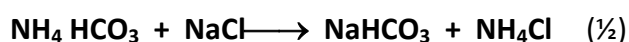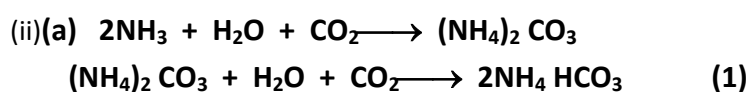
36.a) (1) Not possible because $n \neq 0$ (3) Not possible because when n=1, $l \neq 1$ (1/2,1/2)

   (2) Possible   (4) Possible (1/2,1/2)

(b) Pairing of electrons in the orbitals belonging to the same subshell (p, d or f) does not takeplace until each orbital belonging to that subshell has got one electron each i.e., it is singly occupied   1

(c). According to heisenbergsuncertainity principle

$\Delta x \times (m \times \Delta v) = h/4\pi$

$\Delta x = h/4\pi \times m \times \Delta v$ (1)

$\backslash = 6.6 \times 10^{-34} = 1.0 \times 10^{-10}$ m $4 \times 3.14 \times 9.1 \times 10^{-31} \times 5.7 \times 10^5$

$= 1.0 \times 10^{-5}$ m (1)

                            Or

.(1) minimum value of n= 5 (1)

 (2)n=3, l=2, m_l = -2, -1, 0, +1, +2 (1)

(3) $E_5 = -2.18 \times 10^{-18}/25$

   $I.E_5 = E_\infty - E_5$ (1)

     $= 0 - [-2.18 \times 10^{-18}/25]$ J atom^{-1}

     $= 8.72 \times 10^{-20}$ Jatom^{-1}

I.E for H-atom (1)

   $I.E_1 = E_\infty - E_1$

     $= 0 - [-2.18 \times 10^{-18}/1]$ J atom-1

      -2.18×10^{-18} Jatom^{-1} (1)

on comparing $I.E_1 / I.E_5 = -2.18 \times 10^{-18}$ Jatom$^{-1}/8.72 \times 10^{-20}$ Jatom^{-1}

                  $= 25$

37..a) I andIII   (1)

(b) I andIII   (1)

(c) VI andVII   (1)

(d) V andVI   (1)

(e) Those isomers which differ in position of functional groups are called position isomers. Eg – But-1-ene and But-2-ene and those isomers which differ in functional groups are called functional isomers. Eg – Ethanol and Dimethylether   (1)

Or

a) The principal functional group is aldehydic group –CHO and the secondary functional group is alcoholic group –OH and methoxy (- OMe)group.

b)

(c)For mono-substituted benzene, there is only oneisomer.   (1)
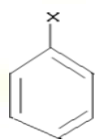
(d)For disubstituted benzene, there are threeisomers.
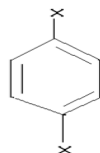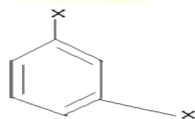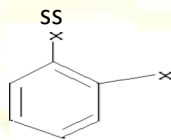
PAPER NO 07

CLASS XI (CHEM)

Session ending

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S.No.	Unit	VSA (1 Mark)	SA (2 Marks)	LA-I (3 Marks)	LA-II (5 Marks)	Total
1	Some Basic Concepts of Chemistry	1	2(2)			11
2	Structure of Atom	1			1	
3	Classification of Elements and Periodicity in Properties	1		1		4
4	Chemical Bonding and Molecular Structure	1	1	1		21
5	States of Matter: Gases and Liquids	1		1		
6	Chemical Thermodynamics	1	1	1		
7	Equilibrium	2		1		
8	Redox Reactions	1	1			16
9	Hydrogen	1	1			
10	s -Block Elements	1			1	
11	p -Block Elements	1		1		
12	Organic Chemistry: Some basic Principles and Techniques	3			1	18
13	Hydrocarbons	2	1	1		
14	Environmental Chemistry	3				
	Total	20X1=20	7X2=14	7X3=21	3X5=15	70(37)

CHEMISTRY (THEORY)
CLASS XI

Time allowed: 3 Hours   **Maximum Marks: 70**

General instructions:

8.   All questions are compulsory.

9.   Marks for each question are indicated against it.

10. Question numbers 1 to 20are very short answer question and carries 1 mark each.

11. Question numbers 21 to 27 are short answer question and carry 2 marks each.

12. Question numbers 28 to 34 are also short answer question and carries 3mark each.

13. Question numbers 35 to 37 are long answer questions and carries 5marks each.

14. Use log tables, if necessary. Use of calculators is **not** allowed.

1. A measured temperature on Fahrenheit scale is 200 °F. What will this reading be on Celsius scale? (i) 40 °C (ii) 94 °C (iii) 93.3 °C (iv) 30 °C

2.Number of angular nodes for 4d orbital is _____.

(i) 4 (ii) 3 (iii) 2 (iv) 1

3.The elements in which electrons are progressively filled in 4f-orbital are called

(i) actinoids (ii) transition elements (iii) lanthanoids (iv) halogens

4.In which of the following substances will hydrogen bond be strongest?

 (i) HCl (ii) H_2O (iii) HI (iv) H_2S

5. Which of the following property of water can be used to explain the spherical shape of rain droplets?

(i) viscosity (ii) surface tension (iii) critical phenomena (iv) pressure

6.The enthalpies of elements in their standard states are taken as zero. The enthalpy of formation of a compound

 (i)   is always negative (ii) is always positive (iii) may be positive or negative (iv) is never negative

7. Acidity of BF3 can be explained on the basis of which of the following concepts?

 (i) Arrhenius concept (ii) Bronsted Lowry concept (iii) Lewis concept (iv) Bronsted Lowry as well as Lewis concept.

8.On increasing the pressure, in which direction will the gas phase reaction proceed to re-establish equilibrium, is predicted by applying the Le Chatelier's principle. Consider the reaction.

$N_2 (g) + 3H_2 (g) \rightleftharpoons 2NH_3 (g)$

Which of the following is correct, if the total pressure at which the equilibrium is established, is increased without changing the temperature?

(i)   K will remain same (ii) K will decrease (iii) K will increase (iv) K will increase initially and decrease when pressure is very high

9. Identify disproportionation reaction
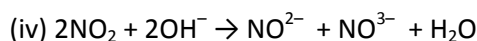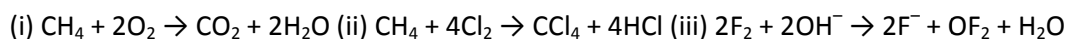
(i) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ (ii) $CH_4 + 4Cl_2 \rightarrow CCl_4 + 4HCl$ (iii) $2F_2 + 2OH^- \rightarrow 2F^- + OF_2 + H_2O$

(iv) $2NO_2 + 2OH^- \rightarrow NO^{2-} + NO^{3-} + H_2O$

10.Which of the following hydrides is electron-precise hydride?

(i) B_2H_6 (ii) NH_3

(iii) H_2O (iv) CH_4

11. The reducing power of a metal depends on various factors. Suggest the factor which makes Li, the strongest reducing agent in aqueous solution.

(i) Sublimation enthalpy (ii) Ionisation enthalpy (iii) Hydration enthalpy (iv) Electron-gain enthalpy

12. Which of the following is a Lewis acid ?

(i) $AlCl_3$ (ii) $MgCl_2$ (iii) $CaCl_2$ (iv) $BaCl_2$

13. In which of the following, functional group isomerism is not possible?

(i) Alcohols (ii) Aldehydes

(iii) Alkyl halides (iv) Cyanides
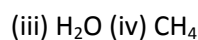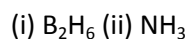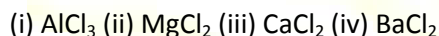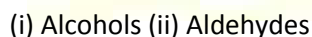
14. The principle involved in paper chromatography is

(i) Adsorption (ii) Partition (iii) Solubility (iv) Volatility

15.The IUPAC name for
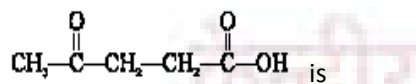
$CH_3-\overset{O}{\overset{\|}{C}}-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-OH$ is _____

(i) 1-hydroxypentane-1,4-dione
(ii) 1,4-dioxopentanol
(iii) 1-carboxybutan-3-one
(iv) 4-oxopentanoic acid

16.Arrange the following hydrogen halides in order of their decreasing reactivity with propene.

(i) HCl > HBr > HI (ii) HBr > HI > HCl (iii) HI > HBr > HCl (iv) HCl > HI > HBr

17.Arrange the following alkyl halides in decreasing order of the rate of β– elimination reaction with alcoholic KOH.

68

(A)
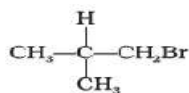
$CH_3-\overset{\overset{H}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2Br$

(B) CH_3-CH_2-Br (C) $CH_3-CH_2-CH_2-Br$

(i) A > B > C (ii) C > B > A (iii) B > C > A (iv) A > C > B

18.Which of the following statements about photochemical smog is wrong?

(i) It has high concentration of oxidising agents. (ii) It has low concentration of oxidising agent.

(iii) It can be controlled by controlling the release of NO2, hydrocarbons, ozone etc.

(iv) Plantation of some plants like pinus helps in controlling photochemical smog.

19. The gaseous envelope around the earth is known as atmosphere. The lowest layer of this is extended upto 10 km from sea level, this layer is _____.

(i) Stratosphere (ii) Troposphere (iii) Mesosphere (iv) Hydrosphere

20. Dinitrogen and dioxygen are main constituents of air but these do not react with each other to form oxides of nitrogen because _____.

(i) the reaction is endothermic and requires very high temperature. (ii) the reaction can be initiated only in presence of a catalyst. (iii) oxides of nitrogen are unstable. (iv) N_2 and O_2 are unreactive.

21.. What is the concentration of sugar ($C_{12}H_{22}O_{11}$) in mol L^{-1}if 20g of it is dissolved in enough water to make final volume up to 2L?

22.(i) Calculate the number of atoms in 52 u of He.

(ii) Out of molarity and molality which is preferred in chemistry experimentsand why?

23.(i) Write the resonance structures for carbonate ion CO_3^{-2}.

(ii) Draw the shape of BrF_3 molecule using VSEPR model.

Or

Give the hybridization of PCl5 and explainWhy are the axial bonds longer as compared to equatorial bonds?

24) **Identify the oxidizing agent and reducing agent in the following reaction:** $6Fe^{2+} + Cr_2O_7^{2-} + 14H^+ \longrightarrow 6Fe^{3+} + 2Cr^{3+} + 7H_2O$
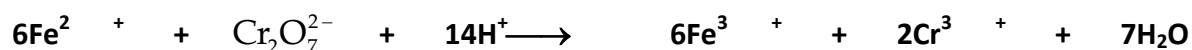
or

a) What is the oxidation state of sulphur in $Na_2S_2O_7$?

(b) What is disproportionation reaction?

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25. Why are Potassium and caesium, rather than lithium used in photoelectric cells?

   (ii) When an alkali metal dissolves in liquid ammonia the solution can acquire Different colours. Explain the reasons for this type of colour change.

26. Illustrate with one reaction

(i) Friedel craft alkylation

(ii) Anti Markownikov addition or Karasch effect

27. (i) What causes temporary and permanent hardness of water ?

   (ii) write one method to remove permanent hardness of water ?

28.. Account for the following:
(a) Ionisation enthalpy of nitrogen is more than that of Oxygen
(b) A cation is always smaller than their parent atom.
(c) why do Li and Mg show similarties in their properties
          Or
(1). Explain why the electron gain enthalpy of fluorine is less negative than that of chlorine.

   (2) Among the elements B .Al .C and Si

    (a) Which elements has highest first ionization enthalpy?

    (b) Which element has the most metallic character

29. On the basis of VSEPR theory draw the structure and tell the shape of :
(i) XeF_4 (ii) ClF_3 (iii) H_2O

30. An oxygen cylinder has 10 L oxygen at 200 atm. If patient takes 0.5 mL of oxygen at 1 atm in

one breathes at 37^0C. How many breaths are possible

          or

(a) Name two phenomena that can be explained on the basis of surface tension.

(b) What will be minimum pressure required compressing 500dm^3 of air at 1 bar to 200 dm^3 at 30° C?

31. i) State the second law of thermodynamics.

   ii) For the reaction $H_2(g) \rightarrow 2H(g)$, what are the signs of ΔH and ΔS ?

 Discuss the effect of temperature on the spontaneity of a reaction, when both ΔH^0 and ΔS^0 have positive signs.

32. (a) Derive relation between Kp and Kc .(2)

(b)What is reaction quotient. (1)

33.Write the balance equation for the following:

i) BF_3 + $LiH\rightarrow$

ii) B_2H_6 + H_2O $\rightarrow$

iii) Al + $NaOH\rightarrow$
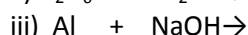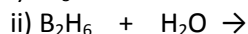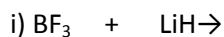
34.(a)How will you convert the following:

(i)Benzene to Acetophenone

(ii)Propene to Bromopropane

(ii) Ethanol to Ethene

35.(i) Define an orbital?

(ii)What is meant by photoelectric effect?

(iii)The threshold frequency for a metal is 7.0×10^{14} s^{-1}. Calculate the kinetic energy of an electron emitted when radiation of frequency v = 1.0×10^{15} s^{-1} hits the metal.

OR

(a) States Heisenberg's Uncertainty Principle?

(b)What designations are given to the orbitals having

(i) n = 3, l = 1 (ii) n = 2, l = 0

(c) Which quantum number determines

(i) Energy of electron (ii) Orientation of orbitals.

(d) What transition in the hydrogen spectrum would have the same wavelength as the Balmer transition, n = 4 to n =2 of He$^+$ spectrum?

36.(a) Which of the following carbocation is most stable ?(1)
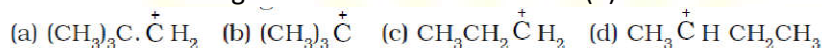
(a) $(CH_3)_3C.\overset{+}{C}H_2$ (b) $(CH_3)_3\overset{+}{C}$ (c) $CH_3CH_2\overset{+}{C}H_2$ (d) $CH_3\overset{+}{C}H\,CH_2CH_3$

(b)In the Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of:(1)

(c)Explain the reason for the fusion of an organic compound with metallic sodium for testing nitrogen, sulphur and halogens.(1)

(d)0.3780 g of an organic chloro compound gave 0.5740 g of silver chloride in Carius estimation. Calculate the percentage of chlorine present in the compound.

OR

(a)Write bond line formulas for : (i)Isopropyl alcohol (ii) 2,3-Dimethyl butanal

(iii) Heptan-4-one.(3)

(b)Explain why chloroacetic acid is more acidic than acetic acid.

37.Complete the following rxn:-

i) Ca + H_2O---$\rightarrow$

II)$Ca(OH)_2$ + Cl_2---$\rightarrow$

III) BeO +$2NaOH$----$\rightarrow$

IV) BaO_2 + H_2SO_4---$\rightarrow$

V) $Al2O_3$ + $6HCl$ ----$\rightarrow$
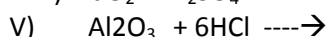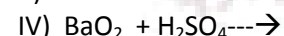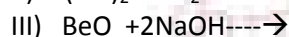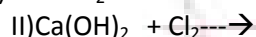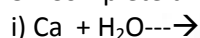
OR

What happens when

i)Magnesium is burnet in air

ii)Quic lime is heated with silica.

iii) chlorine reacts with slaked lime

iv) calcium nitrate is heated

v) Lime is heated wi

Marking scheme

i.iii2.iii3.iii4.ii5.ii6.i7.iii

8.i According to Le-Chatelier's principle, at constant temperature, the equilibrium composition will change but K will remain same.

9.iv10.iv11.iii12.i13.iii14.ii15.iv16.iii17.iv18.ii19.ii20.i

21.Formula used: Molarity = No. of moles of sugar

$$\text{Volume of solution in litres} \quad (1)$$

No. of moles = Given mass/ Molar mass

= 20/342 = 0.058 moles

Molarity = 0.058/2 = 0.029 M   (1)

22.(i) 1 atom of He = 4 u of He   (1)

Or

4 u of He = 1 atom of He

1 u of He $= \dfrac{1}{4}$ atom of He

52u of He $= \dfrac{52}{4}$ atom of He   (1)

= 13 atoms of He

(iii)   Molality. It doesn't not change with temperature since mass remains unaffected with temperature.   (1)

23.(i)Correct resonance structures   (1)

(ii)

or
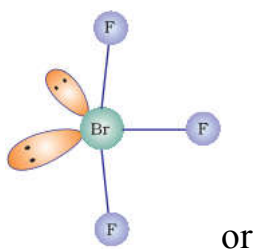
sp$_3$d hybridization. (1)

There are five P–Cl sigma bonds in PCl5. Three P–Cl bonds lie in one plane and make an angle of 120° with each other. These bonds are called equatorial bonds. The remaining two P–Cl bonds lie above and below the equatorial plane and make an angle of 90° with the plane. These bonds are called axial bonds. As the axial bond pairs suffer more repulsion from the equatorial bond pairs, axial bonds are slightly longer than equatorial bonds (i)

24(i) oxidising agent = $Cr_2O_7^{2-}$ (1)

reducing agent = Fe^{2+} (1)

or

(a) 2 (+ 1) + 2 (S) + 7 (– 2) = 0, S = + 6 (1) (1)

(b) Correct statement. (1)

25.i) Potassium and caesium,have low Ionsation enthalpy. (1)

(ii)Due to ammoniated electrons (1)

$26.$(i) Correct Definition with one reaction (1)
(ii) Correct Definition with one reaction.
27. i) Cause of temporary hardness of water:
Presence of calcium or magnesium salt of hydrogencarbonate
Cause of permanent hardness of water:
presence of calcium or magnesium salt of chloride or sulphate
( )any one method to remove permanent hardness of water: by treatment with sodium carbonate, Calgon's method, ion-exchange method or synthetic resin method (1)
28a) Due to extra stability of half filled orbital(2p) (1)

b) Due to more effective nuclear charge (1)
c) due to diognal relationship (1)
or
(1) small size of fluorine and repulsion between electrons (1)

(2) (a) C has highest ionization enthalpy (1)

(b) Al has the most metallic character

29. Square planar , T-shaped ,bent shape   (1,1,1)

30. $P1V1 = P2V2$ (1)
    $200 \times 10 = 1 \times V2$ (1)
    $V2 = 2000L$ (1)
    Number of breath $= TotalVolume/Volume for\ 1\ breath$
    $= 2000L/5 \times 10^{-3}L$
    $= 4 \times 10^{6}$
         Or

.(a)Surface tension can explain (i) capillary action. (ii) Spherical shape of small drops of liquid   (1)

(b) P1 = 1bar.

 V1 = 500dm^3

 P$_2$ = ?

 V$_2$ =200 dm^3& temp. constant 30°C

So by Boyle's low P1V1 = P2 V2   (1)

1 x 500 = P2 x 200

orP$_2$= 200/ 500

 = 2.5 bar   (1)

 31.(i)Statement   (1)
     (ii)ΔH = +ve ΔS = +ve
     At high temperature – spontaneous .   (1)
At low temperature - non spontaneous   (1)
32.a)For a reaction
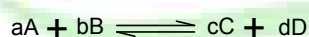
        aA + bB $\rightleftharpoons$ cC + dD

        K$_c$ = ([C]^c [D]^d)/([A]^a [B]^b) and K$_p$ = (p$_C$)^c(p$_D$)^d/(p$_A$)^a(p$_B$)^b (1)
pV=nRT , p=nRT/V=CRT
p$_A$=[A]RT, p$_B$=[B]RT, p$_C$=[C]RT, p$_D$=[D]RT
K$_p$=([C] RT)^c([D] RT)^d/([A] RT)^a([B] RT)^b (1)
  =(RT)$^{(c+d)-(a+b)}$ X ([C]^c [D]^d)/([A]^a [B]^b)
  =(RT)$^{\Delta n}$K$_c$ (1)
b) For any reversible reaction at any stage other than equilibrium, the ratio of the molar concentrations of the products to that of the reactants. Where each concentration term is raise to the power equal to the stoichiometric coefficient to the substance concerned, is called the reaction quotient, Qc.
(1)
33.B$_2$H$_6$ + LiF   (1)
ii. 2B(OH)$_3$(aq) + 6H$_2$(g)   (1)
iii. 2 Na+ [Al(OH)$_4$] $^-$(aq) + 3H$_2$(g)   (1)
34(i) $C_6H_6 +\ CH_3COCl \xrightarrow{Anhy.Alcl_3} C_6H_5COCH_3 + HCl$ (1)

(ii) $CH_3 - CH = CH_2 + HBr \xrightarrow{Benzoyl\ Peroxide} CH_3CH_2CH_2Br$ (1)

(iv) $CH_3CH_2OH \xrightarrow{Conc.H_2SO_4}, CH_2 = CH_2 + H_2O$ (1)
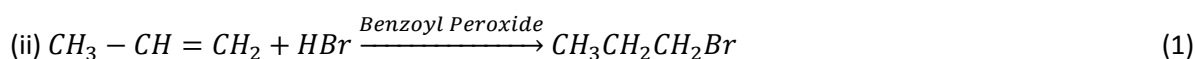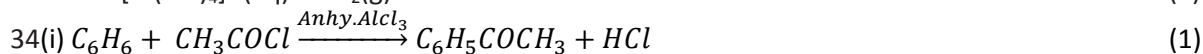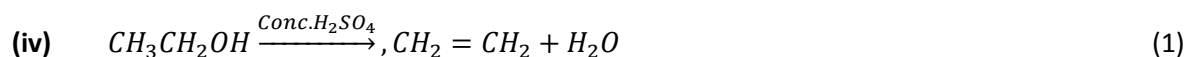
35.i.correct definition (1)
ii.correct statement (1)
iii.Kinetic energy $= 1/2m_ev^2 = h(v - v0)$
$= 1.988 \times 10^{-19}$ J (1)
Or
i.correct definition(1)
ii.3p, 2s (1)
iii. n and m
iv. n=2 to n=1 (correct formula and substittion) (1)
36.(a) $(CH_3)_3C^+$ (1)
(b) $Fe_4[Fe(CN)_6]_3.xH_2O$ (1)
(c) To convert N, S, P and halogens present in the organic compound to their sodium salts. (1)
(d) (2)

Given that,
Mass of organic compound is 0.3780 g.
Mass of AgCl formed = 0.5740 g
1 mol of AgCl contains 1 mol of Cl.
Thus, mass of chlorine in 0.5740 g of AgCl

$= \dfrac{35.5 \times 0.5740}{143.32}$
$= 0.1421g$

∴ Percentage of chlorine $= \dfrac{0.1421}{0.3780} \times 100 = 37.59\%$

Hence, the percentage of chlorine present in the given organic chloro compound is
37.59% .

OR

(a)(i)
Isopropyl alcohol

(1)
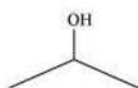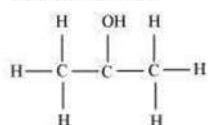
(ii)
2, 3–dimethyl butanal

(1)

(iii)

Heptan-4-one

(1)
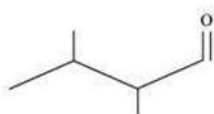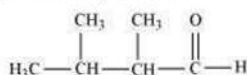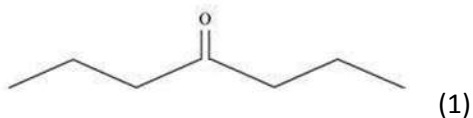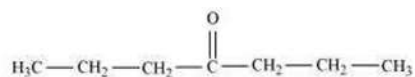
37. i) $Ca + 2 H_2O \text{---} Ca(OH)_2 + H_2$

  II) $Ca(OH)_2 + Cl_2 \text{---}\rightarrow CaOCl_2 + H_2O$

  III) $BeO + 2NaOH \text{----}\rightarrow Na_2BeO_2 + H_2O$

  IV) $BaO_2 + H_2SO_4 \text{---}\rightarrow BaSO_4 + H_2O$

 V) $Al_2O_3 + 6HCl \text{----}\rightarrow AlCl_3 + 3H_2O$

    Or

i) $2Mg + O_2 \text{------}\rightarrow 2MgO$

II) $CaO + SiO_2 \text{-----}\rightarrow CaSiO_3$

III) $2Ca(OH)_2 + 2Cl_2 \text{----}\rightarrow CaOCl_2 + CaCl_2 + 2H_2O$

IV) $2Ca(NO_3)_2 (\text{heating}) \text{----}\rightarrow 2CaO + 4NO_2 + O2$

V) $CaO + 3C \text{ ---}\rightarrow CaC_2 + CO$

PAPER NO 08

KENDRIYA VIDYALAYA SANGATHAN JAMMU REGION
SESSION-2019-20
SUBJECT: - CHEMITSRY
CLASS XI

MM:- 70   **TIME:- 3 HOURS**

General Instructions :

(i) *All questions are compulsory.*

(ii) *Section A: Question numbers 1 to 20 are MCQ and carrry 1 mark each.*

(iii) *Section B: Question numbers from 21 to 27 are short answer questions and carry 2 marks each.*

(iv) *Section C: Question numbers 28 to 34 are also short answer questions and carry 3 marks each.*

(v) *Section D: Question numbers 35 to 37 are long answer questions and carry 5 marks each.*

(vi) *There is no overall choice. However an internal choice has been provided in two questions of one mark, two questions of two marks, two questions of three marks and one question of five marks weightage. You have to attempt only one of the choices in such questions.*

(vii) *Use log table, if necessary. Use of calculator is prohibited.*

Section-A

Multiple choice Questions:-

Q-1	Which of the following statements about the electron is incorrect? (a) It is a negatively charged particle. (b) The mass of electron is equal to the mass of neutron (c) It is a basic constituent of all atoms. (d) It is a constituent of cathode rays	1
Q-2-	The elements in which electrons are progressively filled in 4f-orbital are called (a) actinoids (b) transition elements (c) lanthanoids (d) halogens	1
Q-3-	The period number in the long form of the periodic table is equal to (a) magnetic quantum number of any element of the period. (b) atomic number of any element of the period. (c) maximum Principal quantum number of any element of the period. (d) maximum Azimuthal quantum number of any element of the period.	1
Q-4-	In NO 3 ion, the number of bond pairs and lone pairs of electrons on nitrogen atom are (a) 2, 2	1

	(b) 3, 1 (c) 1, 3 (d) 4, 0	

Q-5-	In which of the following substances will hydrogen bond be strongest?
	    (a) HCl
	    (b) H_2O
	    (c) HI
	    (d) H_2S
		1

Q-6-	The interaction energy of London force is inversely proportional to sixth powerof the distance between two interacting particles but their magnitude depends upon
	    (a) charge of interacting particles
	    (b) mass of interacting particles
	    (c) polarisability of interacting particles
	    (d) strength of permanent dipoles in the particles.
		1

Q-7-	As the temperature increases, average kinetic energy of molecules increases. What would be the effect of increase of temperature on pressure provided the volume is constant?
	    (a) increases
	    (b) decreases
	    (c) remains same
	    (d) becomes half
		1

Q-8-	Thermodynamics is not concerned about_____.
	    (a) energy changes involved in a chemical reaction.
	    (b) the extent to which a chemical reaction proceeds.
	    (c) the rate at which a reaction proceeds.
	    (d) the feasibility of a chemical reaction.
		1

Q-9-	The volume of gas is reduced to half from its original volume. The specific heat will be _____.
	    (a) reduce to half
	    (b) be doubled
	    (c) remain constant
	    (d) increase four times
		1

Q-10-	The enthalpies of elements in their standard states are taken as zero. The enthalpy of formation of a compound
	    (a) is always negative
	    (b) is always positive
	    (c) may be positive or negative
	    (d) is never negative
		1

Q-11-	The pH of neutral water at 25°C is 7.0. As the temperature increases, ionization of water increases, however, the concentration of H+ ions and OH– ions are equal. What will be the pH of pure water at 60°C?
	    (a) Equal to 7.0
	    (b) Greater than 7.0
	    (c) Less than 7.0
	    (d) Equal to zero
		1

Q-12-	The oxidation number of an element in a compound is evaluated on the basis of certain rules. Which of the following rules is not correct in this respect? (a) The oxidation number of hydrogen is always +1. (b) The algebraic sum of all the oxidation numbers in a compound is zero. (c) An element in the free or the uncombined state bears oxidation number zero.	1

	(d) In all its compounds, the oxidation number of fluorine is – 1.	
Q-13-	Hydrogen peroxide is _____. (a) an oxidising agent (b) a reducing agent (c) both an oxidising and a reducing agent (d) neither oxidising nor reducing agent	1
Q-14-	A substance which gives brick red flame and breaks down on heating to give oxygen and a brown gas is (a) Magnesium nitrate (b) Calcium nitrate (c) Barium nitrate (d) Strontium nitrate	1
Q-15-	Suspension of slaked lime in water is known as (a) lime water (b) quick lime (c) milk of lime (d) aqueous solution of slaked lime	1
Q-16-	Boric acid is an acid because its molecule (i) contains replaceable H+ ion (ii) gives up a proton (iii) accepts OH– from water releasing proton (iv) combines with proton from water molecule	1
Q-17-	The most commonly used reducing agent is (i) AlCl3 (ii) PbCl2 (iii) SnCl4 (iv) SnCl2	1
Q-18-	In which of the following, functional group isomerism is not possible? (i) Alcohols (ii) Aldehydes (iii) Alkyl halides (iv) Cyanides	1
Q-19-	The principle involved in paper chromatography is (i) Adsorption (ii) Partition (iii) Solubility (iv) Volatility	1
Q-20-	The gaseous envelope around the earth is known as atmosphere. The lowest layer of this is extended upto 10 km from sea level, this layer is _____. (a) Stratosphere (b) Troposphere (c) Mesosphere (d) Hydrosphere	1
	Section :- B	
Q-21-	Round up the following up to three significant figures: (a) 10.4107 (b) 0.04597	2

Q-22-	Define electronegativity. How does it differ from electron gain enthalpy?	2
Q-23-	For the reaction, 2Cl (g) -----------> Cl2 (g), what are the signs of ΔHand ΔS? OR The reaction of cyanamide, $NH_2CN(s)$, with dioxygen was carried out in a bomb calorimeter and ΔU was found to be -742.7 kJ mol^{-1} at 298 K.Calculate enthalpy change for the reaction at 298 K. NH_2CN (s) +3/2 O_2(g) → N_2(g) + CO_2(g) +H_2O(l)	2
Q-24-	Define the term hybridization. Explain the structure of ethene with help of hybridization. OR 1) Write resonance structures for NO3- 2) Discuss the shape of PH3 using VSEPR theory	2
Q-25-	What is Lassaigne's extract? Discuss the chemistry of Lassaigne's test.	2
Q-26-	(a) Define photoelectric effect? (b) What is the number of photons of light with a wave length of 4000pm that provide 1J of energy?	2
Q-27-	What is smog? How is classical smog different from photochemical smog?	2

SECTION-C

Q-28-	A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 L (at S.T.P.) of this welding gas is found to weigh 11.6 g. Calculate: (i) empirical formula (ii) molar mass of the gas, and (iii) molecular formula.	3
Q-29	Draw Lewis structures for the following molecules and identify the atoms which do not obey octet rule: H2S, SF2, BF3, SO2, PCl3, and PCl5. OR Explain O2 Molecule on the basis of Molecular Orbital Theory.	3
Q-30	(i) Calculate the total pressure in a mixture of 8 gm of dioxygen and 4 gm of hydrogen confined in a vessel of 1dm3 at 27 ^{0}C (R=0.083 bar dm3 K-1 mol-1) (ii) Critical temperature for carbon dioxide and methane are 31.1 ^{0}C and -81.9 ^{0}Crespectively. Which of these has stronger intermolecular forces and why? OR Write postulates of kinetic molecular theory of gas.	3
Q-31	What happens when: (i) Beryllium carbide reacts with water. (ii) Magnesium Nitrate is heated. (iii) Quick lime is heated in electric furnace with powdered coke?	3
Q-32	(i) Write chemical reactions to show the amphoteric nature of water. (ii)H2O2cannot be stored for prolonged period give reason	3
Q-33	On complete combustion of 0.246 g of an organic compound gave 0.198 g of carbon dioxide and 0.101 g of water. Determine percentage composition of carbon and hydrogen in the given compound.	3

Q-34	Give reasons for the following: (a) Alkaline earth metals are weaker reducing agents than alkali metals. (b) The second ionisations enthalpy of alkaline earth metals is greater than first ionisations enthalpy. (c) There is a striking similarity between Li and Mg.	3
	SECTION-D	
Q-35	(a) Derive de Broglie equation for microscopic particles. (b)Calculate the wavelength, frequency and wave number of a light wave whose period is 2.0 X 10-10 s. OR (a) State Heisenberg's uncertainty principle (b) An atomic orbital has n=3 what are the possible values of l (c) The mass of an electron is 9.1 X 10_31 Kg. If its K.E. is 3.0 X10_25J. Calculate its wavelength.	5
Q-36	(a) State Le-Chatelier's principle. (b) What is the effect of increase in pressure and increase in volume on the following equilibrium reaction? N2 (g) +3H2 (g) ⇌2 NH3 (g) (c)The concentration of hydrogen ion in a sample of acid is 3.8X10-3 M. What is its pH?	5

Q-37	a) Write short note on the following :
	        i) Wurtz reaction
	        ii) Markownikov`s rule
	        iii) Decarboxylation reaction.
	 b) An alkene with Molecular formula C5H10 'A' on ozonolysis form a triozonide which on reaction with Zn/H2O gives a mixture of acetaldehyde and acetone. Write Chemical equation involved,structure and IUPAC name of 'A'.
	 OR
	 a) How would you convert Ethyne into:
	  i) propyne ii) Toluene
	 b) What happens when: [Give chemical equations]
	  i) Ethene is oxidized with cold dil ,neutral or Alk KMnO4
	 ii) Ethanol is heated with conc. H2SO4.
	 iii) Benzene is heated with acetyl chloride in the presence of AlCl3
		5

MARKING SCHEME

SL. NO.	ANSWERS	MARKS
ANS :- 1	b	1
Ans:- 2	c	1
ANS:-3	c	1
ANS:-4	d	1
ANS:- 5	b	1
ANS:- 6	c	1
ANS:- 7	a	1
ANS:- 8	c	1
ANS:- 9	c	1
ANS:- 10	c	1
ANS:- 11	c	1
ANS:- 12	a	1
ANS:- 13	c	1
ANS:- 14	b	1
ANS:- 15	c	1
ANS:- 16	c	1
ANS:- 17	d	1
ANS:- 18	c	1
ANS:- 19	b	1
ANS:- 20	b	1
ANS:- 21	(a) 10.4 (b) 0.04601	1+1
ANS:- 22	Correct definition with two differences	1 ½ + ½
ANS:- 23	H = -ve(bond formation energy released) and S= -ve (no of moles decreases on right hand side) OR Calculation of Δng=1+1- 3/2 =1/2 Correct formula substitution of values calculation = -741.4615k J/mol	1+1 ½ ½ ½ ½
Ans:- 24	the process of an animal or plant breeding with an individual of another species or variety."these irises are the products of hybridization carried out by a plant breeding firm Ethene is not a very complicated molecule. It contains two carbon atoms that are double bonded to each other, with each of these atoms also bonded to two Hydrogen atoms. This forms a total of three bonds to each carbon atom, giving them an sp2 hybridization. Or 1. acceptable resonance structures are: The actual structure of NO3– is an equal mixture of all three resonance structures; i.e. a hybrid: each NO bond is 1.333 times the strength of a normal NO single bond. 2. b ased on VSEPR Theory (Valence Shell Electron Pair Repulsion Theory) the electron clouds on atoms and lone pair of electrons around the P atom will repel each other. As a result they will be pushed apart giving the PH3 molecule a **trigonal pyramidal** geometry or shape.	1+1
Ans:-25	In this test organic compound containing N and/or S or halogen is fused with sodium metal to detect their presence. In Lassaigne's test the elements present in compound are converted from	1+1

	covelant form to ionic form. So, that they can be tested.	
Ans:- 26	(a) The phenomenon of ejection of electron from the surface of metal when light of suitable frequency falls on its surface. (b) Suppose N photons of light with wavelength 4000pm can provide 1J of energy Energy of N photons = N hv 1J= N hv=Nhc/λ N=1JX4000X10-12m/6.63X10-34JsX3.0X108ms-1 =2.01X1016	1+1
Ans:- 27	Correct definition with two differences	1+1
Ans:- 28	(i) Calculation for empirical formula CH (ii) Calculation for molar mass of the gas = 25.984 g (iii) Calculation for molecular formula C2H2	1 1 1
Ans:- 29	Correct Lewis dot Structure. OR Molecular Orbital Configuration, Energy Diagram, Bond Order	3 1+1+1
Ans:- 30	i) Pressure, P=nRT/V P=56.025 bar ii) Correct answer and explanation OR Correct Postulates.	1½ 1½ 3
Ans:- 31	**1.** (i) $Be_2C + 4 H_2O \rightarrow 2Be(OH)_2 + CH_4$ (ii) $2Mg(NO_3)_2 \rightarrow 2MgO + 4NO_2 + O_2$ (iii) $CaO_{(s)} + 3C_{(s)} \rightarrow CaC_{2(s)} + CO_{(g)}$	1+1+1
Ans:- 32	(i)correct equations (ii)correct reason	1+1 1
Ans:- 33	Percentage of Carbon = (12×0.198×100) / (44×0.246) = 21.95 % Percentage of Hydrogen = (2×0.101×100) / (18×0.246) = 4.58 %	1½ 1½
Ans:- 34	a) Due to greater ionization enthalpies (b) Second electron is to be removed from a mono-valent cation (c) diagonal relationship / equal size	1 1 1
Ans:- 35	(a) Derivation by using quantum theory and Einstien equation (b) Frequency =1/T=1/2.0 X10_10 =5X109s-1 Wavelength= C/Frequency= 6.0X10_2 m Wave number=i/wavelength=16.66 m-1 OR (a) Correct answer (b) l=0,1,2 (c) K.E.= 1/2mv2, v=(2K.E./m)1/2=812m/s (d) Wavelength=H/mv=8967X10_10m	2 1+1+1 1 1 1 +1/2 1 +1/2

Ans:- 36	a) Right statement
	(b) with increase in pressure equilibrium shifts towards lesser moles(right)
	    with increase in volume equilibrium shifts towards greater moles(left)
	(c) pH= -log[H+]
	    pH= -log[3.8X10-3]
	        =2.42
		1
		1
		1
		1
		1
		½ 1/2

Ans:-37	For correct answer Or Right conversion Correct chemical equation	1+1+1+2 1+1+1+1+1

BLUE PRINT

S.No.	Title	VSA MCQ	SA I	SA II	LA	TOTAL	Marks distribution as per CBSE
		(1 Mark)	(2 Marks)	(3 Marks)	(5 Marks)		
1	Some Basic concepts of chemistry	-	1(2)	1(3)	-	2(5)	11
2	Structure of Atom	1(1)			1(5)	2(6)	
3	Classification of Elements and Periodicity in Properties	2(2)	1(2)	-	-	3(4)	04
4	Chemical Bonding and molecular Structure	2(2)	-	1(3)	-	3(5)	21
5	States of Matter: Gases and Liquids	2(2)		1(3)	-	3(5)	
6	Thermodynamics	3(3)	1(2)	-		4(5)	
7	Equilibrium	1(1)	-	-	1(5)	2(6)	
8	Redox Reactions	1(1)	-	1(3)	-	2(4)	16
9	Hydrogen	1(1)	-	1(3)	-	2(4)	
10	s- Block Elements	2(2)	1(2)	-	-	3(4)	
11	Some p- Block Elements	2(2)	1(2)			3(4)	
12	Organic Chemistry: some basic Principles and Techniques	2(2)	1(2)	1(3)	-	4(7)	18
13	Hydrocarbons	-	-	1(3)	1(5)	2(8)	
14	Environmental Chemistry	1(1)	1(2)		-	2(3)	
	Total	**20(20)**	**7(14)**	**7(21)**	**3(15)**	**37(70)**	**Total=70**

84

कक्षा १२

रोड मैप

Ascent of Series

$$R-X \xrightarrow{\text{alc. KCN}} R-CN \xrightarrow[\text{Reduction}]{\text{LiAlH}_4} R-CH_2NH_2$$

Alkyl halide   Nitrile   Primary amine

R—CN → (Hydrolysis, H_3O^+) → RCOOH

R—CH$_2$NH$_2$ → (HNO$_2$, NaNO$_2$ & HCl) → R—CH$_2$OH

$$RCOOH \xleftarrow{\text{Oxidation}} R-CH_2OH$$

Organic compound   Carboxylic acid   Primary alcohol

Descent of Series

$$RCOOH \xrightarrow[\Delta]{\text{NH}_3} RCONH_2 \xrightarrow[\text{KOH}]{\text{Br}_2} R-NH_2$$

Carboxylic acid   Acid amide   Amine

R—NH$_2$ → (NaNO$_2$ & HCl) HNO$_2$ → R—OH

$$\text{Carboxylic acid or aldehyde} \xleftarrow{\text{Oxidation}} R-OH$$

Primary alcohol

Organic compound
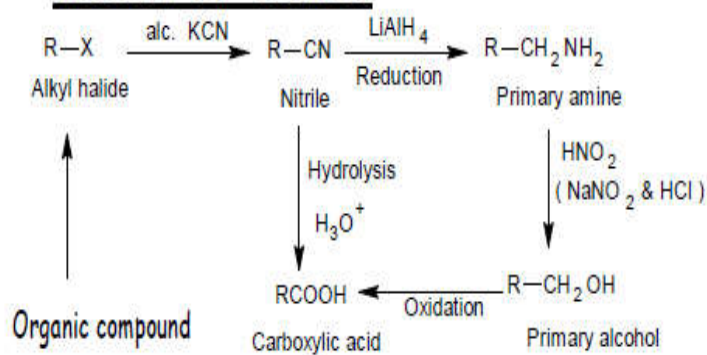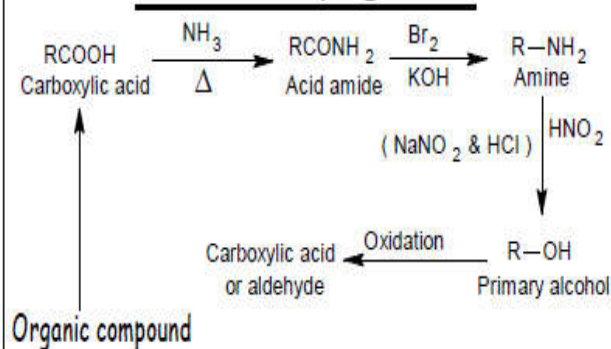
For aromatic conversion take the help of benzenediazonium chloride

Ethyne into benzene

$$3 \ CH\equiv CH \xrightarrow[\text{Polymerisation}]{\text{Red-Hot-Cu Tube}} \bigcirc$$

Ethene into benzene

$$H_2C=CH_2 \xrightarrow{\text{Br}_2} \underset{\text{Br} \quad \text{Br}}{H_2C-CH_2} \xrightarrow{\text{Alc. KOH}} HC\equiv CH \xrightarrow[\text{Polymerisation}]{\text{Red-Hot-Cu Tube}} \bigcirc$$
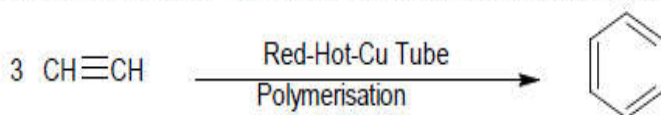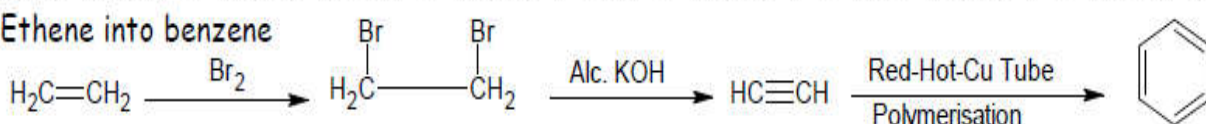
Hexane into benzene

$$\text{Hexane} \xrightarrow[\text{773 K / 10-20 atm. (- H}_2)]{\text{Cr}_2\text{O}_7 / \text{V}_2\text{O}_5 / \text{Mo}_2\text{O}_3} \text{Cyclohexane} \xrightarrow[-3\text{H}_2]{\text{Aromatisation}} \text{Benzene}$$
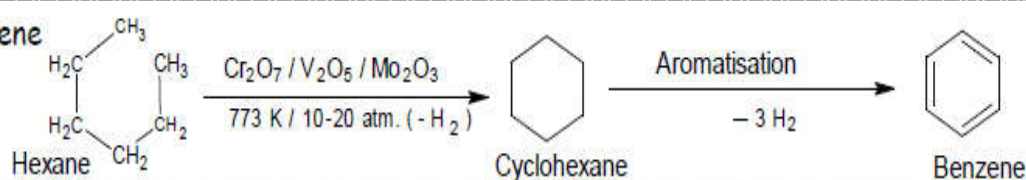
Benzene into p-nitrobromobenzene

$$\bigcirc \xrightarrow{\text{Br}_2 / \text{FeBr}_3} \bigcirc-\text{Br} \xrightarrow{\text{HNO}_3 / \text{H}_2\text{SO}_4} O_2N-\bigcirc-Br$$
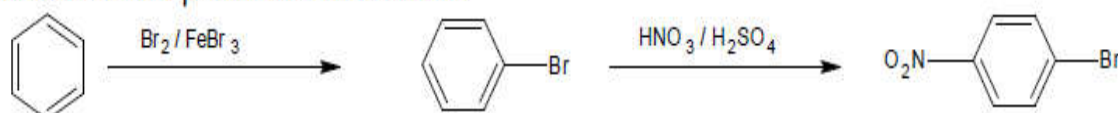
Benzene into m-nitrochlorobenzene

$$\bigcirc \xrightarrow{\text{HNO}_3 / \text{H}_2\text{SO}_4} \overset{\text{NO}_2}{\bigcirc} \xrightarrow{\text{Cl}_2 / \text{FeCl}_3} \overset{\text{NO}_2}{\underset{\text{Cl}}{\bigcirc}}$$
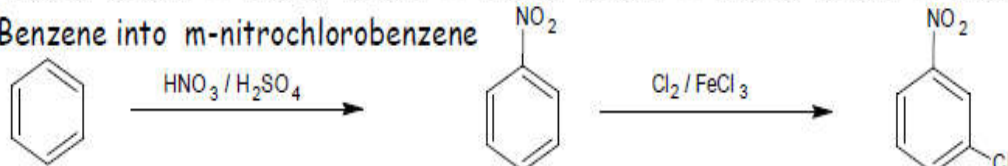
Benzene into p-nitrotoluene

$$\bigcirc \xrightarrow{\text{CH}_3\text{Cl} / \text{anhy. AlCl}_3} \bigcirc-\text{CH}_3 \xrightarrow{\text{HNO}_3 / \text{H}_2\text{SO}_4} O_2N-\bigcirc-CH_3$$
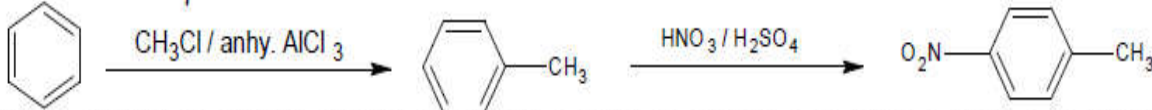
Benzene into Acetophenone

$$\bigcirc + H_3C-\overset{O}{\underset{}{C}}-Cl \xrightarrow{\text{Anhy. AlCl}_3} \bigcirc-\overset{O}{\underset{}{C}}-CH_3$$

Ethanol into but-1-yne

$$CH_3CH_2OH \xrightarrow[\text{(Pyridine)}]{\text{SOCl}_2} CH_3CH_2Cl \xrightarrow[-\text{NaCl}]{\text{HC}\equiv\text{CNa}} HC\equiv CCH_2CH_3$$

Ethane to Bromoethene

$$H_3C-CH_3 \xrightarrow{\text{Br}_2} CH_3CH_2Br \xrightarrow{\text{Alc. KOH}} H_2C=CH_2 \xrightarrow{\text{Br}_2} \underset{\text{Br} \quad \text{Br}}{H_2C-CH_2} \xrightarrow{\text{Alc. KOH}} H_2C=CH-Br$$
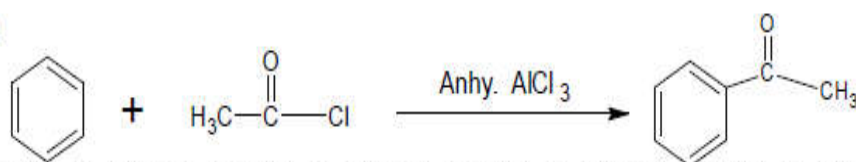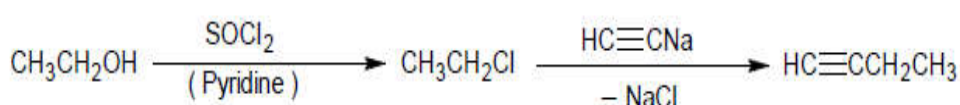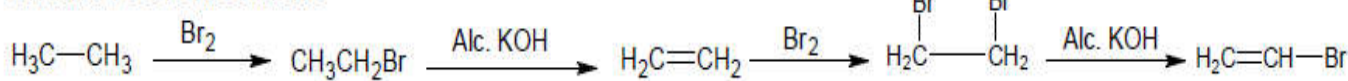
Propene into 1-nitropropane

$$H_3C-CH=CH_2 \xrightarrow[\text{(Peroxide)}]{\text{HBr}} H_3C-CH_2-CH_2-Br \xrightarrow[-\text{AgBr}]{\text{AgNO}_2} H_3C-CH_2-CH_2-NO_2$$
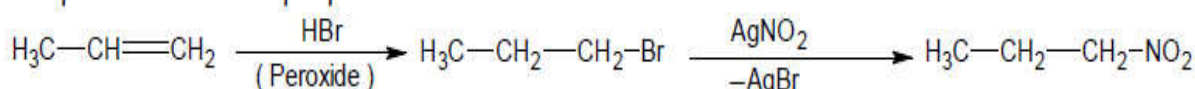
Ethanoic acid into Benzene

$$H_3C-COOH \xrightarrow{\text{aq NaOH}} H_3C-COONa \xrightarrow[\Delta]{\text{Sodalime}} CH_4 \xrightarrow{\text{Cl}_2 / h\nu} H_3C-Cl \xrightarrow{\text{Na / Dryether}} H_3C-CH_3$$

$$H_3C-CH_3 \xrightarrow{\text{Cl}_2 / h\nu} \underset{\text{CH}_2\text{CH}_3}{\overset{\text{Cl}}{|}} \xrightarrow{\text{Alc. KOH}} H_2C=CH_2 \xrightarrow{\text{Br}_2} \underset{\text{Br} \quad \text{Br}}{H_2C-CH_2} \xrightarrow{\text{Alc. KOH}} H_2C=CH-Br \xrightarrow{\text{NaNH}_2} HC\equiv CH \xrightarrow[\text{873 K}]{\text{Red hot iron tube}} \bigcirc$$

Toluene into Benzyl alcohol

$C_6H_5-CH_3 \xrightarrow[- HCl]{Cl_2 / Boil} C_6H_5-CH_2-Cl \xrightarrow{Aq. KOH} C_6H_5-CH_2-OH$

Propene into Propyne

$H_3C-CH=CH_2 \xrightarrow{Br_2 / CCl_4} H_3C-\underset{Br}{HC}-\underset{Br}{CH_2} \xrightarrow[NaNH_2]{alc. KOH} H_3C-C\equiv CH$
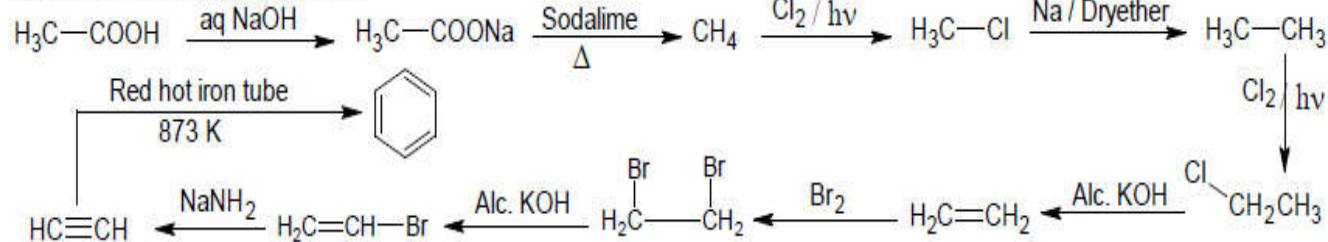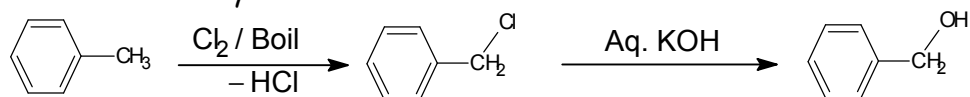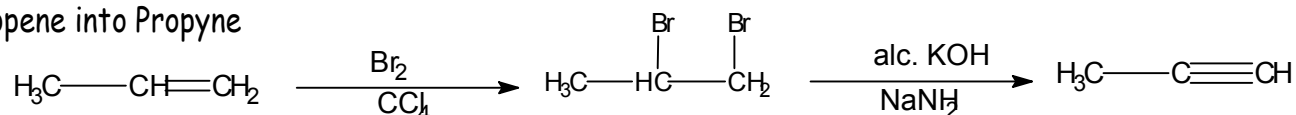
Ethanol into Fluoroethane

$H_3C-CH_2-OH \xrightarrow[(Pyridine)]{SOCl_2} H_3C-CH_2-Cl \xrightarrow[- Hg_2Cl_2]{Hg_2F_2} H_3C-CH_2-F$
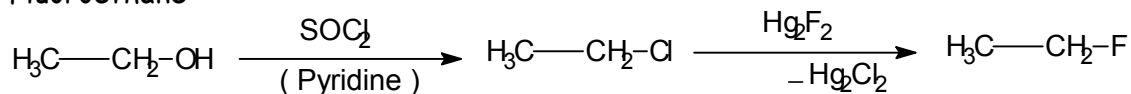
Bromomethane into Propanone

$CH_3Br \xrightarrow[-KBr]{Alc. KCN} CH_3CN \xrightarrow[(ether)]{CH_3MgBr} H_3C-\underset{CH_3}{\overset{CH_3}{C}}=NMgBr \xrightarrow{H_2O / H^+} H_3C-\underset{CH_3}{\overset{CH_3}{C}}=O$

But-1-ene into But-2-ene

$H_3C-CH_2-CH=CH_2 \xrightarrow{HBr} H_3C-CH_2-\underset{Br}{HC}-CH_3 \xrightarrow{alc. KOH} H_3C-CH=CH-CH_3$
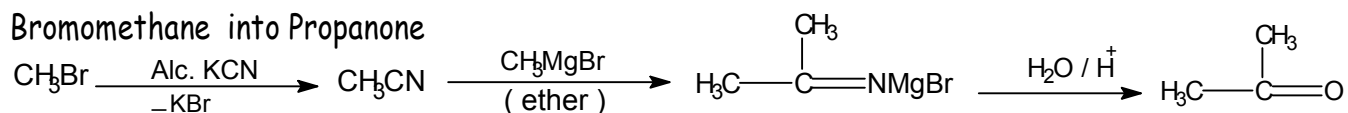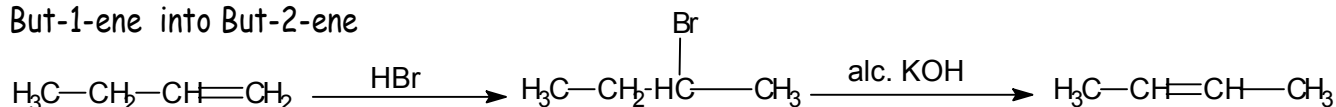
1- Chlorobutane into n- Octane

$H_3C-CH_2-CH_2-CH_2-Cl + 2\ Na \xrightarrow[(Wurtz\ reaction)]{Dry\ ether} H_3C-(CH_2)_6-CH_3$

Benzene into Biphenyl

$C_6H_6 \xrightarrow{Br_2 / FeBr_3} 2\ C_6H_5-Br \xrightarrow{Na / Dryether} C_6H_5-C_6H_5$

Propene into Propan-1-ol

$H_3C-CH=CH_2 \xrightarrow[Peroxide]{HBr} H_3C-CH_2-CH_2-Br \xrightarrow{Aq. KOH} H_3C-CH_2-CH_2-OH$
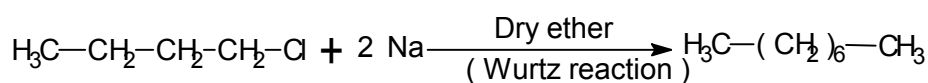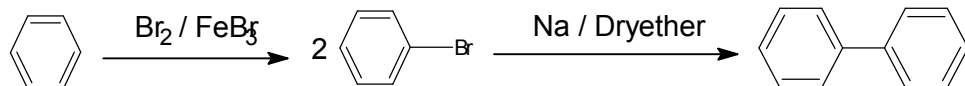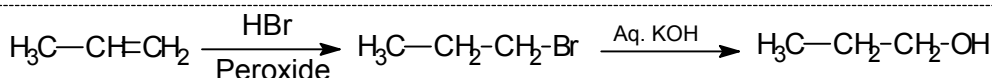
1- Bromopropane into 2-Bromopropane

$H_3C-CH_2-CH_2-Br \xrightarrow{alc. KOH} H_3C-CH=CH_2 \xrightarrow{HBr} H_3C-\underset{Br}{CH}-CH_3$
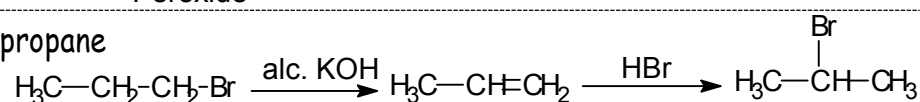
Benzyl alcohol into 2-Phenylethanoic acid

$C_6H_5-CH_2-OH \xrightarrow{SOCl_2} C_6H_5-CH_2-Cl \xrightarrow{KCN} C_6H_5-CH_2-CN \xrightarrow{H_2O / H^+} C_6H_5-CH_2COOH$

Ethanol into Propanenitrile

$H_3C-CH_2-OH \xrightarrow[(Pyridine)]{SOCl_2} H_3C-CH_2-Cl \xrightarrow{KCN} H_3C-CH_2-CN$
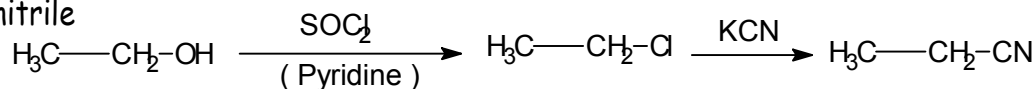
Aniline into Chlorobenzene

$C_6H_5-NH_2 \xrightarrow{NaNO_2 / HCl} C_6H_5-N_2^+Cl^- \xrightarrow{CuCl / HCl} C_6H_5-Cl$
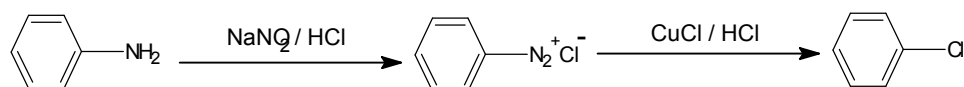
2-Chlorobutane into 3,4-Dimethylhexane

$2\ H_3C-CH_2-\underset{CH_3}{CH}-Cl \xrightarrow{Na / Dryether} H_3C-CH_2-\underset{CH_3}{CH}-\underset{CH_3}{CH}-CH_2-CH_3$
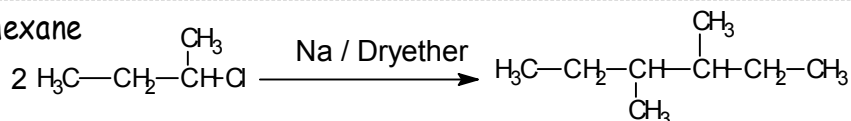
2-Methylpropene into 2-Chloro- 2-methylpropane

$H_3C-\underset{CH_3}{\overset{}{C}}=CH_2 \xrightarrow{HCl} H_3C-\underset{CH_3}{\overset{Cl}{C}}-CH_3$
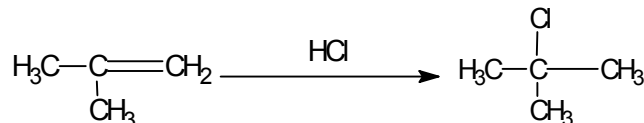
Ethylchloride into Propanoic acid

$H_3C-CH_2-Cl \xrightarrow{KCN} H_3C-CH_2-CN \xrightarrow{H_2O / H^+} H_3C-CH_2-COOH$
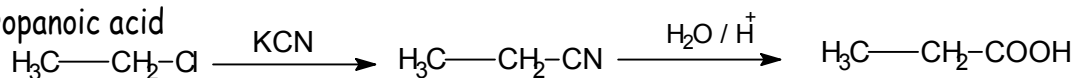
But-1-ene into n-butyliodide

$H_3C-CH_2-CH=CH_2 \xrightarrow[Peroxide]{HBr} H_3C-CH_2-CH_2-CH_2-Br \xrightarrow[Acetone]{NaI} H_3C-CH_2-CH_2-CH_2-I$
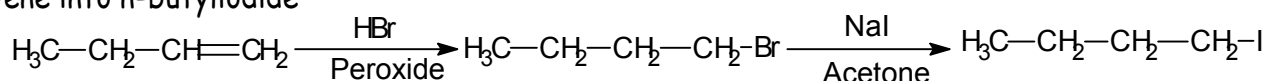
2-Chloropropane into Propan-1-ol

$H_3C-\underset{Cl}{CH}-CH_3 \xrightarrow{alc. KOH} H_3C-CH=CH_2 \xrightarrow[H_2O_2 / OH^-]{B_2H_6} H_3C-CH_2-CH_2-OH$

Isopropyl alcohol into Idoform

$H_3C-\underset{OH}{CH}-CH_3 \xrightarrow[- CH_3COONa]{I_2 / Na_2CO_3} CHI_3$
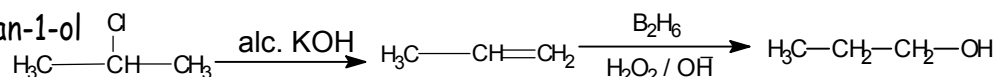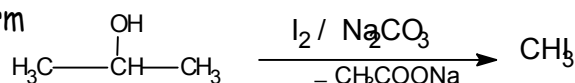
Chlorobenzene into p-nitrophenol

$C_6H_5-Cl \xrightarrow[623K / 300atm.]{NaOH} C_6H_5-OH \xrightarrow{HNO_3 / H_2SO_4} O_2N-C_6H_4-OH$
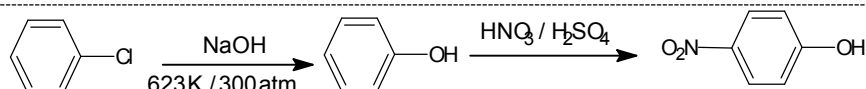
2- Bromopropane into 1-Bromopropane

$$H_3C-CH(Br)-CH_3 \xrightarrow{\text{alc. KOH}} H_3C-CH=CH_2 \xrightarrow[\text{Peroxide}]{\text{HBr}} H_3C-CH_2-CH_2-Br$$
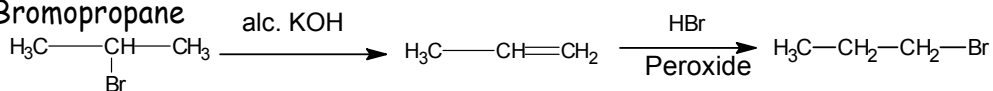
tert.butyl bromide into Isobutyl bromide

$$(CH_3)_3C-Br \xrightarrow{\text{alc. KOH}} H_3C-C(CH_3)=CH_2 \xrightarrow[\text{Peroxide}]{\text{HBr}} H_3C-CH(CH_3)-CH_2-Br$$
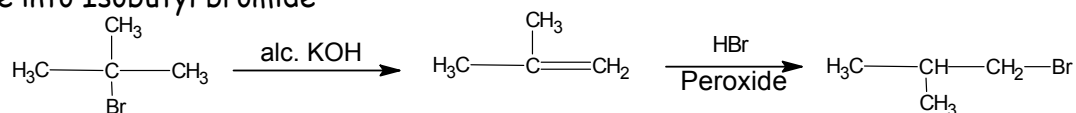
Aniline into Phenylisocyanide

$$C_6H_5-NH_2 + CHCl_3 + 3\,KOH \xrightarrow{(\text{ warm })} C_6H_5-NC + 3\,KCl + 3\,H_2O$$

Propene into Propan-2-ol

$$H_3C-CH=CH_2 \xrightarrow{\text{HBr}} H_3C-CH(Br)-CH_3 \xrightarrow{\text{aq. KOH}} H_3C-CH(HO)-CH_3$$
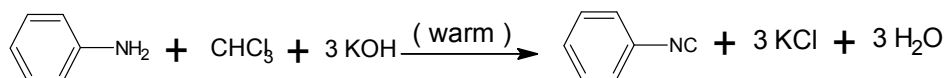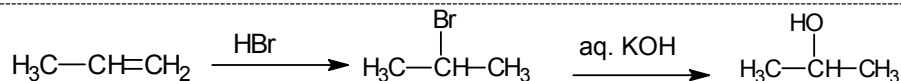
Benzyl chloride into Benzyl alcohol

$$C_6H_5-CH_2-Cl \xrightarrow{\text{aq. KOH}} C_6H_5-CH_2-OH$$
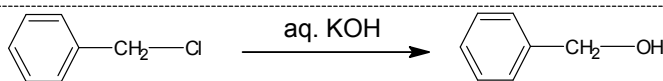
Ethylmagnesium chloride into Propan-1-ol

$$H_3C-CH_2-MgCl + H-\overset{O}{\underset{}{C}}-H \longrightarrow H_3C-CH_2-CH_2-OMgCl \xrightarrow{H_2O / H^+} H_3C-CH_2-CH_2-OH$$
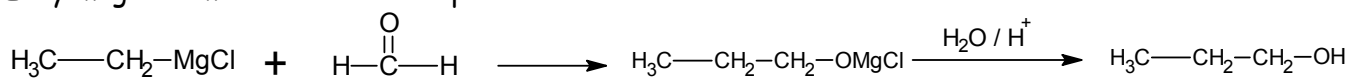
Methylmagnesium bromide into 2-Methylpropan-2-ol

$$CH_3MgBr + H_3C-\overset{O}{\underset{}{C}}-CH_3 \longrightarrow H_3C-\underset{H_3C}{\overset{OMgBr}{C}}-CH_3 \xrightarrow{H_2O / H^+} H_3C-\underset{H_3C}{\overset{OH}{C}}-CH_3$$
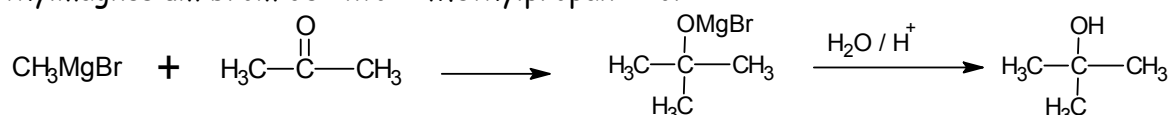
Butan-1-ol into Butanoic acid

$$CH_3CH_2CH_2CH_2OH \xrightarrow{\text{Jones reagent (} CrO_3\text{- }H_2SO_4 \text{)}} CH_3CH_2CH_2COOH$$
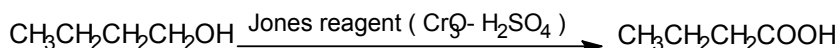
Benzyl alcohol into phenylethanoic acid

$$C_6H_5-CH_2OH \xrightarrow{\text{HBr}} C_6H_5-CH_2Br \xrightarrow{\text{KCN}} C_6H_5-CH_2CN \xrightarrow[\Delta]{H_3O^+} C_6H_5-CH_2COOH$$
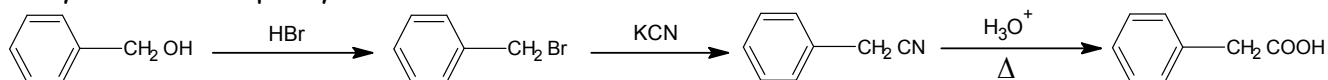
3-Nitrobromobenzene into 3-Nitrobenzoic acid

$$\text{(3-nitrobromobenzene)} \xrightarrow[\text{Ether}]{\text{Mg}} \text{(3-nitro-C}_6H_4\text{-MgBr)} \xrightarrow[\text{(Dry ice)}]{CO_2} \text{(3-nitro-C}_6H_4\text{-COOMgBr)} \xrightarrow[\Delta]{H_3O^+} \text{(3-nitro-C}_6H_4\text{-COOH)}$$
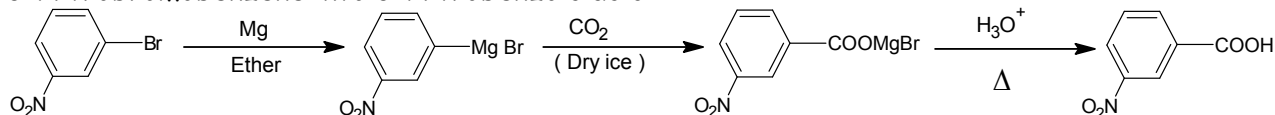
4-Methylacetophenone into Benzene-1,4-dicarboxylic acid

$$H_3C-C_6H_4-COCH_3 \xrightarrow{KMnO_4 / KOH} KOOC-C_6H_4-COOK \xrightarrow{\text{dil. } H_2SO_4} HOOC-C_6H_4-COOH$$
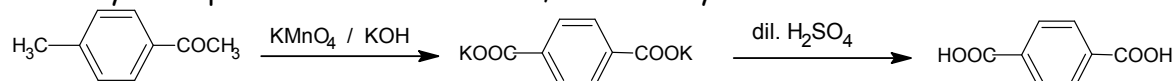
Cyclohexene into Hexane-1,6-dioic acid

$$\text{(cyclohexene)} \xrightarrow[\text{Heat}]{KMnO_4 - H_2SO_4} \text{(cyclohexane ring with COOH, COOH)} \quad \text{Adipic acid}$$
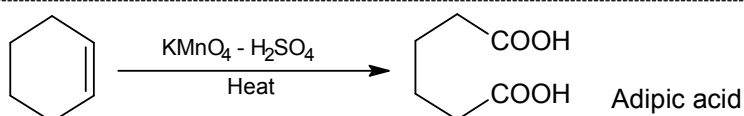
Butanal into Butanoic acid
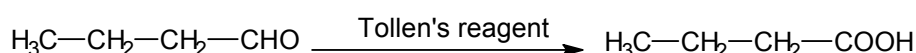
$$H_3C-CH_2-CH_2-CHO \xrightarrow{\text{Tollen's reagent}} H_3C-CH_2-CH_2-COOH$$

Ethylbenzene into Benzoic acid

$$C_6H_5-CH_2CH_3 \xrightarrow{KMnO_4 / KOH} C_6H_5-COOK \xrightarrow{H_3O^+} C_6H_5-COOH$$

Acetophenone into Benzoic acid

$$C_6H_5-COCH_3 \xrightarrow{KMnO_4 / KOH} C_6H_5-COOK \xrightarrow{H_3O^+} C_6H_5-COOH$$

Bromobenzene into Benzoic acid

$$C_6H_5-Br \xrightarrow{\text{Mg}} C_6H_5-MgBr \xrightarrow{O=C=O} C_6H_5-\overset{O}{C}-OMgBr \xrightarrow{H_2O} C_6H_5-COOH$$
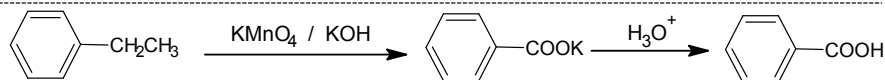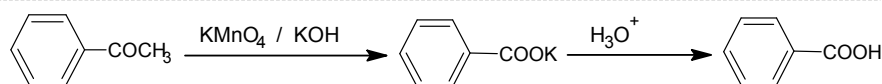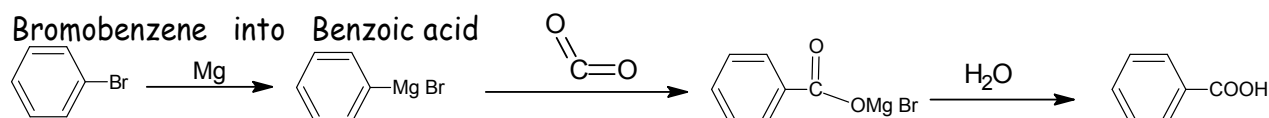
Phenylethene (Styrene) into Benzoic acid

$$C_6H_5-CH=CH_2 \xrightarrow{KMnO_4 / KOH} C_6H_5-COOK \xrightarrow{H_3O^+} C_6H_5-COOH$$
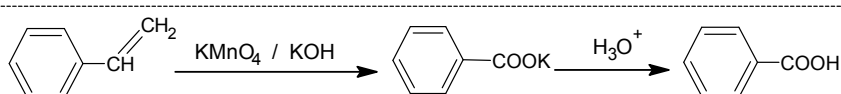
Ethanal into Butane-1,3-diol

$$H_3C-CHO \xrightarrow{\text{dil. NaOH}} H_3C-\underset{}{\overset{OH}{CH}}-CH_2-CHO \xrightarrow{LiAlH_4} H_3C-\overset{OH}{CH}-CH_2-\overset{OH}{CH_2}$$

Ethanal into But-2-enal

$H_3C-CHO \xrightarrow{\text{dil. NaOH}} H_3C-HC(OH)-CH_2-CHO \xrightarrow[-H_2O]{\text{Heat}} H_3C-CH=CH-CHO$
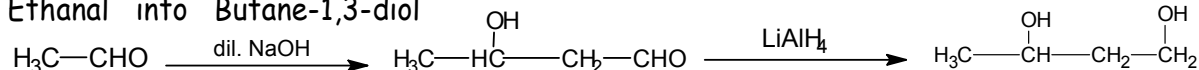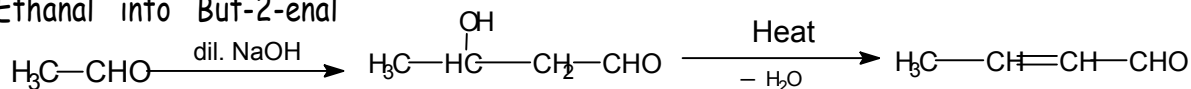
Ethanal into But-2-enoic acid

$H_3C-CHO \xrightarrow{\text{dil. NaOH}} H_3C-CH(OH)-CH_2-CHO \xrightarrow[-H_2O]{\text{Heat}} H_3C-CH=CH-CHO \xrightarrow{\text{Tollen's reagent}} H_3C-CH=CH-COOH$
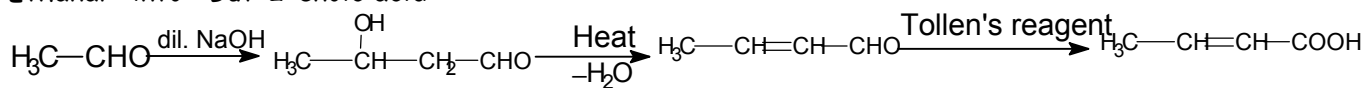
Benzene into methylbenzoate

Benzene $\xrightarrow[\text{Anhy. AlCl}_3]{CH_3Cl}$ toluene $\xrightarrow{KMnO_4/OH^-}$ benzoic acid (COOH) $\xrightarrow[(H_2SO_4)]{CH_3OH}$ methyl benzoate (COOCH$_3$)
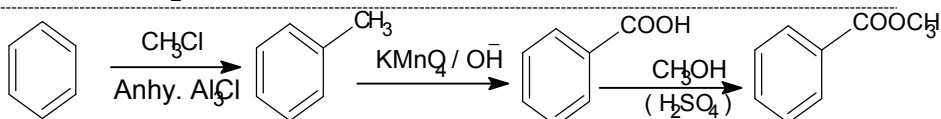
Benzene into m-Nitrobenzoic acid

Benzene $\xrightarrow[\text{Anhy. AlCl}_3]{CH_3Cl}$ toluene $\xrightarrow{KMnO_4/OH^-}$ benzoic acid (COOH) $\xrightarrow[H_2SO_4]{HNO_3}$ m-nitrobenzoic acid (COOH, NO$_2$)
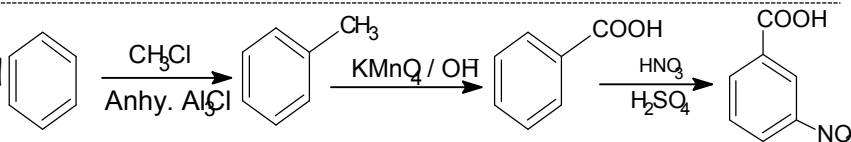
Benzene into p-Nitrobenzoic acid

Benzene $\xrightarrow[\text{Anhy. AlCl}_3]{CH_3Cl}$ toluene $\xrightarrow[H_2SO_4]{HNO_3}$ $H_3C-C_6H_4-NO_2$ $\xrightarrow{KMnO_4/OH^-}$ $HOOC-C_6H_4-NO_2$
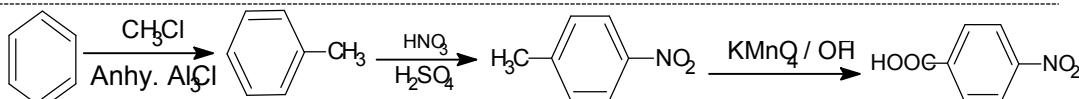
Benzene into p-Nitrobenzaldehyde

Benzene $\xrightarrow[\text{Anhy. AlCl}_3]{CH_3Cl}$ toluene $\xrightarrow[H_2SO_4]{HNO_3}$ $H_3C-C_6H_4-NO_2$ $\xrightarrow[H_3O^+]{CrO_2Cl_2/CS_2}$ $OHC-C_6H_4-NO_2$
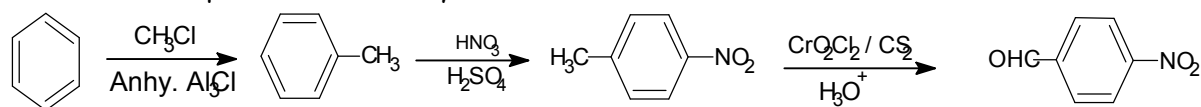
Benzene into Phenylacetic acid

Benzene $\xrightarrow[\text{Anhy. AlCl}_3]{CH_3Cl}$ toluene $\xrightarrow{Cl_2/\text{Boil}}$ $C_6H_5-CH_2Cl$ $\xrightarrow{KCN}$ $C_6H_5-CH_2CN$ $\xrightarrow{H_2O/H^+}$ $C_6H_5-CH_2COOH$

Propanone into propene

$H_3C-CO-CH_3 \xrightarrow{LiAlH_4} H_3C-HC(OH)-CH_3 \xrightarrow[\text{Heat}]{H_2SO_4 \text{ (conc.)}} H_3C-CH=CH_2$

Propanal into butanone

$CH_3CH_2CHO \xrightarrow[H_2O/H^+]{CH_3MgBr} H_3C-CH_2-CH(OH)-CH_3 \xrightarrow{K_2Cr_2O_7/H_2SO_4} H_3C-CH_2-CO-CH_3$
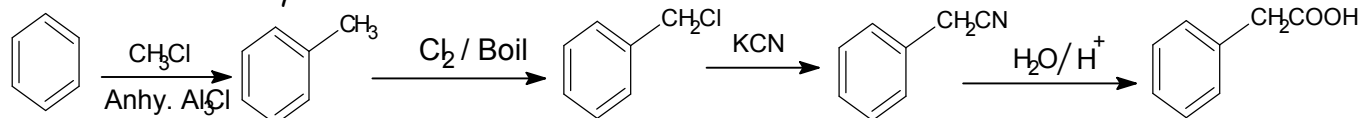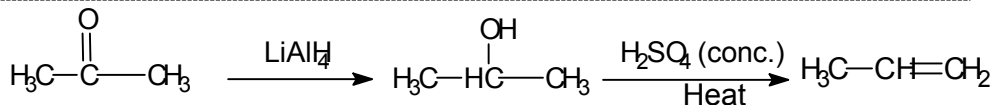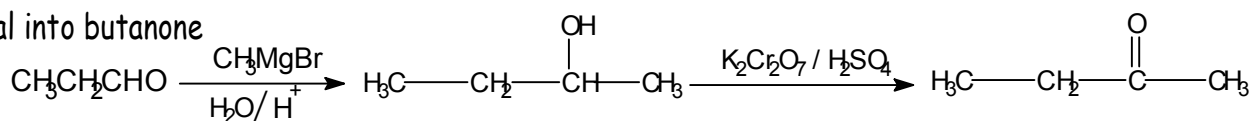
Ethanol into 3-hydroxybutanal

$CH_3CH_2OH \xrightarrow[\text{OR Cu 573K}]{\text{Anhydrous CrO}_3} CH_3CHO \xrightarrow[\text{Aldol condensation}]{\text{Dil. NaOH}} H_3C-HC(OH)-CH_2-CHO$
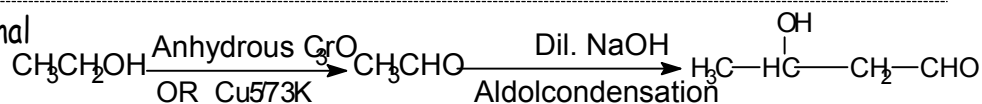
Benzaldehyde into benzophenone

$C_6H_5-CHO \xrightarrow{K_2Cr_2O_7/H_2SO_4} C_6H_5-COOH \xrightarrow[\text{Heat}]{Ca(OH)_2} (C_6H_5)_2C=O$

Benzaldehyde into 3-phenylpropan-1-ol

$C_6H_5-CHO + CH_3CHO \xrightarrow[\text{(Cross aldol condensation)}]{\text{dil.NaOH}} C_6H_5-CH=CH-CHO \xrightarrow{H_2/Ni} C_6H_5-CH_2-CH_2-CH_2OH$
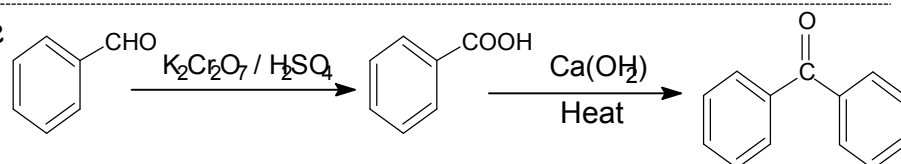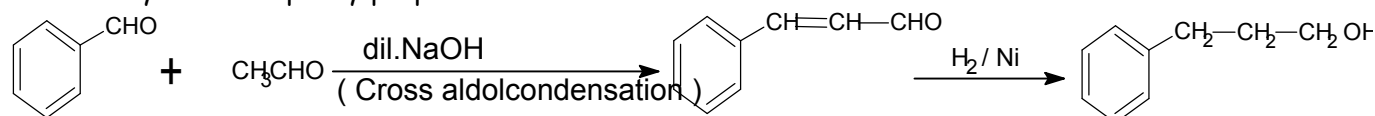
Benzaldehyde into 3-phenylprop-2-en-1-ol

$C_6H_5-CHO + CH_3CHO \xrightarrow[\text{(Cross aldol condensation)}]{\text{dil.NaOH}} C_6H_5-CH=CH-CHO \xrightarrow{NaBH_4/CH_3OH} C_6H_5-CH=CH-CH_2OH$
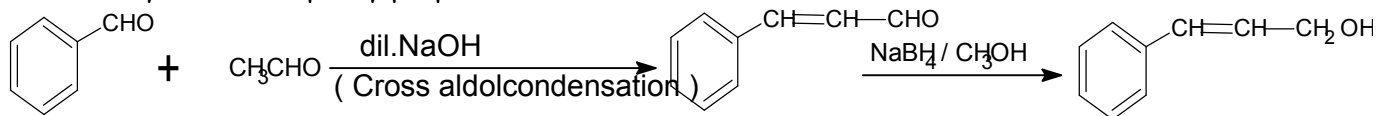
Benzaldehyde into α-Hydroxyphenylacetic acid

$C_6H_5-CHO + HCN \longrightarrow C_6H_5-CH(OH)-CN \xrightarrow{H_2O/H^+} C_6H_5-CH(OH)-COOH$
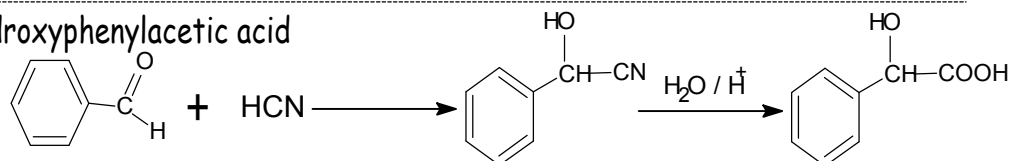
Benzoic acid into m-Nitrobenzyl alcohol

Benzoic acid (COOH) $\xrightarrow{HNO_3/H_2SO_4}$ m-nitrobenzoic acid (COOH, NO$_2$) $\xrightarrow{B_2H_6/H_3O^+}$ m-nitrobenzyl alcohol (CH$_2$OH, NO$_2$)
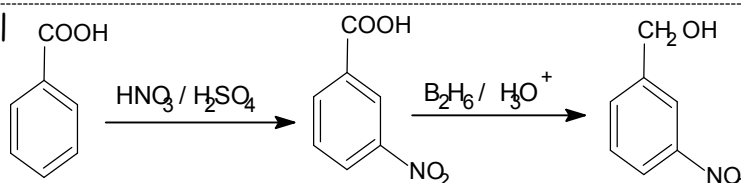
Benzoic acid into Benzaldehyde

Benzoic acid (COOH) $\xrightarrow{SOCl_2}$ (COCl) $\xrightarrow[\text{Rosenmund reduction}]{Pd/BaSO_4}$ (CHO)
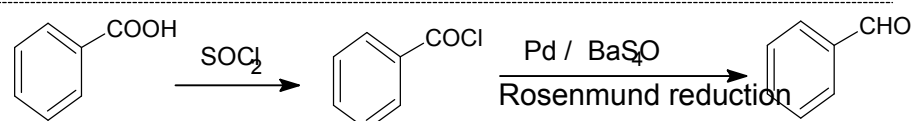
Benzene into m-Nitroacetophenone

Benzene $\xrightarrow{CH_3COCl\ AlCl_3}$ acetophenone $\xrightarrow{HNO_3\ /\ H_2SO_4}$ m-nitroacetophenone
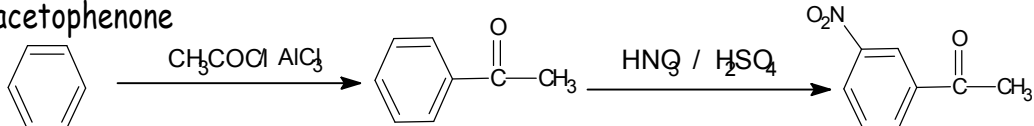
Bromobenzene into 1-Phenylethanol

Bromobenzene $\xrightarrow{Mg}$ PhMgBr $\xrightarrow{H_3C-CHO}$ addition product ($O^-\ ^+MgBr$) $\xrightarrow{H_3O^+}$ 1-phenylethanol (HO)
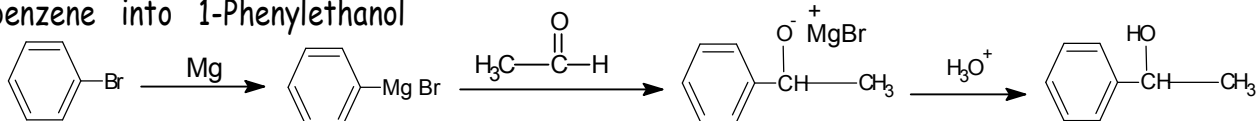
Chloroethane into propan-1-amine

$H_3C-CH_2-Cl \xrightarrow{Ethanolic\ NaCN} H_3C-CH_2-C\equiv N \xrightarrow[Reduction]{LiAlH_4} H_3C-CH_2-CH_2-NH_2$
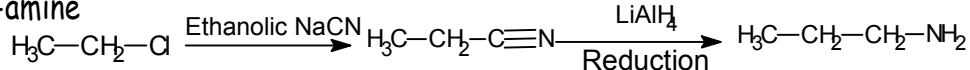
Chlorophenylmethane into 2-Phenylethanamine

$Ph-CH_2-Cl \xrightarrow{Ethanolic\ NaCN} Ph-CH_2-C\equiv N \xrightarrow[Reduction]{H_2\ /\ Ni} Ph-CH_2-CH_2-NH_2$
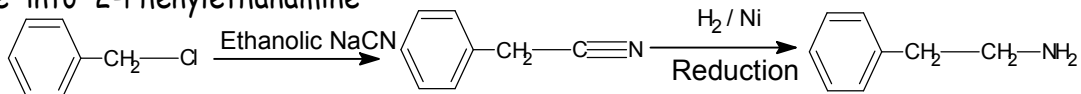
Benzene into Aniline

Benzene $\xrightarrow{HNO_3\ /\ H_2SO_4}$ nitrobenzene (NO_2) $\xrightarrow[Reduction]{Sn\ /\ HCl}$ aniline (NH_2)
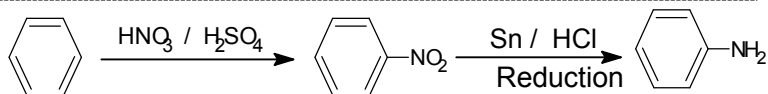
Benzene into N,N-dimethylaniline

Benzene $\xrightarrow{HNO_3\ /\ H_2SO_4}$ nitrobenzene (NO_2) $\xrightarrow[Reduction]{Sn\ /\ HCl}$ aniline (NH_2) $\xrightarrow{CH_3Br}$ N,N-dimethylaniline ($N(CH_3)_2$)
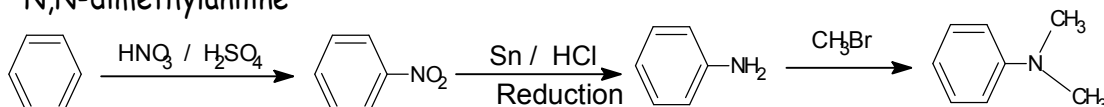
1,6-Dichlorobutane into hexane-1,6-diamine

$Cl-(CH_2)_4-Cl \xrightarrow{KCN} NC-(CH_2)_4-CN \xrightarrow{LiAlH_4} H_2NH_2C-(CH_2)_4-CH_2NH_2$
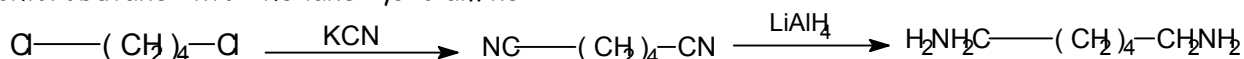
4-Nitrotoluene into 2- bromobenzoic acid

4-nitrotoluene (CH_3, NO_2) $\xrightarrow{Br_2}$ (CH_3, Br, NO_2) $\xrightarrow{Sn\ /\ HCl}$ (CH_3, Br, NH_2) $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ (CH_3, Br, $N\equiv N\ \bar{Cl}$) $\xrightarrow[H_2O]{H_3PO_2}$ (CH_3, Br) $\xrightarrow[OH^-]{KMnO_4}$ (COOH, Br)

3-Methylaniline into 3-nitrotoluene

3-methylaniline (NH_2, CH_3) $\xrightarrow{NaNO_2+HCl}$ ($N_2^+\ \bar{Cl}$, CH_3) $\xrightarrow{HBF_4}$ ($N_2^+BF_4^-$, CH_3) $\xrightarrow[Cu\ \Delta]{NaNO_2}$ (NO_2, CH_3)

Aniline into 1,3,5-tribromobenzene
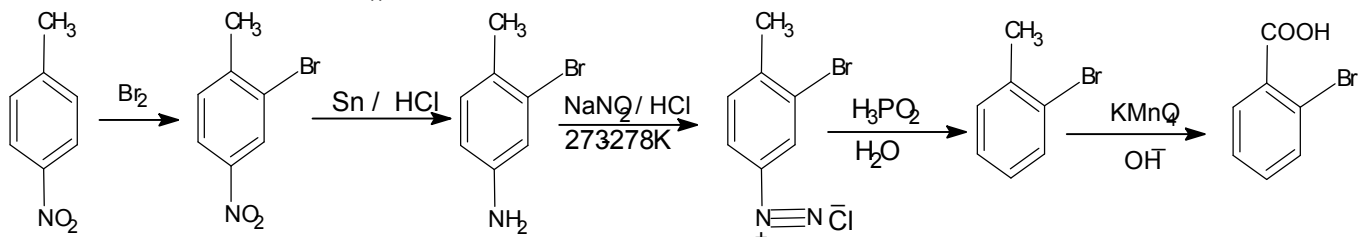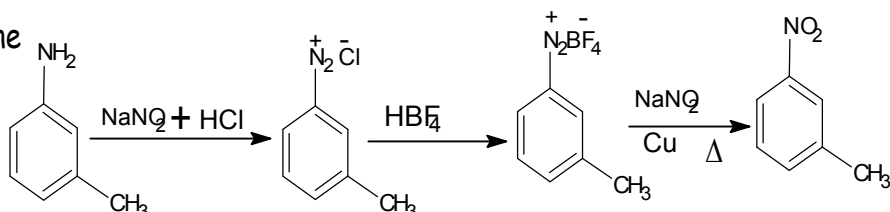
aniline (NH_2) $\xrightarrow{aq.\ Br_2}$ (Br, Br, NH_2, Br) $\xrightarrow{NaNO_2+HCl}$ (Br, Br, $N_2^+\ \bar{Cl}$, Br) $\xrightarrow{H_3PO_2}$ (Br, Br, Br) 1,3,5-tribromobenzene
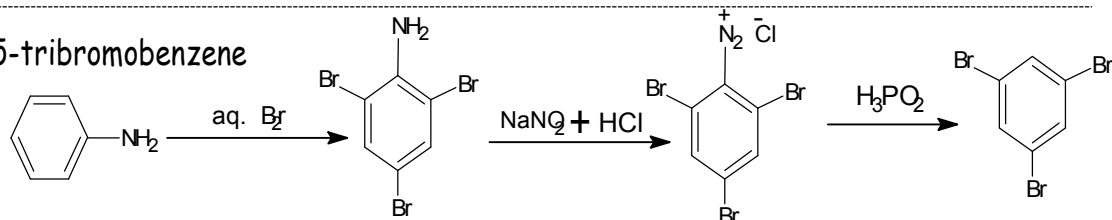
Hexanenitrile into 1-aminopentane

$H_3C-(CH_2)_4-C\equiv N \xrightarrow[H_2O_2]{H_2O\ /\ HO^-} H_3C-(CH_2)_4-CONH_2 \xrightarrow{Br_2\ +\ 4\ KOH} H_3C-(CH_2)_3-CH_2-NH_2$
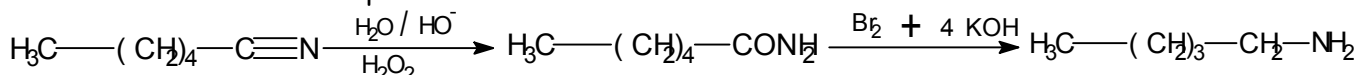
Methanol into ethanoic acid

$H_3C-OH \xrightarrow{SOCl_2} H_3C-Cl \xrightarrow{KCN} H_3C-CN \xrightarrow{H_2O/\ H^+} CH_3COOH$
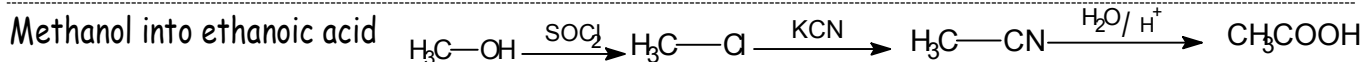
Etahnamine into methanamine

$CH_3CH_2NH_2 \xrightarrow[(HNO_2)]{NaNO_2\ +\ HCl} CH_3CH_2OH \xrightarrow[OH^-]{KMnO_4} CH_3COOH \xrightarrow[\Delta]{NH_3} CH_3CONH_2 \xrightarrow{Br_2\ +\ 4\ KOH} CH_3NH_2$
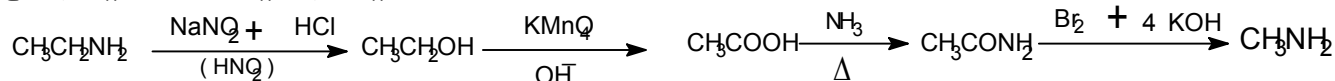
Methanamine into ethanamine

$CH_3NH_2 \xrightarrow[(HNO_2)]{NaNO_2\ +\ HCl} H_3C-OH \xrightarrow{SOCl_2} H_3C-Cl \xrightarrow{KCN} H_3C-CN \xrightarrow{LiAlH_4} CH_3CH_2NH_2$
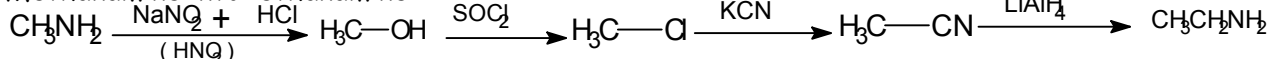
Ethanoic acid into Propanoic acid

$CH_3COOH \xrightarrow{B_2H_6\ /\ H_3O^+} CH_3CH_2OH \xrightarrow{SOCl_2} CH_3CH_2Cl \xrightarrow{KCN} CH_3CH_2CN \xrightarrow{H_2O/\ H^+} CH_3CH_2COOH$
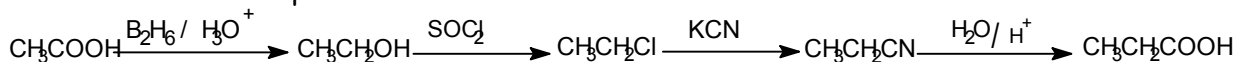
Propanoic acid into ethanoic acid

$CH_3CH_2COOH \xrightarrow[\Delta]{NH_3} CH_3CH_2CONH_2 \xrightarrow{Br_2\ +\ 4\ KOH} CH_3CH_2NH_2 \xrightarrow[(HNO_2)]{NaNO_2\ +\ HCl} CH_3CH_2OH \xrightarrow[OH^-]{KMnO_4} CH_3COOH$

Nitromethane into dimethylamine

$$CH_3NO_2 \xrightarrow[6\ [H]]{Sn\ /\ HCl} CH_3NH_2 \xrightarrow{CH_3\ Cl} (CH_3)_2NH$$

Ethanoic acid into methanamine

$$CH_3COOH \xrightarrow[\Delta]{NH_3} CH_3CONH_2 \xrightarrow{Br_2\ +\ 4\ KOH} CH_3NH_2\ +\ K_2CO_3\ +\ 2\ KBr\ +\ 2\ H_2O$$

Nitrobenzene into benzoic acid

C6H5-NO2 $\xrightarrow{Sn\ /\ HCl}$ C6H5-NH2 $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ C6H5-N2+Cl– $\xrightarrow{CuCN}$ C6H5-CN $\xrightarrow{H_2O/\ H^+}$ C6H5-COOH
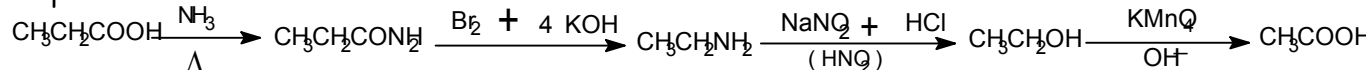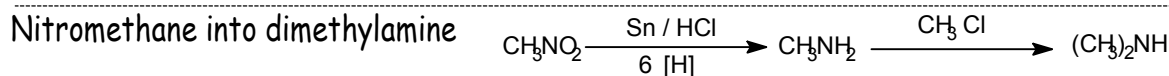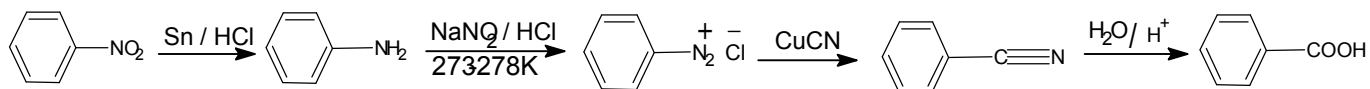
Benzoic acid into aniline

C6H5-COOH $\xrightarrow[\Delta]{NH_3}$ C6H5-CONH2 $\xrightarrow{Br_2\ +\ 4\ KOH}$ C6H5-NH2

Benzamide into toluene

C6H5-CONH2 $\xrightarrow{Br_2\ /\ KOH}$ C6H5-NH2 $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ C6H5-N2+Cl– $\xrightarrow{H_3PO_2\ /\ H_2O}$ C6H6 $\xrightarrow[\text{Anhyd. AlCl}_3]{CH_3Cl}$ C6H5-CH3
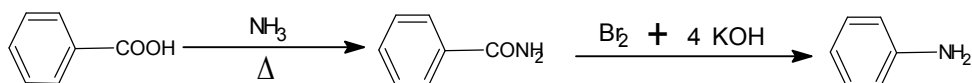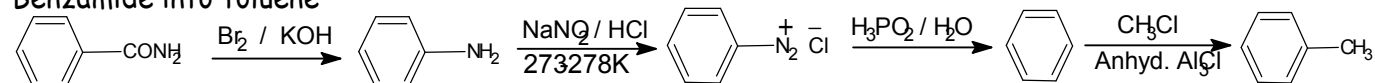
Aniline into p-Bromoaniline

C6H5-NH2 $\xrightarrow[\text{Pyridine}]{(CH_3CO)_2O}$ C6H5-NH-CO-CH3 $\xrightarrow[\text{CH}_3\text{COOH}]{Br_2}$ Br-C6H4-NH-CO-CH3 $\xrightarrow{HO^-/\ H^+}$ Br-C6H4-NH2
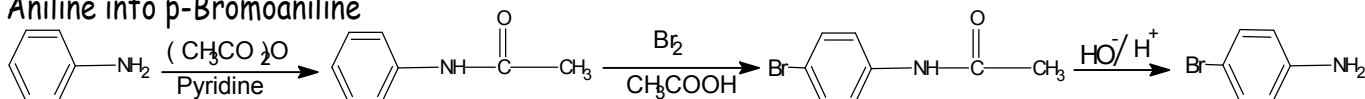
Aniline into 2,4,6-tribromofluorobenzene

Aniline (NH2) $\xrightarrow{\text{aq. Br}_2}$ 2,4,6-tribromoaniline $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ diazonium salt (N2+Cl–) $\xrightarrow{HBF_4}$ (N2+BF4–) $\xrightarrow[\text{Cu}\ \Delta]{NaNO_2}$ 2,4,6-tribromofluorobenzene (F)

Aniline into benzyl alcohol

C6H5-NH2 $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ C6H5-N2+Cl– $\xrightarrow{CuCN}$ C6H5-CN $\xrightarrow{LiAlH_4}$ C6H5-CH2NH2 $\xrightarrow{NaNO_2\ /\ HCl}$ C6H5-CH2OH
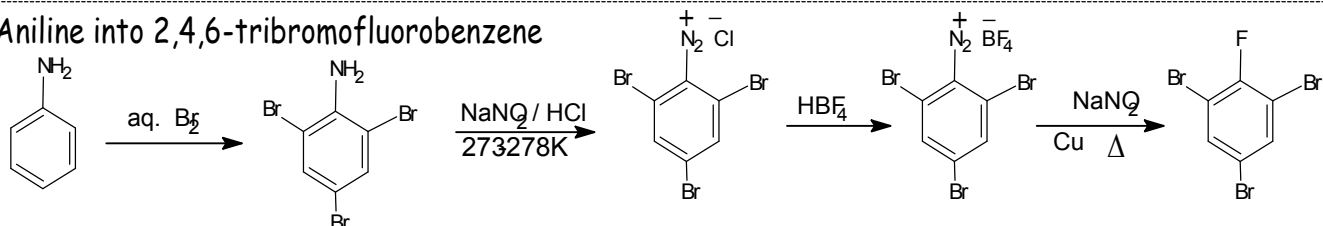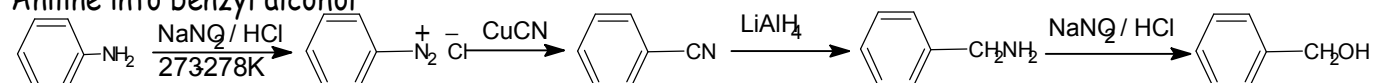
Chlorobenzene into p-Chloroaniline

C6H5-Cl $\xrightarrow[H_2SO_4]{HNO_3}$ Cl-C6H4-NO2 $\xrightarrow{Sn\ /\ HCl}$ Cl-C6H4-NH2
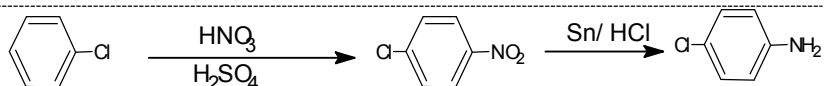
Benzene into m-bromophenol

C6H6 $\xrightarrow[H_2SO_4]{HNO_3}$ C6H5-NO2 $\xrightarrow[FeBr_3]{Br_2}$ m-bromonitrobenzene $\xrightarrow{Sn\ /\ HCl}$ m-bromoaniline $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ diazonium salt $\xrightarrow{Boil\ H_2O}$ m-bromophenol (OH)
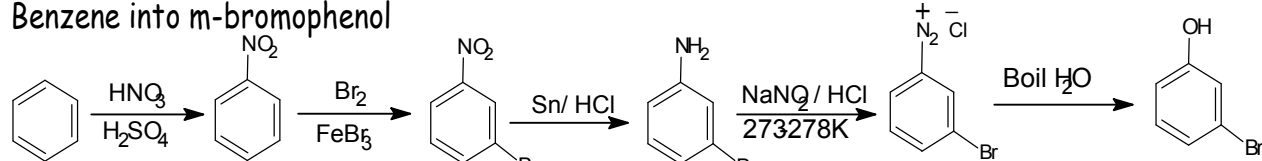
Benzyl chloride into 2-Phenylethanamine

C6H5-CH2Cl $\xrightarrow{KCN}$ C6H5-CH2CN $\xrightarrow{LiAlH_4}$ C6H5-CH2CH2NH2
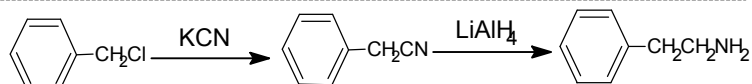
m-Nitroaniline into m-Chloroiodobenzene

m-nitroaniline (NO2, NH2) $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ (NO2, N2+Cl–) $\xrightarrow{CuCl}$ (NO2, Cl) $\xrightarrow{Sn\ /\ HCl}$ (NH2, Cl) $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ (N2+Cl–, Cl) $\xrightarrow{KI\ /\ Heat}$ (I, Cl)

Aniline into Benzoic acid

C6H5-NH2 $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ C6H5-N2+Cl– $\xrightarrow{CuCN}$ C6H5-CN $\xrightarrow{H_2O\ /\ H^+}$ C6H5-COOH
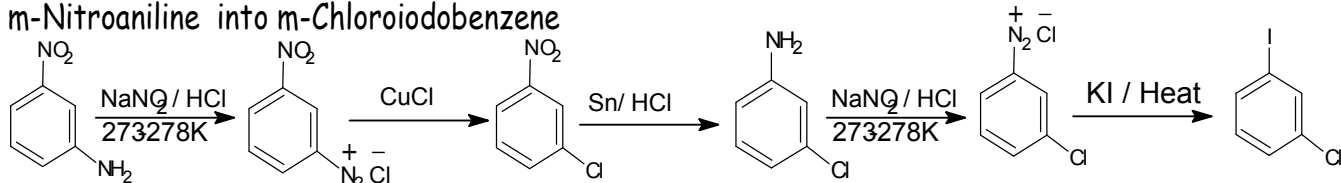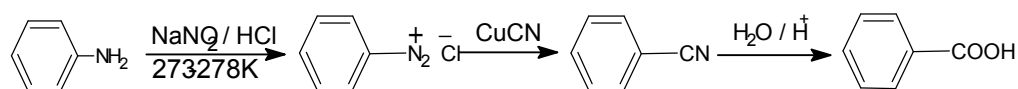
p-Chloroaniline into p-Chlorobenzylamine

Cl-C6H4-NH2 $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ Cl-C6H4-N2+Cl– $\xrightarrow{CuCN}$ Cl-C6H4-CN $\xrightarrow{LiAlH_4}$ Cl-C6H4-CH2NH2
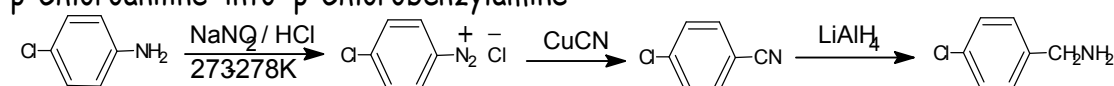
Toluene into m-Bromotoluene

C6H5-CH3 $\xrightarrow[H_2SO_4]{HNO_3}$ p-nitrotoluene (CH3, NO2) $\xrightarrow{LiAlH_4}$ p-toluidine (CH3, NH2) $\xrightarrow[\text{Pyridine}]{(CH_3CO)_2O}$ (CH3, NHCOCH3) $\xrightarrow[CH_3COOH]{Br_2}$ (CH3, Br, NHCOCH3) $\xrightarrow{H_2O\ /\ H^+}$ (CH3, Br, NH2) $\xrightarrow[\text{(ii) } H_3PO_2\ /\ H_2O]{\text{(i) Diazotisation}}$ m-bromotoluene (CH3, Br)
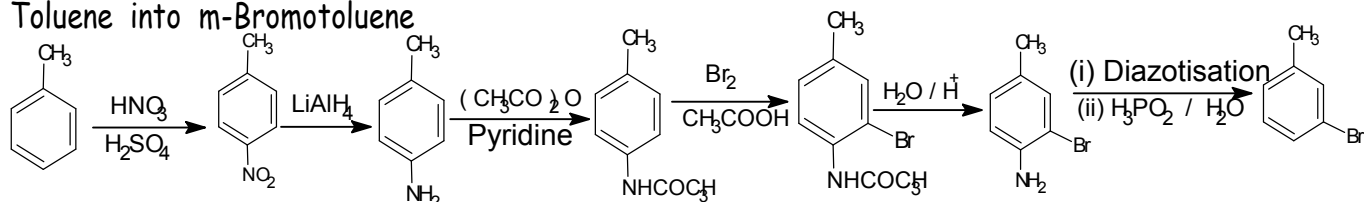
m-Dinitrobenzene into m-Dichlorobenzene

m-dinitrobenzene (NO2, NO2) $\xrightarrow{Sn\ /\ HCl}$ m-phenylenediamine (NH2, NH2) $\xrightarrow[273\text{–}278K]{NaNO_2\ /\ HCl}$ (N2+Cl–, N2+Cl–) $\xrightarrow{CuCl}$ m-dichlorobenzene (Cl, Cl)
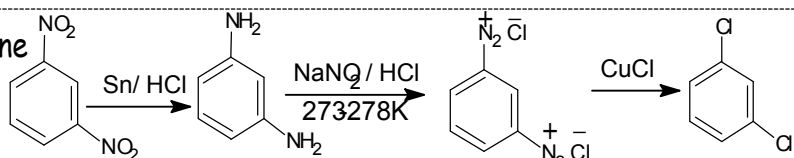
BIOMOLECULES

| KEY POINTS	EXPLANATIONS
Monosaccharides	Cannot be hydrolyzed further . eg- glucose, fructose, ribose
Disaccharides	Sucrose (α-D- glucose + β-D-fructose) , Maltose(α-D- glucose + α-D- glucose) Lactose(β-D-galactose + β-D-glucose)
Polysaccharides	*Starch* (two components—Amylose and Amylopectin) polymer of α-D- glucose
Amylose	Water soluble , 15-20% of starch., unbranched chain , C1– C4 glycosidic linkage.
Amylopectin	Water insoluble , 80-85% of starch., branched chain polymer, C1–C4 & C1–C6 glycosidic linkage
Cellulose	Straight chain polysaccharide of β -D-glucose units/ joined by C1-C4glycosidic linkage (β-link), not digestible by human / constituent of cell wall of plant cells
Glycogen	Highly branched **polymer of α-D- glucose** .found in liver, muscles and brain.
reducing sugars	Aldehydic/ ketonic groups free so reduce Fehling's/ Tollens solution and. Eg- maltose and lactose
Non reducing sugars	Aldehydic/ ketonic groups are bonded so can not reduce Fehling's solution and Tollens' reagent. Eg-Sucrose
Anomers.	The two cyclic hemiacetal forms of glucose differ only in the configuration of the hydroxyl group at C1, called *anomeric carbon* Such isomers, i.e., α –form and β -form, are called anomers.
Invert sugar	Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose. Since the laevorotation of fructose (–92.4°) is more than dextrorotation of glucose (+ 52.5°), the mixture is laevorotatory. Thus, hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (–) and the product is named as invert sugar
Glycosidic linkage	Linkage between two mono saccharide
Importance of Carbohydrates	Major portion of our food. / used as storage molecules as starch in plants and **glycogen** in animals/. Cell wall of bacteria and plants is made up of cellulose./wood and cloth are cellulose / provide raw materials for many important industries like textiles, paper, lacquers and breweries.
essential amino acids	which cannot be synthesised in the body and must be obtained through diet, eg- Valine, Leucine
Nonessential amino acids	which can be synthesised in the body, eg - Glycine, Alanine
zwitter ion.	In aqueous solution, amino acids exist as a dipolar ion known as *zwitter ion*.
peptide linkage	peptide linkage is an amide formed between –COOH group and –NH2 group of two successive amino acids in peptide chain.
1⁰- str. of proteins:	sequence of amino acids that is said to be the primary structure of protein
2⁰- str. of proteins:	secondary structure of protein refers to the shape in which a long polypeptide chain can exist. They are found to exist in two types of structures viz. α -helix and β -pleated sheet structure.
Tertiary structure of proteins:	further folding of the secondary structure. It gives rise to two major molecular shapes viz. fibrous and globular.
Fibrous proteins	Polypeptide chains run parallel, held together by hydrogen and disulphide bonds, fibre– like structure. Water insoluble . Eg- are keratin(in hair, wool, silk) and myosin (present in muscles).
Globular proteins	chains of polypeptides coil around to give a spherical shape. water soluble. Eg-Insulin and albumins
Stab.forces 2°& 3°	hydrogen bonds, disulphide linkages, van der Waals and electrostatic forces of attraction.
Denaturation of Proteins	When a protein is subjected to physical change like change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called **denaturation** of protein. (During denaturation 2° and 3° structures are destroyed but 1° structure remains intact.) eg- The coagulation of egg white on boiling, curdling of milk
Fat soluble vit	These are vitamins A, D, E and K. They are stored in liver and adipose (fat storing) tissues
Water soluble vit	B , C . these vitamins must be supplied regularly in diet because they are readily excreted in urine
Vitamins –sources- Deficiency diseases	Vit- A (Fish liver oil, carrots)- Night blindness / Vitamin B1 (Yeast, milk,)- Beri beri
	Vit-B2 (Milk, eggwhite)- Cheilosis / Vit- B6 (Yeast, milk,)- Convulsions / Vit- B12 (Meat, fish,)- anaemia
	Vit C(Citrus fruits)- Scurvy, / Vit D(Exposure to sunlight, fish and egg yolk)- Rickets, osteomalacia
	Vit E(wheat oil, sunflower oil)- fragility of RBCs / Vit K(leafy vegetables)- Increased blood clotting time
DNA	pentose sugar (D-2-deoxyribose) + phosphoric acid + nitrogenious bases (A , G , C, T)
RNA	pentose sugar (ribose) + phosphoric acid + nitrogenious bases (A , G , C, U)
Nucleoside / tides	Nucleoside → sugar + base Nucleotides → sugar + base + phosphate
Phosphodiester link	Linkage between two nucleotides in polynucleotides
Functions of Nucleic Acids	DNA reserve genetic information, maintain the identity of different species e is capable of self duplication during cell division, synthesizes protein in the cell.

Biomolecules

(Q.) Define the term bio molecules? (1 Mark)

(**Ans**) Bio molecules may be defined as the complex lifeless chemical substances which form the basis of life, i.e., they not only build up living systems (creatures) but are also responsible for their growth, maintenance and their ability to reproduce.

(Q.) Define the term photosynthesis? Give its general chemical equation? (1 Mark)

(**Ans**) Photosynthesis may be defined as a chemical process through which plants make their own food by the reaction of carbon dioxide and water in the presence of sunlight with the help of plant chlorophyll.
$x\ CO_2 + y\ H_2O \longrightarrow C_x(H_2O)_y + x\ O_2$
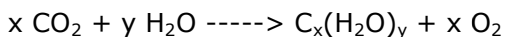
(Q.) Define Monosaccharides? (1 Mark)

(**Ans**) These are the simplest carbohydrates which cannot be hydrolysed to smaller molecules. Their general formula is $(CH_2O)_n$, where n = 3-7.

(Q.) Define the term Oligosaccharides? (1 Mark)

(**Ans**) Those carbohydrates which give 2-10 molecules of monosaccharides in hydrolysis.

(Q.) Define Disaccharides? (1 Mark)

(**Ans**) Carbohydrates which on hydrolysis give two molecules of the same or different monosaccharides are called disaccharides. e.g.,
$C_{12}H_{22}O_{11} + H_2O \longrightarrow C_6H_{12}O_6 + C_6H_{12}O_6$
sucrose glucose fructoes
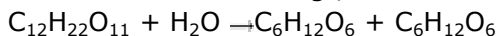
(Q.) What is difference between Reducing and non-reducing sugars or carbohydrates? (1 Mark)

(**Ans**) All those carbohydrates which contain aldehydic and ketonic group in the hemiacetal or hemiketal form and reduce Tollen's reagent or Fehling's solution are called reducing carbohydrates while others which do not reduce these reagents are called non-reducing reagents.

(Q.) Explain the term mutarotation? (1 Mark)

(**Ans**) Mutarotation is the change in the specific rotation of an optically active compound with time, to an equilibrium mixture.

(Q.) Define glycosidic linkage? (1 Mark)

(**Ans**) The two monosaccharide units are joined together through an ethereal or oxide linkage formed by the loss of a molecule of H_2O. Such a linkage between two monosaccharide units through oxygen atoms is called glycosidic linkage.

(Q.) Give a chemical equation for obtaining Maltose? (1 Mark)

(**Ans**) Maltose is obtained by partial hydrolysis of starch by the enzyme diastase present in malt i.e., sprouted barley seeds.
$2(C_6H_{10}O_5)_n + n\ H_2O \xrightarrow{\text{Diastase}} n\ C_6H_{12}O_6$
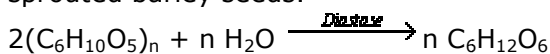
(Q.) What are the main sources of vitamins? (1 Mark)

(**Ans**) The main sources of vitamins are milk, butter, cheese, fruits, green vegetables, meat, fish, eggs, etc.

(Q.) Give two methods for the preparation of glucose? **(2 Marks)**

(Ans) The methods for the preparation of glucose are:

(i) From sucrose (Cane Sugar).
When sucrose is hydrolysed by boiling with dil. HCl or H_2SO_4 in alcoholic solution, an equimolar mixture of glucose or fructose is obtained.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^+} C_6H_{12}O_6 + C_6H_{12}O_6$$
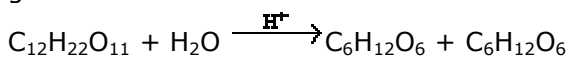
(ii) From starch.
Commercially glucose is obtained by hydrolysis of starch by boiling it with dil. H_2SO_4 at 393 K under pressure.

$$(C_6H_{10}O_5)n + n\ H_2O \xrightarrow{H^+/393K,\ 2-3\ atm} n\ C_6H_{12}O_6$$
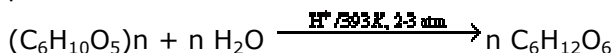
(Q.) Define Carbohydrates? Give their basic classification depending upon their behaviour towards hydrolysis. **(2 Marks)**

(Ans) Carbohydrates are defined as optically active polyhydroxy aldehydes or polyhydroxy ketone substances which give these on hydrolysis.
These are broadly classified as:
(i) Monosaccharides.
(ii) Oligosaccharides.
(iii) Polysaccharides.

(Q.) What is Milk sugar? Give its characteristics. **(2 Marks)**

(Ans) Lactose occurs in milk so, it is called milk sugar. Lactose on hydrolysis with dilute acids yields an equimolar mixture of D-glucose and D-galactose. It is a reducing sugar since it forms an osazone. It undergoes mutarotation and also reduces Tollen's or Fehling's solution.

(Q.) Define the term vitamins? State its importance. **(2 Marks)**

(Ans) Vitamins may be defined as group of bio-molecules (other than fats, carbohydrates and proteins) which are required in small amounts for normal metabolic processes and for the life, growth and health of human beings and animal organisms. Vitamins neither supply energy nor help in building tissues of the cells. They play an important role in keeping good health of human beings and animals. Their deficiency causes serious disturbances and diseases in the body.

(Q.) What do you understand by denaturation of proteins? **(2 Marks)**

(Ans) When a protein in its native form, is subjected to physical change like in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein.

(Q.) Give the D and L configurations of Glyceraldehyde? **(2 Marks)**

(Ans)

D-(*d*)-glyceraldehyde   L-(*l*)-glyceraldehyde
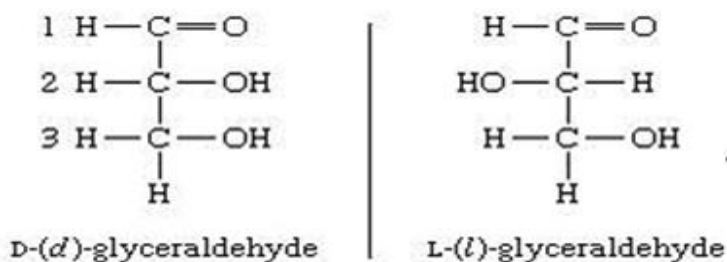
(Q.) Give the chemical structure of sucrose & explain why sucrose is non reducing sugar. (2 Marks)

(Ans)
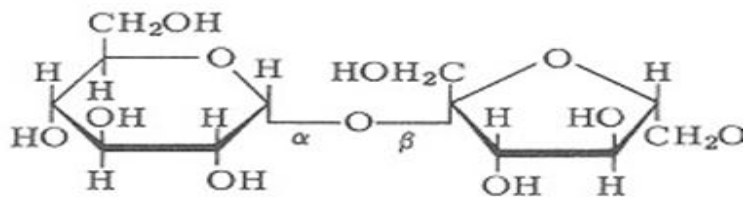
The two monosaccharide are held together by a glycosidic linkage between C1 of α-glucose and C2 of β-fructose. Since the reducing groups of glucose and fructose are involved in glycosidic bond formation, sucrose is a non-reducing sugar.

(Q.) Give a broad classification of vitamins? (2 Marks)

(Ans) Vitamins are complex organic molecules.They can be broadly classified as:

(i) Water soluble vitamins: These include vitamin B-complex and vitamin C.
(ii) Fat soluble vitamins: These are oily substances that are not readily soluble in water. However, they are soluble in fat. These include vitamins A,D,E and K. Nucleic acids are bipolar (i.e. polymers present in the living system). They are also called polynucleotides since the repeating structural unit of nucleic acids is a nucleotide.
General structure of a nucleotide can be given as:
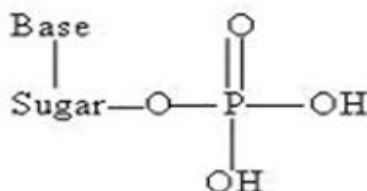
(Q.) Write a short note on cellulose and give its chemical structure. (3 Marks)

(Ans)
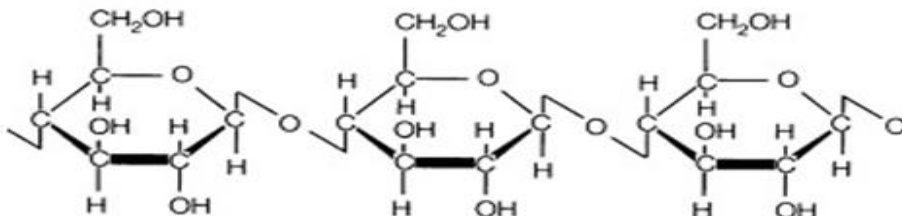
Cellulose occurs exclusively in plants and it is the most abundant organic substance in plant kingdom. It is a predominant constituent of cell wall of plant cells. Cellulose is a straight chain polysaccharide composed only of β-D-glucose units which are joined by glycosidic linkage between C1 of one glucose unit and C4 of t he next glucose unit.

(Q.) Give a short note on Zwitter ion? (3 Marks)

(Ans) Amino acids are usually colourless, crystalline solids. These are water soluble , high melting solids and behave like salts rather than simple amines or carboxylic acids. This behaviour is due to the presence of both acidic (carboxylic group) and basic (amino group) groups in the same molecule. In aqueous solution, the carboxyl group can lose a proton and amino group can accept a proton, giving rise to a dipolar ion known as zwitter ion.

$$NH_2$$
$$R—\overset{\displaystyle NH_2}{\underset{\displaystyle H}{C}}—COOH$$
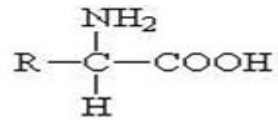
R is the functional group of the amino acid

$$R—\overset{\displaystyle NH_3^+}{\underset{\displaystyle H}{C}}—COO^-$$
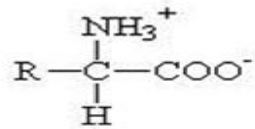
(Q.) How are peptides formed. Show the formation of peptide bond with diagram. (3 Marks)

(**Ans**) Peptides are amides formed by the condensation of amino group of one α-amino acid with the carboxyl group of another molecule of the same or different α-amino acid with the elimination of awater molecule. They are classified as di-, tri-, tetra-, etc.
E.g.
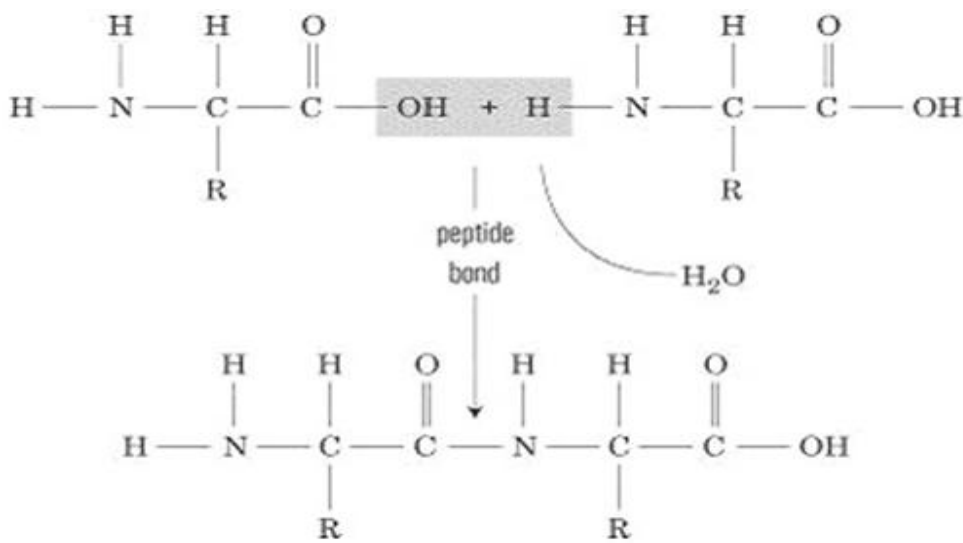
SURFACE CHEMISTRY

ADSORPTION

PHYSIOSORPTION
1. Weak van der waels forces
2. Heat of adsorption 20 – 40 kJ/mol
3. No compound formation
4. Not specific
5. Effect of temp.
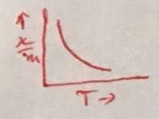
CHEMISORPTION
1. Chemical bonds.
2. Heats of adsorption 40 – 400 kJ/mol
3. Surface compounds formed.
4. Specific
5. Effect of temp.
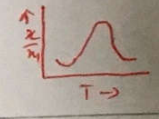
Effect of Pressure (Freundlich Adsorption Isotherm)

At low pressure $\frac{x}{m} \propto P$

At high pressure $\frac{x}{m} \propto p^0$

At intermediate pressure
$$x/m \propto p^{1/n}$$
$$x/m = k \, p^{1/n}$$

$$\log x/m = \log k + \frac{1}{n} \log P$$

slope $\frac{1}{n}$
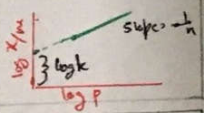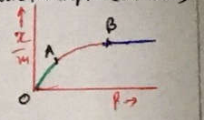
Application of Adsorption.
1. In preserving vacuum
2. In gas masks.
3. Clarification of sugar
4. Chromatographic Ananalysis
5. Heterogeneous catalysis.
6. Dehumidizers.
7. Dyeing.
8. Curing diseases.

CATALYSIS

HOMOGENEOUS
$$2SO_2(g) + O_2(g)$$
$$\xrightarrow{NO(g)} 2SO_3(g)$$

$$2CO(g) + O_2(g) \xrightarrow{NO(g)} 2CO_2(g)$$

Reactants and catalyst in same phase.

HETEROGENEOUS
$$N_2(g) + 3H_2(g) \xrightarrow{Fe(s)} 2NH_3(g)$$

$$SO_2(g) + O_2(g) \xrightarrow{Pt(s)} 2SO_3(g)$$

Reactants and catalyst are in different phase
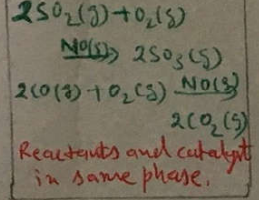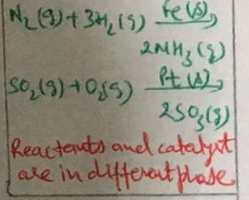
ENZYME CATALYSIS
Examples – Invertase, Zymase, Diastase etc
Characteristics – (i) Specificity (ii) Effiency
(iii) Small quantity (iv) Optimum pH & temp.
(v) Co – enzymes (vi) Inhibitors.
Mechanism of enzyme catalysis – Lock and key mechanism.

Shape selective catalysis – Zeolites.
Alcohols $\xrightarrow{ZSM-5}$ Hydrocarbons.

Catalysts Used in Industries
(i) Haber's Process – Fe (catalyst), Mo (Promoter)
(ii) Ostwald's Process – Platinised Asbestos.
(iii) Contact Process – Platinised Asbestos or V_2O_5
(iv) Bosch's Process – Fe_2O_3 (catalyst) Cr_2O_3 (Promoter)
(v) Deacon's Process – $CuCl_2$
(vi) Wacker Process – $PdCl_2$

COLLOIDS

CLASSIFICATIONS
1. Based on the physical state of dispersion medium and dispersed phase
2. Nature of Interaction b/w phase & medium
3. Type of particles of dispersed phase

PREPARATION
1. Mechanical disintegration
2. Bredig's Method
3. Peptization
4. Chemic Reaction

PURIFICATION
1. Dialysis
2. Ultrafiltration
3. Electro dialysis.

PROPERTIES
1. Colligative Properties
2. Brownian Movements
3. Tyndall effect
4. Electrical Properties

COAGULATION OR FLOCCULATION
1. By electrophoresis
2. Mutual precipitation
3. Prolonged dialysis
4. By Heating or cooling
Hardy Schulze Rule

Protective Action of Lyphilic Colloids (Gold Number)

water-in-oil (w/o) ← EMULSIONS → oil-in-water (o/w)

Applications of Colloids.
(i) Medicines.
(ii) Food Articles
(iii) fog, mist, Cloud
(iv) Artificial Rain
(v) formation of Delta
(vi) Blue colour of Sky
(vii) Tail of comets.
(viii) Cleaning action of soaps
(ix) Smoke precipitators.
(x) Purification of water
(xi) Photography
(xii) Rubber industry
(xiii) Tanning of leather.

Reagent	Product	Reaction

$\text{HNO}_3, \text{H}_2\text{SO}_4 \longrightarrow$

—NO_2 + H_2O nitration

nitrobenzene

$\text{Br}_2, \text{FeBr}_3 \longrightarrow$

—Br + HBr bromination

bromobenzene

$\text{Cl}_2, \text{FeCl}_3 \longrightarrow$

—Cl + HCl chlorination

chlorobenzene

$\text{HOCl}, \text{H}^{\oplus}, \text{Ag}^{\oplus} \longrightarrow$

—Cl + H_2O chlorination

chlorobenzene

conc. $\text{H}_2\text{SO}_4 \longrightarrow$

—SO_3H + H_2O sulfonation

benzenesulfonic acid

$\text{CH}_3\text{CH}_2\text{Cl}$ / $\text{AlCl}_3 \longrightarrow$

—CH_2CH_3 + HCl alkylation

ethylbenzene

$\text{CH}_3\text{CH}{=}\text{CH}_2$ / $\text{H}_3\text{PO}_4 \longrightarrow$

—$\overset{\displaystyle \text{CH}_3}{\underset{\displaystyle \text{CH}_3}{\text{CH}}}$ alkylation

(1-methylethyl)benzene
(isopropylbenzene)

$\overset{\text{O}}{\overset{\|}{\text{CH}_3\text{CCl}}}$ / $\text{AlCl}_3 \longrightarrow$

—$\overset{\text{O}}{\overset{\|}{\text{C}}}$—$\text{CH}_3$ + HCl acylation

phenylethanone
(acetophenone)

$\text{D}_2\text{SO}_4 \longrightarrow$

—D + HDSO_4 deuteration

monodeuteriobenzene

Directive influence of a functional group in monosubstituted benzene:-

1. Ortho and para directing groups and activating- $-OH$, $-NH_2$, $-NHR$, $-NHCOCH_3$, $-OCH_3$, $-CH_3$, $-C_2H_5$, etc.
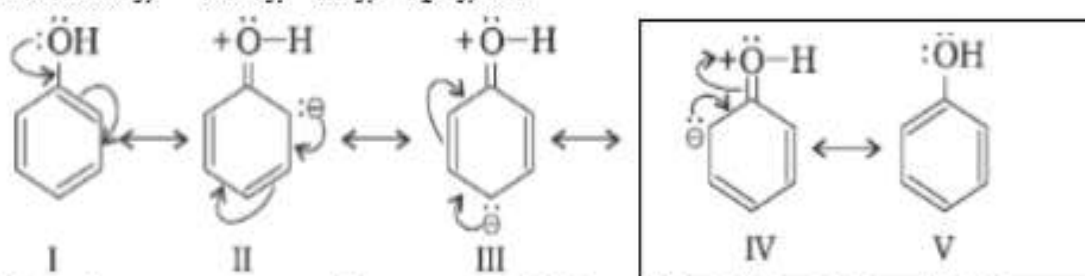
2. *Meta directing group and deactivating:* $-NO_2$, $-CN$, $-CHO$, $-COR$, $-COOH$, $-COOR$, $-SO_3H$, etc.
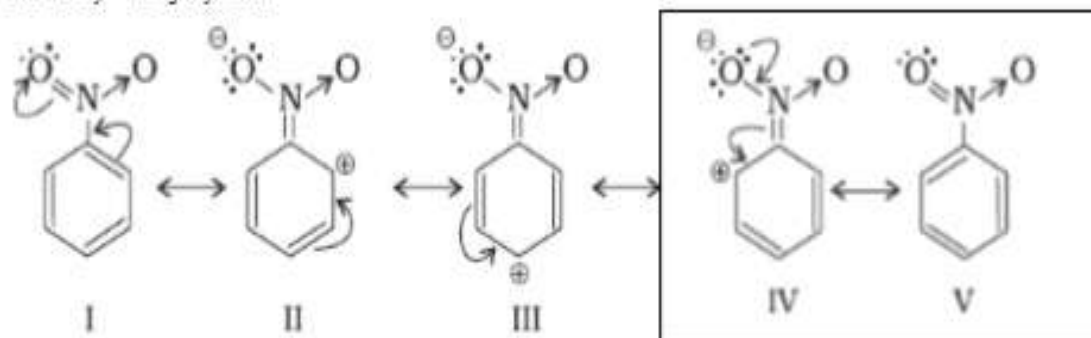
3. Ortho and para directing groups and deactivating- Halogens because of their strong $-I$ effect, overall electron density on benzene ring decreases. However, due to resonance the electron density on $o-$ and $p-$ positions is greater than that at the $m-$position. Hence, they are also $o-$ and $p-$ directing groups.

कक्षा १२
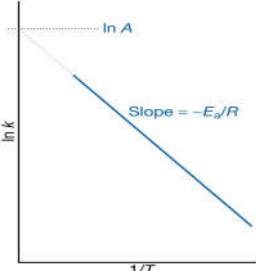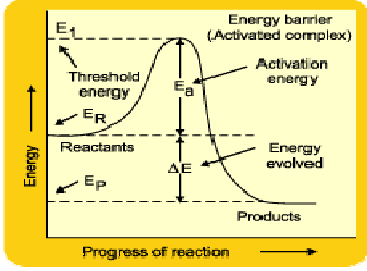
पाठ्य सामग्री

CHAPTER: CHEMICAL KINETICS- LESSON PLAN

Date: **Class:**   **Period Required:**
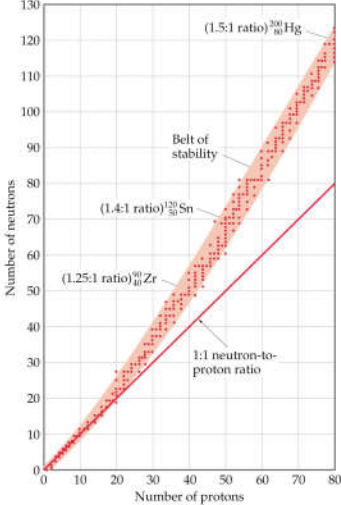
Gist of Unit /Sub Unit	*Activities(Individual or Group)/Demo/ E-class/PPT*

➔ define the average and instantaneous rate of a reaction;
 	
 ➔ express the rate of a reaction interms of change in concentration of either of the reactants or products with time;
 	
 ➔ distinguish between elementary and complex reactions;
 	
 ➔ differentiate between the molecularity and order of a reaction;
 	
 ➔ define rate constant;
 	
 ➔ discuss the dependence of rate of reactions on concentration, temperature and catalyst;
 	
 ➔ derive integrated rate equations for the zero and first order reactions;
 	
 ➔ determine the rate constants for zeroth and first order reactions;
 	
 ➔ describe collision theory.
	Chemical Kinetics helps us to understand how chemical reactions occur.
	
	 ➔ Rate of a Chemical Reaction
	      ➔ Average and Instantaneous rate
	 ➔ <u>Factors Influencing Rate of a Reaction</u>
	      ⇨ Dependence of Rate on Concentration
	      ⇨ Rate Expression and Rate Constant
	      ⇨ Order of a Reaction & Molecularity of a Reaction
	 ➔ <u>Integrated Rate Equations</u>
	      ⇨ Zero Order Reactions ➔ First Order Reactions ➔ Half-Life of a Reaction
	
	 $\boxed{k=(A_0-A_t)/t}$ $\ln \dfrac{[A]_0}{[A]_t} = kt$ $\boxed{t_{1/2} = \ln 2/k}$
	
	 ➔ <u>Pseudo First Order Reaction</u>
	
	 ➔ <u>Temperature Dependence of the Rate of a Reaction</u>
	 Arrhenius equation
	
	  $$\ln k_1 = -\frac{E_a}{RT_1} + \ln A \quad \text{and} \quad \ln k_2 = -\frac{E_a}{RT_2} + \ln A$$ $$\ln k_1 - \ln k_2 = \left(-\frac{E_a}{RT_1} + \ln A\right) - \left(-\frac{E_a}{RT_2} + \ln A\right)$$ $$\ln \frac{k_1}{k_2} = \frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$
	
	 ➔ Collision Theory of Chemical Reactions and effect of Catalyst

Remarks/ Suggestion   *Teacher Signature*

HOME ASSINGMENT	*HOTS AND MLL*	*CO-RELATION WITH OTHER SUBJECTS* *And extended learning*
➔ Students are given the Home assingment to solve all the in text question solved and unsolved exercises of NCERT. ➔ Exemplar problems for students preparing for competitive examinations. 1) State the order with respect to each reactant and overall reaction. $H2O + 3I- + 2H+ \rightarrow 2H2O + I^{3-}$ 2) A first order reaction takes 69.3 min for 50% completion. Determine the time needed for 80% completion. 3) The rate constant for first order reaction is 60/s. How much time will it take to reduce the concentration of the reaction to 1/10 of its initial value. 4) *The rate constant of a reaction at 500K and 700K are .02 and .07 s-1 respectively. Calculate the value of E_a and A.*	HOTS ➔Question numbers 1- 4 are VSA question of one mark 1. Initial conc. Of cisplatin, is .01mol/L, after 20 minutes, it is 0.0097 mol/L. What is the average rate of reaction? 2. From the rate expressions of the following reaction, determine the order of reaction and the dimensions of the rate constant. $3NO(g) \rightarrow N_2O (g) + NO_2 (g)$; Rate=$k[NO]^2$ 3. "Slowest step in the mechanism of the reaction determines the rate of the reaction" comment upon the statement with an example. 4. The rate of the decomposition of NH_3 on platinum surface is zero order. What are the rate of production of N_2 & H_2 if k=$2.5 *10^{-4}$M/s. ➔Question numbers 5- 11 are SA question of two marks 5. Thermal decomposition of a compound is of first order. If 50% of a sample of the compound is decomposed in 120 min. how long will it take for 90 % of the compound to decompose? 6. (a) How do we justify the occurrence of those reactions, which seems to have molecularity more than four, five or even more on the basis of their balanced equations? (b) What are pseudo first order reaction. Give an example. 7. The rate constant of a reaction at 300K & 310K are $1.2* 10^{-3}$ s^{-1} and $2.1 * 10^{-3}$ s^{-1} respectively. Calculate the values of Activation energy. (R=8.314 J/K/mol) 8. " Every 10^0 rise in temperature doubles the rate of the reaction". Explain in detail the factors contributing the rate of the reaction. 9. What is the effect of catalyst on reaction rate. Explain graphically. 10. Give one example each of fractional order and Zero order reaction. 11. The rate constant for the first order reaction is 60 s^{-1} . How much time will it take to reduce the initial concentration of the reactant to reduce its value to 1/16th value.	➔Relation with Mathematics. ➔ PPT available ➔Lectures on Youtube. ➔Bozeman Chemistry ➔AP chemistry ➔Log and Antilogs ➔Examples on Radioactivity

Date_____   Lesson: Chemistry in everyday life

Class XII   Periods Requried_____

Subject : Chemistry

Gist of unit/Sub unit	Activities(individual or group)/demonstration	Home Assignment

1 MEDICINES: (a)Classification of drugs on the basis of (i)Pharmacological effect (ii)Drug action (iii)Chemical action (iv)Molecular target
 	
(b)Enzymes are drug targets
 	
(c)Antagonists,agonists. antacids,Antihistamines, tranqulizers.analgesic,A ntimicrobial, antiseptic,disinfectant and antifertility
 	
2 Chemicals in food:
 	
 Artificial sweetening agents and food preservatives
 	
3 Cleansing agents
 	
 Soaps and its different types
 	
 Synthetic detergents (anionic ,cationic and non-ionic) bio-degradable and non –biodegradable detergents
	Classification of commonly available drugs being used at home.
	Enzymes are proteins which perform the role of biological catalysts
	(a) Catalytic action of enzymes:
	(i) Enzyme hold to the substrate for chemical reaction
	(ii) Enzyme provide the functional group that attack the substrate for reaction.
	(b) Drug enzyme interaction:It can block the binding site of the enzyme and prevent binding of the substrate or inhibit its activity.
	Analgesic : Relieving pain
	   Narcotics :contain alkaloids and addictive (morphine,heroin and codein)
	   Non-Narcotics : Non addictive.
	Broad spectrum antibiotics—are effective against wide range of microorganisms eg-Chlorophenicol used against typhoid,diarrhea,UTI etc
	
	Artificial sweetening agents—control intake calories
	(1) Saccharin- 550 times sweeter than sugar
	(2) Aspartame-100 times sweeter than sugar and decompose at cooking temperature(used in cold food)
	(3) Alitame-2000 times sweeter than sugar and is more stable .It is difficult to control the sweetness of the food.
	(4) Sucrolose-600 times sweeter than sugar and stable at cooking temperature.
	
	Soap-Na or K salt of higher of fatty acids like palamitic acid ($C_{15} H_{31}COOH$),stearic acid ($C_{17}H_{35}COOH$)
	Detergents—Ammonium or sulphonate or sulphate salts of long chain of hydrocarbons.
	Anionic detergent-large part of their molecules are anions which involved in cleansing action eg Sodium lauryl sulphate ($C_{17}H_{23}CH_2OSO_3Na$).
	 Cationic detergent--large part of their molecules are cations which involved in cleansing action eg Cetyltrimethylammonium bromide.
	Non-ionic-have no any ions.these are ester of high molecular mass alcohols eg polyethylene glycol stearate.
		Solve all the in text and exercise questions of NCERT. Solve all the questions of last five years in CBSE Board.
		
		Define all the terms involved in the lesson.

Date of Commencement _____	
Expected date of Completion _____	
Actual date of Completion _____	

HOTS AND MLL(minimum level of learning)Question prepared	Co-relation with other subject

HOTS: 1 Account for the following:
  (i)   Aspirin drugs helps in the prevention of heart attack.
  (ii) Diabetic patients are advised to take artificial sweeteners instead of natural sweeteners.
  (iii) Detergents are non-biodegradable while soaps are biodegradable.
  2 In order to wash clothes with water containing dissolved In calcium Bicarbonate,Which cleansing agentwill you prefer and why?
MLL: (1) Which of the following is a food preservative:
      Equanil, morphine, sodium benzoate.
   (2) Give one example of artificial sweetener used by diabetic patients
   (3) Name the substance which can acts as both:
     (a) Antiseptic and disinfectant.
      (b) Analgesic and antipyretic.
   (4) Why is the use of aspartame limited to cold food and drinks?
   (5) What are bio	

CHAPTER: COORDINATION CHEMISTRY- LESSON PLAN

Date: **Class:**   **Period Required:**

Gist of Unit /Sub Unit	*Activities(Individual or Group)/Demo/ E-class/PPT*

❖ **Postulates of Werner's theory of coordination compounds,**
 	
❖ **Some basic terms:**
coordination entity, central atom/ion, ligand, coordination number, coordination sphere, coordination polyhedron, oxidation number, homoleptic & heteroleptic;
 	
❖ **Nomenclature of coordination compounds;**
 	
❖ **Formulas and names of mononuclear coordination compounds;**
 	
❖ **Isomerism**
 	
❖ **Valence Bond and Crystal Field theories;**
 	
❖ **Stability of coordination compounds;**
 	
❖ **Importance and applications of coordination compounds in our day to day life**
	➢ **WERNER'S THEORY ::** Primary and secondary valences
	➢ **A COMPLEX GENERALLY CONSISTS OF FOLLOWING UNITS**
	➢ **LIGANDS may be classified as follows**
	  Monodentate :: Cl^- ; H_2O
	  Didentate :: $C_2O_4{}^{2-}$ (ox);
	  Polydentate :: $(EDTA)^{4-}$
	➢ **EXAMPLES regarding IUPAC Nomenclature :-**
	➢ $[Cr(NH_3)_3(H_2O)_3]Cl_3$ :: Triamminetriaquachromium(III) chloride
	  $[Co(H_2NCH_2CH_2NH_2)_3]_2(SO_4)_3$ :: Tris(ethane-1,2-diammine)cobalt(III) sulphate
	
	➢ **ISOMERISM ::**
	➢ **(A).STRUCTURAL SOMERISM**
	  i. Linkage isomerism ii. Hydrate isomerism iii. Ionisation isomerism iv. Coordination isomerism
	  (B). STEREOISOMERISM
	  i. Geometrical isomerism ii. Optical isomerism
	
	➢ **VALENCE BOND THEORY:**
	➢ **MAGNETIC PROPERTIES ::**
	      $\mu = \sqrt{n(n+2)}$
	➢ **SPECTROCHEMICAL SERIES :** $I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4{}^{2-} < H_2O < NCS^- < EDTA^{4-} < NH_3 < en < CN^- < CO$
	➢ **CRYSTAL-FIELD THEORY:**
	
	➢ **COLOUR IN COORDINATION COMPOUNDS:**
	➢ **SYNERGIC BONDING**
	
	➢ **STABILITY OF COORDINATION COMPOUNDS:**
	      $\beta n = K1 \times K2 \times K3 \times K4…Kn$
	➢ **APPLICATIONS OF COORDINATION COMPOUNDS ::**
	  <u>Analytical chemistry,</u> Metallurgy, Biological processes, Medical Field etc.

Remarks/ Suggestion   *Teacher Signature*

Date of Commencement :	Expected Date of Completion:	

HOME ASSINGMENT	*HOTS AND MLL*	*CO-RELATION WITH OTHER SUBJECTS And extended learning*
➜ Students are given the Home assingment to solve all the in text question solved and unsolved exercises of NCERT. ➜ Exemplar problems for students preparing for competitive examinations. ➜ Compile all questions asked from the chapter in last five years in CBSE board examination. 1. Using IUPAC norms write the formula for the following: Tetrahydroxozincate(II) . 2. Using IUPAC norms write the systematic name of the following: $[Pt(NH_3)_2Cl(NH_2CH_3)]Cl$ 3. Give an example of organometallic compound that is used as a homogenous catalyst. 4. Specify the oxidation number of metals in the following coordination entities: (a) $[CrCl_3 (NH)_3]$ (b) $K_3 [Fe (CN)_6]$	**Q. 1. A cationic complex has two isomers A & B. Each has one Co^{3+}, five NH_3, one Br and one $SO_4{}^{2-}$. A gives a white precipitate with $BaCl_2$ solution while B gives a yellow precipitate with $AgNO_3$ solution.** **(a)What are the possible structures of the complexes A and B ?** **(b)Will the two complexes have same colour ?** **Q.2 If to an aqueous solution of $CuSO_4$ in two tubes, we add ammonia solution in one tube and HCl (aq) to the other tube, how the colour of the solutions will change ? Explain with the help of reaction.** 1) write the IUPAC name of $[CO(en)2(ONO)Cl]Cl$ 2) which of two is more stable $K_4[Fe(CN)_6]$ or $K_3[Fe(CN)_6]$ and why? 3) NH_3 has strong ligand but NH_4^+ is not why? 4) $[Ti(H_2O)]^{3+}$ is colored but $[Sc(H_2O)]^{3+}$ is colorless why? 5. $[Ni (CO)_4]$ has a tetrahedral structure while $[Pt (NH_3)_2 Cl_2]$ has a square planar structure. Explain. 6. $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic. Explain why? 7. Calculate the overall complex dissociation equilibrium constant for the $[Cu(NH3)4]2+$ ion, given that $\beta 4$ for this complex is 2.1×10^{13}. 8. What do you mean by CFSE? Represent it in the case of octahedral complex. 9. The spin only magnetic moment of $[MnBr_4]^{2-}$ is 5.9 BM. Predict the geometry of the complex ion? 10. Draw the structure of optical isomers of: (a) $[PtCl_2(en)_2(NH_3)_2]^+$ (b) $[PtCl_2(en)_2]^{3+}$ ➜ <u>Question numbers 11- 13 are SA question of three marks</u> 11. Give a chemical test to distinguish between $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$. Name the type of isomerism exhibited by these compounds. 12. Draw all the isomers (geometrical and optical) of: (i) $[CoCl_2(en)_2]+$ (ii) $[Co(NH_3)Cl(en)_2]^{2+}$ (iii) $[Co(NH_3)_2Cl_2(en)]+$ 13. Discuss the nature of bonding in the following coordination entities on the basis of valence bond theory: (i) $[Fe(CN)_6]^{4-}$ (ii) $[FeF_6]^{3-}$ (iii) $[Co(C_2O_4)_3]^{3-}$ (iv) $[CoF_6]^{3-}$	**1. BIOLOGY : Haemoglobin and Chlophyll.** **2.MEDICAL FIELD :: Cis- Platin in Cancer** **and** **EDTA in Lead poisoning.**
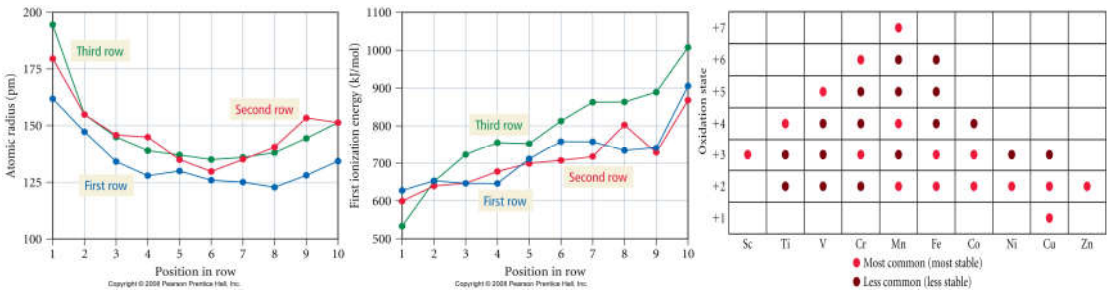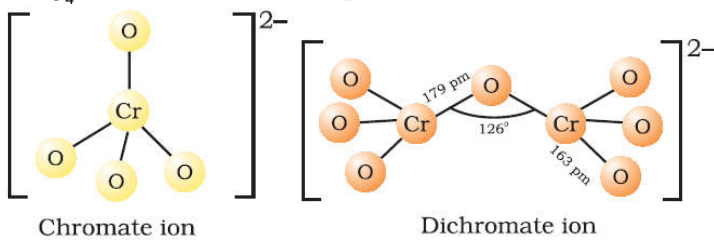
Date:	lesson/Topic: d & f block elements	
Class: XII	Period Required:	Subject: Chemistry

Gist of Lesson	Concepts/activities(individual or group)/demo/e-class
• To learn the positions of the *d*– and *f*-block elements in the periodic table; • To know the electronic configurations of the transition (*d*-block) and the inner transition (*f*-block) elements; • To appreciate the relative stability of various oxidation states in terms of electrode potential values; • To describe the preparation, properties, structures and uses of some important compounds such as $K_2Cr_2O_7$ and $KMnO_4$; • To understand the general characteristics of the *d*– and *f*–block elements and the general horizontal and group trends in them; • To describe the properties of the *f*-block elements and give a comparative account of the lanthanoids and actinoids with respect to their electronic configurations, oxidation states and chemical behaviour.	**THE TRANSITION ELEMENTS (d-BLOCK)** Position in the Periodic Table, Electronic Configurations of the d-Block Elements $(n-1)d^{1-10} ns^{1-2}$, General Properties of the Transition Elements, Variation in Atomic and Ionic Sizes, The atomic radii decreases from group 3 to 6 (i.e. Sc to Cr) because of increase in effective nuclear charge gradually. Ionisation Enthalpies, Oxidation States, in lower oxidation state are BASIC, intermediate oxidation state are AMPHOTERIC, highest oxidation state are ACIDIC. The transition elements show variable oxidation state due to small energy difference between (n-1)d &ns orbital as a result both (n-1)d &ns electrons take part in bond formation. Trends in the M^{2+}/M Standard Electrode Potentials, Trends in the M^{3+}/M^{2+} Standard Electrode Potentials, Trends in Stability of Higher Oxidation States, Chemical Reactivity and E^o Values, lower value of Reduction Potential due to high ionization potential, high heat of sublimation & low enthalpy of hydration. Magnetic Properties, Most of transition elements are paramagnetic due to presence of unpaired electrons. Formation of Coloured Ions, Formation of Complex Compounds, due to presence of unpaired electrons in (n-1) d orbital & thus they can undergo d-d transition. Catalytic Properties, Formation of Interstitial Compounds, Alloy Formation, **Important Compounds of Transition Elements**, Oxides and Oxoanions of Metals, Potassium dichromate $K_2Cr_2O_7$, Potassium permanganate $KMnO_4$. $$MnO_2 \xrightarrow[\text{with air or } KNO_3]{\text{Fused with KOH, oxidised}} MnO_4^{2-} \quad ; \quad MnO_4^{2-} \xrightarrow[\text{alkaline solution}]{\text{Electrolytic oxidation in}} MnO_4^-$$ manganate ion ; manganate permanganate ion Chromate ion Dichromate ion **THE INNER TRANSITION ELEMENTS (f-BLOCK)** **The Lanthanoids**: Electronic Configurations, $[Xe]4f^{1-14}5d^{0-1}6s^2$. Atomic and Ionic Sizes, Atomic and Ionic Sizes, General Characteristics. **The Actinoids**: Electronic Configurations, Ionic Sizes, General Characteristics and Comparison with Lanthanoids.

Remarks/Suggestions: _____   Sign of Teacher:_____

Date of commencement: **Expected date of completion:**   **Actual date of completion:**

HOME ASSINGMENT	HOTS and MLL	Correlation with other subjects
Students may be asked to solve all the intext questions and some of the exercise questions. Pupils may be asked to prepare a flow chart of preparation of Potassium Permanganate form pyrolusite 1. Copper (I) is diamagnetic whereas copper (II) is paramagnetic. Explain the reason. 2. Sc^{3+} is colourless while Cr^{3+} is coloured. Why is it so? 3. Calculate the magnetic moment of Fe^{3+}. 4. Why Hg is not considered a transition metal. 5. Give reasons for the following (Any four):- (i) Fe has higher melting point than Cu. (ii) $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]$ is colourless. (iii)The 4d and 5d series of transition metals have more frequent metal-metal bonding in their compound than do the 3d metals.	1. Silver atom has completely filled d orbitals in its ground state. How can you say that it is a transition element? 2. Transition elements exhibit their highest oxidation state in their oxides not in Fluorides. Why? 3. Explain why, Zn (II) salts are white while Mn (VII) are deep purple in colour? 4. KMnO4 is used in acidic medium quite frequently than in its aqueous or alkali for oxidizing purpose. Why? 5. Give reasons: i) Zr and Hf have identical sizes ii) In the titration of $FeSO_4$ with $KMnO_4$ in the acidic medium dil.H_2SO_4 is used instead of dil HCl 6. Calculate the spin only magnetic moment of Iron present in the following compound.$[Fe(H_2O)_5NO]^{2+}$ 7. Among the ionic species Sc^{3+}, Ce^{4+} and Eu^{2+} Which one is a good oxidizing agent? 8. What is meant by disproportionation? Give two examples of disproportionation reactions in aqueous medium. 9. Why are Fe^{3+} and Cu^{2+} prominent in their aqueous solutions? 6. Name the oxometal anions of the first series of transition metals in which the metal exhibits the oxidation state equal to its group number. 7. What is lanthanide contraction? What are the consequences of lanthanide contraction?Why are Mn^{2+} compounds more stable than Fe^{2+} compounds towards oxidation to +3 state? 8. There is a dip in the melting point curve at Mn, though the preceding element also has similar electronic configuration. Why? 9. Give the preparation of Potassium Dichromate from iron chromate ore. What is the effect of increasing pH on a solution of potassium dichromate? Describe one of its Oxidizing properties. 10. Account for the following statements: (i)Transition metals some time exhibit very low oxidation state such as +1and 0. (ii)All the transition elements have high m.p. & .p. (iii)Transition elements form a number of interstitial compounds. 11. How will you prepare $KMnO_4$ from pyrolusite ore? Give equations of its oxidizing properties in acidic & basic medium	Related to organometallic and coordination chemistry. Related to subject biology as haemoglobin studied there has Fe atom which transport O_2 and CO_2. Related to mathematics as students are asked to draw the structures of chromate and dichromate ions. Colours produced by most of the transition elements compounds are related to optics in physics.
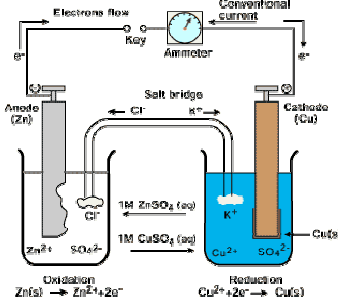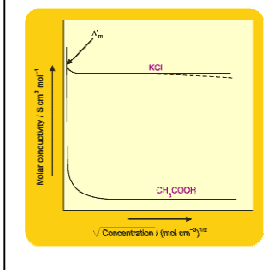
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CHAPTER: ELECTROCHEMISTRY- LESSON PLAN

Date: **Class:**   **Period Required:**

Gist of Unit /Sub Unit	*Activities(Individual or Group)/Demo/ E-class/PPT*
➔describe an electrochemical cell and differentiate between galvanic and electrolytic cells; ➔ apply Nernst equation for calculating the emf of galvanic cell and define standard potential of the cell; ➔ derive relation between standard potential of the cell, Gibbs energy of cell reaction and its equilibrium constant; ➔ define resistivity (ρ), conductivity (κ) and molar conductivity (Λ_m) of ionic solutions; ➔differentiate between ionic (electrolytic) and electronic conductivity; ➔describe the method for measurement of conductivity of electrolytic solutions and calculation of their molar conductivity; ➔justify the variation of conductivity and molar conductivity of solutions with change in their concentration and define (molar conductivity at zero concentration or infinite dilution); ➔enunciate Kohlrausch law and learn its applications; ➔understand quantitative aspects of electrolysis; ➔describe the construction of some primary and secondary batteries and fuel cells; ➔ explain corrosion as an electrochemical process.	*Chemical reactions can be used to produce electrical energy, conversely, electrical energy can be used to carry out chemical reactions that do not proceed spontaneously* ## Electrochemical cells *GALVANIC OR VOLTAIC CELL* - Representation of electrochemical cells - Measurement of electrode potential - Standard Hydrogen Electrode - EMF SERIES and EMF of a cell - **Writing Nernst Equation** - Equilibrium constant from Nernst equation $$E^o_{cell} = \frac{0.0591}{n}\log K_c$$ - Gibb's free energy and cell potential $$\Delta G^o = -2.303RT \log K_c$$ **Nernst Equation:** It is a quantitative equation relating the electrode potential with the concentration of ions in solution and temperature. For a reaction $aA + bB \longrightarrow xX + yY$ $$E_{cell} = E^o_{cell} - \frac{RT}{nF}\ln\frac{[X]^x[Y]^y}{[A]^a[B]^b}$$ **Electrolytic conduction,** Electrical resistance $$\Lambda_m = \kappa \times \frac{1000}{molarity}$$ Conductivity, and molar conductivity **Variation of Λ_m with concentration** - Conductance behaviour of strong electrolytes - Conductance behaviour of weak electrolytes **Kohlrausch law** of independent migration of ions states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte. ➔Applications of Kohlrausch law ⇨ Calculation of molar conductivity at infinite dilution (Λ^o_m) for weak electrolytes ⇨ Calculation of the degree of dissociation and dissociation constant ## ELECTROLYSIS & criteria of product formation in electrolysis **Faraday's Laws of Electrolysis** • The **first law** states that the amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte (solution or melt). $W = ZQ = ZIt$ • The **second law** states that the amounts of different substances liberated by the same quantity of electricity passing through the electrolytic solution are proportional to their chemical equivalent weights. $E = Z * 96500$, (m1/m2=E1/E2) • One faraday is the quantity of charge carried by one mole of electrons. (1 F = 96500 C). ## Commercial cells The various commercial cells can be classified mainly into the following three types: (i) Primary cells (ii) Secondary cells (iii) Fuel cells ➔**Primary** where the reaction occurs only once and cannot be reused once it becomes dead over the course of time. For example dry cell (Leclanche cell). Mercury cell ➔ **Secondary** which can be recharged by passing current through it in the opposite direction so that it can be used again. Ex. Lead Storage battery, Ni-Cd cell. ➔**Fuel cells:** **Fuel cells** are the galvanic cells that convert the energy of combustion of fuels (e.g. hydrogen, methane, methanol, etc.) directly into electrical energy. ⇨ Cell Reaction taking place in Hydrogen –Oxygen Fuel cell ⇨ Advantages of fuel cells Corrosion : **Corrosion** takes place when the metal gets converted to its oxides (e.g., rusting of iron, tarnishing of silver, etc.). It can be prevented by coating it with paint, by inert metals or electrochemical methods. The factors which affect corrosion , Electrochemical theory of rusting Prevention of rusting

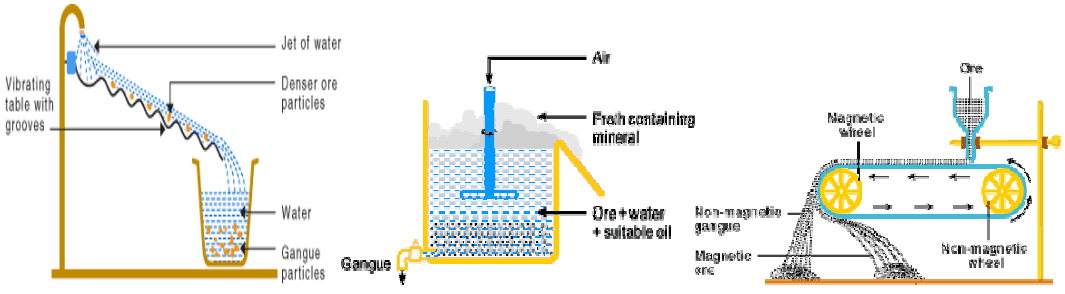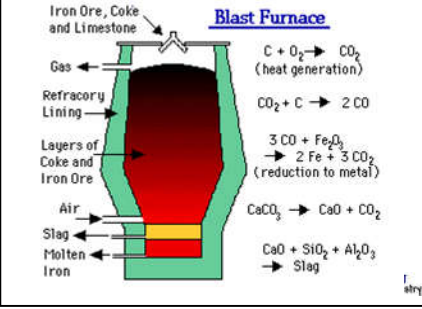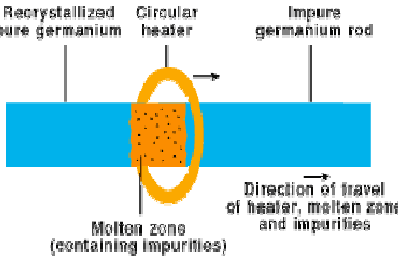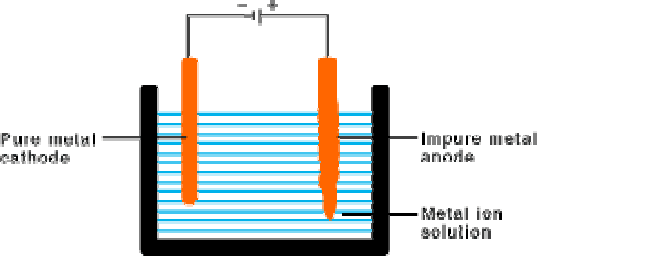*Remarks/ Suggestion*   *Teacher Signature*

HOME ASSINGMENT	*HOTS AND MLL*	*CO-RELATION WITH OTHER SUBJECTS And extended learning*
➔ Students are given the Home assingment to solve all the in text question solved and unsolved exercises of NCERT. ➔ Exemplar problems for students preparing for competitive examinations. ➔ Compile all questions asked from the chapter in last five years in CBSE board examination. *One mark questions* 1. Why does a dry cell become dead after a long time even though it has not been used. 2. Iron objects rusts quicker in saline water than in ordinary water. 3. The standard electrode potential for Daniel cell is 1.1V. Calculate the standard Gibbs energy for the reaction. $Zn(s) + Cu^{2+} (aq.) ==➔ Zn^{2+} + Cu$ *Two marks question* 4. The conductivity of 0.001 M acetic acid is $4.95 * 10^{-5}$ S/cm. Calculate its dissociation constant if λ^0 for acetic acid is 390.5 S cm^2 mol^{-1}. 5. Why products do we get at Anode during the electrolysis of dil. H_2SO_4 and Conc. H_2SO_4 **6.** Calculate the equilibrium constant for the reaction at 298K $Cu(s) + 2Ag^{2+} (aq.) ==➔ Cu^{2+} + 2Ag$ $(E^0 = 0.46V)$ *Three marks question* 7. Explain Kohlrausch law of independent migration of ions. Give its one application . Equivalent conductance at infinite dilution of NaCl, HCl & CH$_3$COONa are 126.45,426.16& 91 ohm^{-1} cm^2 equiv^{-1} respectively. What will be the molar conductance at infinite dilution for acetic acid. 8. What are the faradays law of electrolysis? Explain them. A solution of Ni(NO$_3$)$_2$ is electrolyzed between platinum electrodes using a current of 5.0 A for 30min. What weight of Ni will be produced at the electrode?	HOTS 1. A current of 5 ampere is flowing through a wire for 193 seconds. Calculate number of electrons flowing through cross section of wire for 193 seconds. 2. Calculate $\Lambda°$ m NH$_4$OH from the following values. $\Lambda°$ m for Ba(OH)$_2$, BaCl$_2$, NH$_4$Cl are 257.6, 240.6, 129.8 Scm^2 mol^{-1} respectively. 3. Calculate the standard electrode potential of Ni^{2+}/Ni electrode if the cell potential of the cell: Ni/Ni^{2+} (.01)|| Cu^{2+} (.1 M) /Cu is 0.59V. Given standard EMF of Copper is 0.34V. 4. The EMF of following reaction is 0.28V at 25º C $Zn + 2H^+ → Zn^{2+} + H_2$ (1 atm) E°cell = .76 V Calculate pH of solution at hydrogen electrode. 5. Predict the products of electrolysis of Aq. H$_2$SO$_4$ soln. with platinum electrodes. 6. A solution of CuSO$_4$ is electrolyzed using a current of 1.5 amperes for 10 minutes. What mass of Cu is deposited at the cathode? (Atomic mass of Cu=63.7). 7. What are concentration cells? Give an example. 8. What are the faradays law of electrolysis? Explain them. A solution of Ni(NO$_3$)$_2$ is electrolyzed between platinum electrodes using a current of 5.0 A for 30min. What weight of Ni will be produced at the electrode? **MLL** 1. Explain graphically how the molar conductance of strong & weak electrolyte vary with dilution. 2. A 0.05 M NaOH solution offered a resistance of 31.6 ohm in a conductivity cell at 298K .Calculate the molar conductance. (Cell constant: 0.367 cm^{-2}). 3. Can we store ferrous sulphate solution in a vessel made of zinc 4. What are the differences between primary cell & secondary cell .Give the electrode reactions taking place in the lead storage battery. 5. What is a fuel cell? Give the construction and working of a fuel cell. 6. What is corrosion. Why is it termed as an electro-chemical process. What do you understand by sacrificial protection	➔Relation with Physics to a great extent. ➔ PPT available ➔Lectures on Youtube.

CHAPTER: PRINCIPLES AND PROCESS OF EXTRACTION- LESSON PLAN

Date: **Class:**   **Period Required:**

Gist of Unit /Sub Unit	*Activities(Individual or Group)/Demo/ E-class/PPT*

➔explain the terms minerals, ores, concentration, benefaction, calcination, roasting, refining, etc.;
 	
➔understand the principles of oxidation and reduction as applied to the extraction procedures;
 	
➔ apply the thermodynamic concepts like that of Gibbs energy and entropy to the Principles of extraction of Al, Cu, Zn and Fe;
 	
➔ explain why reduction of certain oxides like Cu_2O is much easier than that of Fe_2O_3;
 	
➔explain why CO is a favourable reducing agent at certain temperatures while coke is better in some other cases;
 	
➔ explain why specific reducing agents are used for the reduction Purposes.
	Thermodynamics illustrates why only a certain reducing element and a minimum specific temperature are suitable for reduction of a metal oxide to the metal in an extraction.
	
	• Occurrence of Metals : Metallurgy, Minerals , Ores and Gangue
	• **Concentration of Ores:**
	   ➔**Hydraulic Washing** ➔ **Magnetic Separation** ➔**Froth Floatation Method**➔ **Leaching**
	
	• Extraction of Crude Metal from Concentrated Ore
	  (a) Conversion to oxide,: Calcination and Roasting
	  (b) Reduction of the oxide to metal
	• Thermodynamic Principles of Metallurgy
	 ➔*Extraction of iron from its oxides*
	 ➔*Extraction of copper from cuprous oxide [copper(I) oxide]*
	 ➔*Extraction of zinc from zinc oxide*
	• Ellingham Diagrams
	
	• Electrochemical Principles of Metallurgy
	 ➔**Aluminium**
	 ➔**Oxidation and Reduction methods**
	
	• Refining
	(a) Distillation (b) Liquation (c) Electrolysis
	(d) Zone refining (e) Vapour phase refining (f) Chromatographic methods

Remarks/ Suggestion   *Teacher Signature*

Date of Commencement :   **Expected Date of Completion:**

HOME ASSINGMENT	HOTS AND MLL	CO-RELATION WITH OTHER SUBJECTS And extended learning

➔ Students are given the Home assingment to solve all the in text question solved and unsolved exercises of NCERT.
 	
➔ Exemplar problems for students preparing for competitive examinations.
 	
➔ Compile all questions asked from the chapter in last five years in CBSE board examination.
	➔ **VSA question of one mark**
	1. What is the purpose of drawing Ellingham diagram?
	2. Which is better reducing agent at 983K, Carbon or CO?
	3. Give the leaching reaction involved in the extraction of Gold.
	4. What is the role of graphite rods in electrometallurgy of aluminum?
	➔**SA question of two marks (Any six)**
	
	5. Explain the leaching of bauxite ore.
	6. What are depressants?
	7. Why copper matte is put in silica lined converter?
	8. Copper can be extracted by hydrometallurgy but not Zn. Why?
	9. Why is reduction of metal oxide easier if the metal formed is in liquid state at the temperature of reduction.
	10. What is Monds process of refining of metals?
	11. The value of $\Delta_f G^0$ for Cr_2O_3 is -540kJ/mole & that of Al_2O_3 is -827kJ/mole. Is the reduction of Cr_2O_3 possible with aluminium?
	12. What are the functions of collectors and stabilizers in the froth floatation method?
	13. Why is reduction of metal oxide easier if metal formed is in liquid state at temperature of reduction?
	➔ **SA question of three marks**
	
	14. What are the different reactions that take place at different temperatures in the extraction of iron ore in the blast furnace?
	15. Name the principal ore of aluminium and describe how Al is extracted from its ore.
	16. Explain the following:-
	    (i) Zinc but not copper is used for recovery of Ag from the complex $[Ag(CN)_2]$-.
	    (ii) Partial roasting of sulphide ore is done in the metallurgy of copper.
	        (iii) Extraction of Cu from pyrites is difficult than that from its oxide ore through reduction
		➔ PPT available
		➔Lectures on Youtube.
		➔**Different types of furnaces**
		Furnace is a device used for heating during metallurgical processes.
		(a) Blast furnace is widely used for smelting iron, copper and lead ores. It is composed of tall structure made of steel with arrangements for blowing air near base, slag hole, a tapping hole and an exit to remove waste.
		(b) Reverberatory furnace is another type of furnace used for calcination, roasting or for smelting.
		(c) Muffle furnace is a furnace in which charge container is heated from all sides.
		(d) Bessemer furnace is a pear-shaped furnace made of steel plates lined inside with lime or magnesium.

Principal Signature

CHAPTER-P-BLOCK- LESSON PLAN

Date: **Class:**   **Period Required:**

Gist of Unit /Sub Unit	*Activities(Individual or Group)/Demo/ E-class/PPT*
➔appreciate general trends in the chemistry of elements of groups 16,17 and 18; ➔ learn the preparation, properties and uses of dinitrogen and phosphorus and some of their important compounds; ➔ describe the preparation, properties and uses of dioxygen and ozone and chemistry of some simple oxides; ➔ know allotropic forms of sulphur, chemistry of its important compounds and the structures of its oxoacids; ➔ describe the preparation, properties and uses of chlorine and hydrochloric acid; ➔know the chemistry of interhalogens and structures of oxoacids of halogens; ➔ enumerate the uses of noble gases; ➔appreciate the importance of these elements and their compounds in our day to day life	*Diversity in chemistry is the hallmark of p–block elements manifested in their ability to react with the elements of s–, d– and f–blocks as well as with their own.* **The Group 16** elements have general electronic configuration ns^2np^4.The Group members are **O, S, Se, Po, Te**. They show maximum oxidation state, +6. Gradation in physical and chemical properties is observed in the group 16 elements. In laboratory, **Dioxygen** is prepared by heating $KClO_3$ in presence of MnO_2. It forms a number of oxides with metals. Reaction of Group members with Hydrogen , Halogens and Oxygen. **Allotropic form of oxygen is O3 Ozone** which is a highly oxidising agent**. Sulphur** forms a number of allotropes. Of these, α– and β– forms of sulphur are the most important. Sulphur combines with oxygen to give oxides such as **SO2 and SO3**. SO_2 is prepared by the direct union of sulphur with oxygen. SO_2 is used in the manufacture of H_2SO_4. Sulphur forms a number of oxoacids. Amongst them, most important is **H2SO4.** It is prepared by contact process. It is a dehydrating and oxidising agent. It is used in the manufacture of several compounds. **Group 17** of the periodic table consists of the following elements **F, Cl, Br, I and At**. These elements are extremely reactive and as such they are found in the combined state only. The common oxidation state of these elements is –1. However, highest oxidation state can be +7. They show regular gradation in physical and chemical properties. They form oxides, hydrogen halides, interhalogen compounds and oxoacids. **Chlorine** is conveniently obtained by the reaction of HCl with $KMnO_4$. **HCl** is prepared by heating NaCl with concentrated H_2SO_4. Halogens combine with one another to form interhalogen compounds of the type $X X_{1n}$ (n = 1, 3, 5, 7) where X_1 is lighter than X. A number of **oxoacids of halogens** are known. In the structures of these oxoacids, halogen is the central atom which is bonded in each case with one OH bond as X–OH. In some cases X = 0 bonds are also found. **Group 18** of the periodic table consists of **noble gases He, Ne, Ar, Kr, Xe**. They have ns^2np^6 valence shell electronic configuration except He which has $1s^2$. All the gases except Rn occur in atmosphere. Rn is obtained as the decay product of $_{226}Ra$.Due to complete octet of outermost shell, they have less tendency to form compounds. The best characterised compounds are those of xenon with fluorine and oxygen only under certain conditions. These gases have several uses. Argon is used to provide inert atmosphere, helium is used in filling balloons for meteorological observations, neon is used in discharge tubes and fluorescent bulbs.

Remarks/ Suggestion   *Teacher Signature*

Date of Commencement :   **Expected Date of Completion:**

HOME ASSINGMENT	*HOTS AND MLL*	*CO-RELATION WITH OTHER SUBJECTS*
➔ Students are given the Home assingment to solve all the in text question solved and unsolved exercises of NCERT. ➔ Exemplar problems for students preparing for competitive examinations. 1. What happens when white P is heated with concentrated NaOH solution in an inert atmosphere of CO_2? 2. How do you account for the reducing behaviour of H_3PO_2 on the basis of its structure? 3. Are all the five bonds in PCl_5 molecule equivalent? Justify your answer. 4. Why is BiH_3 the strongest reducing agent among all the hydrides of Group15 elements? 5. Which form of sulphur shows paramagnetic behaviour. 6. Give one oxidizing reaction of Ozone. 7. H_2S is less acidic that H_2Te. Why. 8. Why does O_3 acts a s powerful oxidizing agent? 9. Why is O_2 a gas but Sulphur is a solid. 10. What happens when SO_2 is passed through an aqueous solution of Fe(III) salt. 11. Describe the manufacture of sulpuuric acid by contact process.	**OXYGEN FAMILY** 1) OF_6 is not known whereas SF_6 is known. 2) Oxygen exists as diatomic gaseous molecule whereas other members of the group are solids. 3) Describe the molecular shapes of the following (a) SF_4 (b) SF_6 4) Name the hydrides of group 16. Arrange these hydrides in increasing order of their (a) Bond angle (b) Volatility (c) Reducing behaviour **HALOGEN FAMILY** 1. Why are halogens coloured. 2. Write the balanced equation for the reaction of chlorine with hot and concentrated NaOH. Is this reaction a disproprtionation reaction? Justify. 3. F exhibits only -1 Ox. State whereas other Halogens exhibits +1, +3, +5, +7 Ox state. Explain. 4. Why is ICl more reactive than I_2. 5. Nitric acid becomes yellow in colour on long standing. 6. What are interhalogen compounds? Explain the geometry of ICl_3 7. What is the order of acidic strength of oxoacids of halogens with increasing oxidation state of the halogens? *INERT GASES* 1. What inspired N. Bartlett for carrying out reaction between Xe and PtF_6? 2. Name the first noble gas compound to be synthesized. How was it possible? 3. How are XeO_3 and $XeOF_4$ prepared? 4. How are XeF_2, XeF_4, XeF_6 prepared? Deduce their structures applying VSEPR theory. Give their reactions with water.	➔ PPT available ➔Lectures on Youtube.

Principal Signature

LESSON

DATE :   LESSON/TOPIC:SURFACE   CHEMISTRY

CLASS:XII   PERIODS REQUIRED:_____

SU JECT: CHEMISTRY

Gist of lesson	Concepts/activities(individual or group)/demo/e-class
• To learn the concept of adsorption ,its mechanism, types of adsorption , adsorption isotherm and isobars and application of adsorption • To understand catalysis ,its types(homogeneous and heterogeneous catalysis) and applications(with special reference to zeolites and enzymes) • To understand the general characteristics of colloids. • To describe the preparation ,purification classification(multimolecular and macromolecular and associated colloids ;lyophilic and lyophobic colloids) ,properties and applications of colloids	**SURFACE CHEMISTRY** Basic difference between adsorption and a sorption ; Mechanism involved **Physisorption and chemisorptions**: 1. Specificity 2. Reversible /irreversible 3. Heat of adsorption 4. Effect of temperature 5. Structure of adsorbed layer 6. Nature of adsorbate 7. Effect of pressure(Freundlich adsorption isotherm) Adsorption involved in production of high vacuum, gas mask, removal of coloring matter, heterogeneous catalysis, softening of water ,I n cure disease ,froth floatation process, chromatography etc. **Catalysis: homogeneous and heterogeneous catalysis** (general characteristics**) Zeolites** and theory of catalysis(intermediate compound formation and adsorption theory) General characteristics of **Enzyme catalysis**: enzymes are highly specific and efficient in their action **Colloidal state**:lyophilic colloids are reversible but lyophobic are irreversible in nature Methods of preparation : mechanical dispersion , bredig's arc method ,peptization,double decomposition, oxidation ,reduction and hydrolysis. Purification of colloids: dialysis ,electro dialysis, ultrafilteration Multimolecular. Macromolecular and associated colloids(CMC and Kraft temperature) Properties : sols are viscous, colored , contain charged colloidal particle, show Tyndall effect and brownian movement(stabilize the sols), coagulation(electrophoresis ,mutual coagulation , oiling, persistent dialysis and addition of an electrolyte) **Emulsion** is of two types: o/w and w/o

Remarks/suggestions_____   Sign of Teacher_____

PLAN

Date of commencement: Expected date of completion:

                                                                              Actual date of completion:

Home Assingment	HOTS / MLL	Correlation with other subjects

➔ Students are given the Home assingment to solve all the in text question solved and unsolved exercises of NCERT.
 	
➔ Exemplar problems for students preparing for competitive examinations.
 	
➔ Compile all questions asked from the chapter in last five years in CBSE board examination.
	1. How does the rate of enzyme catalyzed reactions vary with temperature and pH?
	2. What are surfactants? Give two examples.
	3. What are aquadag(graphite sol in water) and purple of cassius(gold sol)?
	4. Explain the condition when adsorption isotherm becomes parallel to the pressure axis?
	5. Adsorption of gases on solid surface is accompanied y decrease in entropy, yet it is spontaneous, explain.
	6. Why ester hydrolysis is slow initially but hasten after some time?
	7. Why is adsorption always exothermic?
	8. What is the role of desorption in the process of catalysis?
	9. Comment on statement "colloid is not a substance but is a state of substance".
	10. What are emulsions? Discuss its types with suitable examples.
	➔**Question numbers 1- 4 are VSA question of one mark**
	1. What are the physical states of dispersed phase and dispersion medium of froth?
	2. Give an example of micelles system?
	3. What are shape selective catalysts?
	4. How does the adsorption of a gas on a solid surface vary with temperature?
	➔**Question numbers 5- 10 are SA question of two marks**
	
	5. What are Lyophobic & Lyophilic sols? Compare the two in terms of stability & reversibility.
	6. How is the protective power of a protective colloid related to its gold number?
	7. Describes some features of catalysis by Zeolites?
	➔**Question numbers 11- 13 are SA question of three marks**
	
	8. Write short notes on followings:-
	   a. (a) Tyndall effect (b) Brownian Movement (c) Hardy Schulze Rule
	9. Explain What is observe when
	   a. An electrolyte, NaCl is added to hydrate ferric oxide sol.
	   b. Electric current is passed through a colloidal sol.
	   c. When a beam of light is passed through a colloidal sol.
	10. What is the difference between multimolecular & macromolecular colloids? Give one example of each type. How are associated colloids different from these two types of colloids?
		Correlation with Maths as it involves graphs.
		
		Speed/ rate a concept of Physics

Sign of Principal_____

HOTS Questions

BIOMOLECULES

VSA (1 Mark)

Q1.   How many atoms are present in the ring of pyranose structure of glucose?

Ans.   5 Carbon atoms and one Oxygen atom.

Q2.   Write the formula of Zwitter ion for Glycine.

Ans.

    R-CH-COO⁻ CH_2-COO⁻

        | |

    NH_3^+ NH_3^+
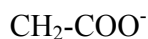
    General Formula   Zwitter ion of glycine

Q3.   Which proteins possess α-Helix structure?

Ans.   Keratin and myosin possess α-Helix structure.

Q4.   Name two diseases caused due to deficiency of enzymes.

Ans.   Albinism and phenylketonuria.

Q5.   Fresh tomatoes are a better source of Vitamin C that which have been stored for some time. Explain.

Ans.   Vitamin C is destroyed on prolonged exposure to air due to its oxidation.

Q6.   Why are carbohydrates generally active?

Ans.   It is due to the presence of Chiral Carbon atoms in their molecules.

Q7.   What type of linkages hold together monomers in DNA?

Ans.   Monomers in DNA are linked by phosphate linkages.

Q8.   Why is cellulose not digested in human body?

Ans.   It is due to the fact that human beings do not have enzymeto digest cellulose.

SA Type I (2 Marks)

Q1.   Give reasons for the following-

(i) On electrolysis in acidic solution amino acids migrate towards cathode, while in alkaline solution these migrate towards anode.

(ii) The monoamino monocarboxylic acids have two pK_a values.

Ans.   (i) In acidic solution, the carboxylate anion accept a proton and gets converted into carboxylic group resulting in the formation of positive ion.

H_3N^+ —CH—COO$^-$ $\underset{\text{(acid)}}{\overset{H^+}{\longrightarrow}}$ H_3N^-—CH—COOH

| |

R   R

(Zwitter ion)   (Positive ion)
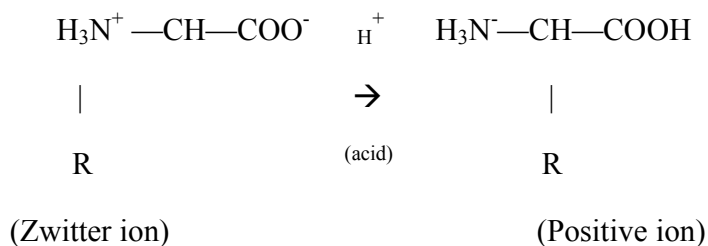
In presence of a base the N^+H_3 ion changes to —NH_2 group by losing a proton and this gives a negative ion.

H_3N^+—CH—COO$^-$ $\underset{\text{base}}{\overset{OH^-}{\longrightarrow}}$ H_2N—CH—COO$^-$ $+H_2O$

| |

R   R

(Zwitter ion)   (Negative ion)
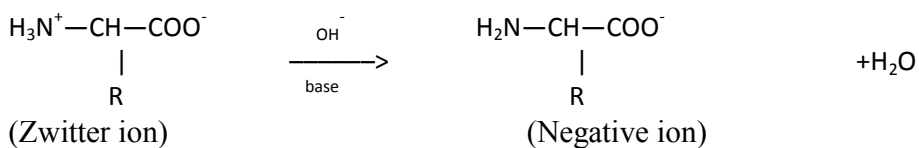
This means that in acidic medium, the amino acid migrates towards the cathode while in alkaline solution it migrates towards anode on electrolysis.

(ii) In aqueous solution, monoamino monocarboxylic amino acid behave like salt at isoelectric point. At a pH lower than isoelectric point (i.e. in acidic medium) it shows one pK_a value which corresponds to structure

$$\begin{array}{c}\qquad\quad \overset{\displaystyle O}{\overset{\displaystyle \|}{}} \\ R\!-\!CH\!-\!C\!-\!O^- \\ \qquad\; | \\ \qquad\; {}^+NH_3 \end{array}$$
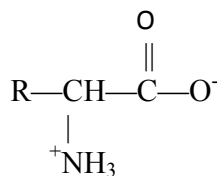
and at a pH higher than isoelectric point, it shows a pK_a value which corresponds to another

$$\begin{array}{c}\qquad\; \overset{\displaystyle O}{\overset{\displaystyle \|}{}} \\ R\!-\!CH\!-\!C\!-\!O^- \\ \qquad | \\ \qquad NH_2 \end{array}$$
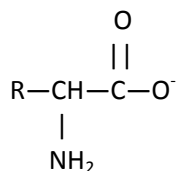
Q2.   Which forces are responsible for the stability of α-helix? Why is it named as 3.6_{13} helix?

Ans.   Hydorgen bonds between – N-H and —C=O groups of peptide bonds give stability to the structure.

It is known as 3.6_{13} helix, since each turn of helix has approximately 3.6 amino acid residue and a 13 member ring is formed by hydrogen bonding.

Q3.   Write about the following protein synthesis-

(i) Name the location where the protein synthesis occurs?

Ans.   Protein synthesis occurs at the ribosome in cytoplasm.

(ii) How do 64 codones code for only 20 amino acids?

Ans.   The 64 codones for 20 amino acids; more than one codon can code for same amino acids, e.g., CUU and CUU both can code leucine. Proline is encoded by CCU, CCA, CCG, and CCC.

Q4.   Describe the mechanism of replication of DNA.

Ans.   Replication of DNA:- The process by which a DNA molecule produces two identical copies of itself is called replication of DNA. In the DNA double helix the sequence of bases in one chain is incomplemanty to the sequence in the other chain, therefore one controls the other. During all division the two strands of the DNA double helix partly unwind and each serves as the template for the synthesis of a new DNA molecule. DNA replication follows the base pairing rules by which A pairs with T and G pairs with C. Therefore, each daughter molecule is an exact replication of the parent molecule. DNA replication is semi conservative i.e. only half of the parental DNA is

conserved and only one strand is synthesised. DNA replication takes place only in 5'→3' direction.

Q5.   Answer the following queries about proteins-

(i) How are proteins related to amino acids?

Ans.   Proteins consist of large number of amino acids linked to each other by peptide linkage, having 3- dimensional structure. Thus, proteins are biopolymers of amino acids.

(ii) When is protein said to be denatured?

Ans.   When nature proteins are subjected to the action of heat, acids or alkalies, they are coagulated or precipitated. The protein in this state is said to be denatured. During denaturation process the water soluble form of globular protein change to water insoluble fibrous protein.

SA(II) (3 Marks)

Q6.   Draw simple Fishcha projections of D and L- glucose. Are these enantiomers?

D-Glucose   L-Glucose
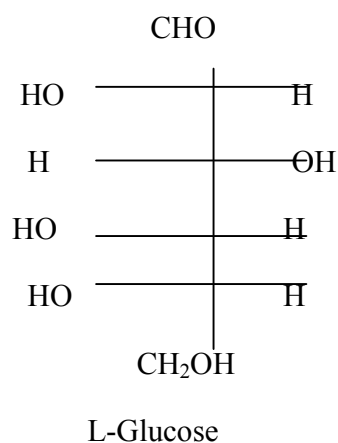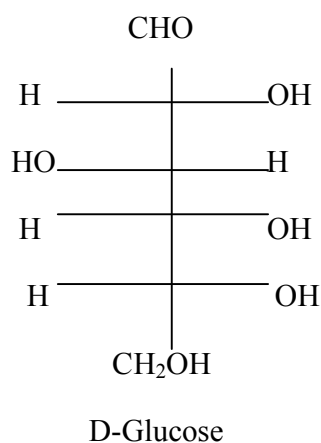
Yes these two fischer projections are called enatiomers.

Q7.   A tripeptide on complete hydolysis gives glycine, alanine and phynylalanine using three letter symbols write down the possible sequence of tripeptide.

Ans.   Each amino acid may be present at the N-terminal as well as C-terminal.

(i) Gly-Ala-Gly

(ii) Gly-Phe-Ala

(iii) Ala-Gly-Phe

(iv) Ala- Phe-Gly

(v) Phe-Ala-Gly

(vi) Phe-Gly-Ala

Q8. Glycine exists as a Zwitter ion but 0-and p-amino benzoic acids do not. Explain.

Ans. The lone pair of N-atom in O- and p-aminobenzoic acid is involved in resonance. The lone pair of N-atom in transferred towards benzene ring. This decreases the acidic character of $-NH_2$ group. Therefore these groups do not transfer and accept H^+ ions, respectively.

Q9. Write short notes on-

(i) Co-enzymes

(ii) Prosthetic groups

Ans. (i) Co-enzymes:- These are usually derived from vitamins such as thaimine ,riboflamin, niacin etc. They are loosely held to the protein and can be easily separated by dialysis.

(ii) Prosthetic groups:- They are also derived from vitamins such as biotin but are tightly held to the protein molecule by covalent bonds. They can be separated only by careful hydrolysis.

Q10. The melting points and solubility in water of amino acids are generally higher than that of the corresponding halo acids. Explain.

Ans. The amino acids exists as zwitter ion (H_3N—CHR—COO^-). They have salt like structure. There are strong dipole-dipole and electrostatic attractions. Therefore, amino acids have high melting points. Amino acids strongly interact with water molecules and are soluble in it. The halo-acids do not have salt like structure and have low melting points. Halo-acids do not interact as strongly with water molecules as do amino acids. Therefore, solubility of amino acids in water is more than those of halo- acids.

Higher Order Thinking Skills Questions (HOTS)

Q.1   (a) What is a ligand? Give an example of a bidentateligand.

(b) Explain as to how the two complexes of nikel $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]$ have different structures but do not have their different magnetic behaviour. (Ni=28)

Ans: (a) Ligands . The ions or molecules bound to the central atom ion in the coordination entity are called ligands. Example of bidentate ligand:

$$H_2NCH_2CH_2NH_2$$
(ethylenediammine)
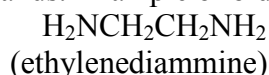
(b) [Ni(CN)4]2- is a square planer complex. which is diamagnetic as no unpaired electron
is present.

[Ni(CO)$_4$] is a tetrahedral complex which is diamagnetic due to the absence of unpaired electron
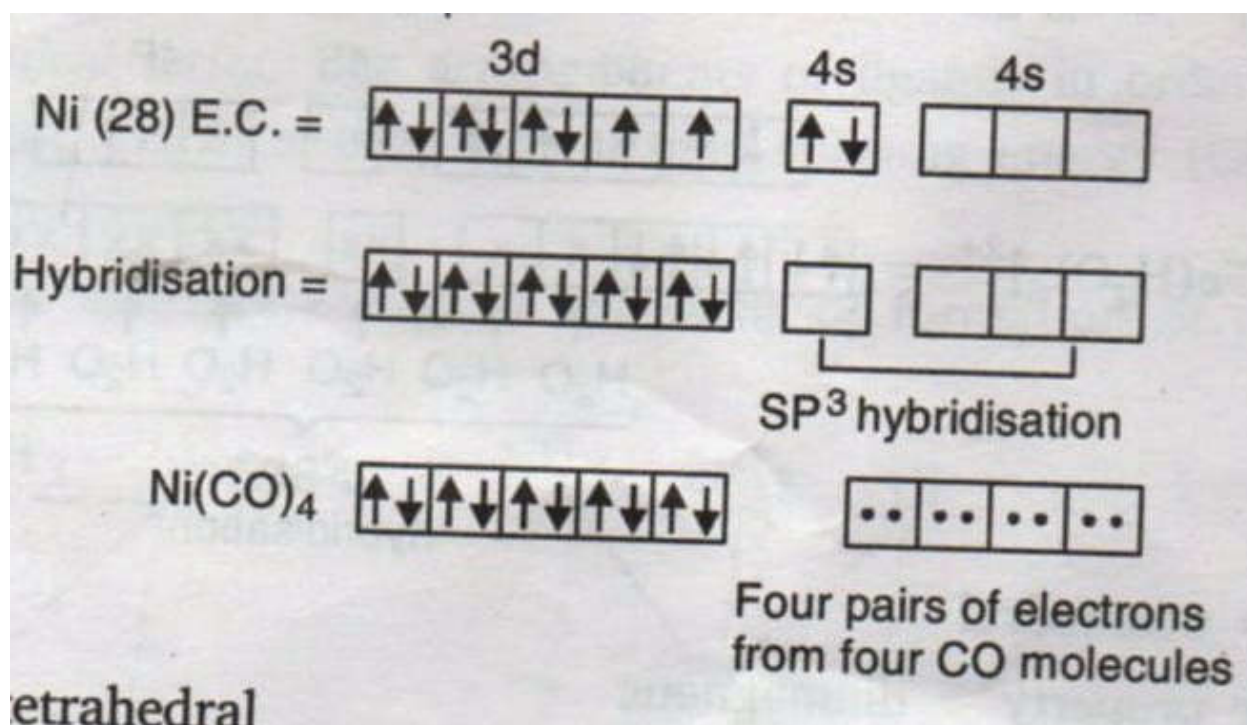
Q.2   (a) Name two main factors that affects a metal ions forming complex.
         (b) Give an example of industrial application of forming co-ordination complex.
         (c) Write IUPAC name of $[Co(en)_2Cl(ONO)]^+$

Ans: (a) (i) Smaller size of cation and higher charge
           (ii)Presence of vacant orbitals

         (b) Silver and gold are extracted by treating zinc with their cynide complexes.

K[Ag(CN)2] is used for electroplating of silver , K[Au(CN)2] is used for gold plating .

Q.3.   Write the name and draw the structure of each of the following complex compounds:
(i)$[Co(NH_3)_4)H_2O)_2]Cl_3$ (ii)$[Pt(NH_3)_4][NiCl_4]$

(i)

Tetraamminediaquacobalt(III) chloride
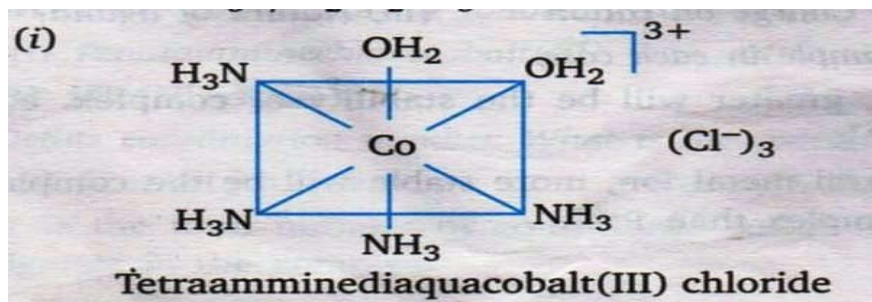
Q4.   How is stability of co-ordination compounds determined in aqueous solution?
Ans: The stability of a co-ordination compound is measured in terms of stability constant
Thus if we have a reaction of the type

$$M + 4L \longleftrightarrow ML4$$
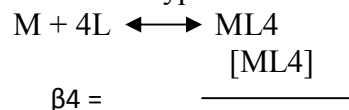
$$\beta 4 = \frac{[ML4]}{[M][L]4}$$

Q.5   (a) Give the IUPAC name of $[Crcl_2(H_2O)_4]Cl$
       (b)Give the number of unpaired electrons in the following complex ions:
              $[FeF_6]^{4-}$ and $[Fe(CN)_6]^{4-}$
       (c) Name the isomerism exhibited by the following pair of coordination compounds.
              $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$
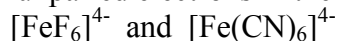
Ans: (a) Tetraquadichloro chromium (III) chloride
       (b) $[FeF_6]^{4-}$has four unpaired electron as F⁻ is a weak field ligand.
           $[Fe(CN)_6]^{4-}$has no unpaired electrons because CN- is a strong field ligand.
       (c) Ionisation isomerism. On addition of dilute HCl followed by aqueous BaCl2,
           [CO(NH3)5]SO4 will give a white precipitate while the other coordination
compound   will not give any white precipitate

D and f block elements

HOTS

1. Silver atom has completely filled d orbitals in its ground state.How can you say that it is a transition elemnt?
2. Why does Ti +4 ion shows diamagnetic behavior?
3. Which element in the first transition series exibit +1 oxidation state more frequently and why?
4. Why does vanadium pentaoxide act as a catalyst?
5. Which has the higher melting point Fe or Cu and why?
6. Why Hg(l) exist as Hg2+ ion in aqueous phase whereas Cu(l) as Cu+.
7. Account for high melting point and boiling points of transition metals.
   Ans. The melting and boiling points of transition metals are high because of the involvement of greater number of electrons from (n-1)d orbitals in addition to the ns electrons in the inter atomic metallic bonding.
8. What is the trend in melting points of transition metals in a series?
   Ans.The melting points of the transition metals in a series rise to a maximum at the middle of the series (i.e. Cr or Mo or W - element with d 5 configuration) and fall regularly as the atomic number increases.
9. Why do transition metals have higher enthalpies of atomization?
   Ans. Involvement of a large number of unpaired electrons of d orbitals favour stronger inter atomic interactions resulting in stronger bonds between the atoms of a metal and higher enthalpies of atomization.
10. Name one 3d series elements, that do not show variable oxidation states.
    Ans. Sc (+3) 15.Transition metals exhibit variable oxidation states in its compounds, why? Ans. Transition metals exhibit variable oxidation states in its compounds due to the availability of both ns & (n – 1) d electrons for bond formation.
11. Name 3d series metal which shows highest oxidation state.
    Ans. The highest oxidation state shown by 3d series transiNa
    tion metals is +7 by Mn
12. Name a metal in the 3d series of transition metals which exhibit +1 oxidation state most frequently.
    Ans. copper
13. What is the trend in oxidation state of transition metals ?
    Ans. The oxidation state increases with increase in atomic number & reaches a maximum in the middle and then decreases.
14. 3d series transition metals exhibit +2 as the most common oxidation state (except Sc) why?
    Ans. The +2 oxidation state, which commonly occurs for nearly all the transition metals is due to the loss of their outer 4s elect

Named Reactions Of Amines

HOTS

1)Hoffmann Ammonolysis reaction: This reaction yields a mixture of primary, secondary and tertiary amines and quaternary ammonium salt on reaction of alkyl halide with ammonia.

$$RNH_2 \xrightarrow{RX} R_2NH \xrightarrow{RX} R_3N \xrightarrow{RX} R_4\overset{+}{N}\overset{-}{X}$$
$$(1°) \qquad\qquad (2°) \qquad\qquad (3°) \qquad\qquad \text{Quaternary ammonium salt}$$

2) Hoffmann bromamide degradation reaction:

This is a method for preparation of primary amines bytreating an amide with bromine in an aqueous or ethanolicsolutionofsodium hydroxide.

$$R - \overset{\overset{\text{O}}{\|}}{C} - NH_2 + Br_2 + 4NaOH \longrightarrow R - NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

3) Gabriel phthalimide synthesis:
This method is used for the preparation of primary amines from phthalimide.
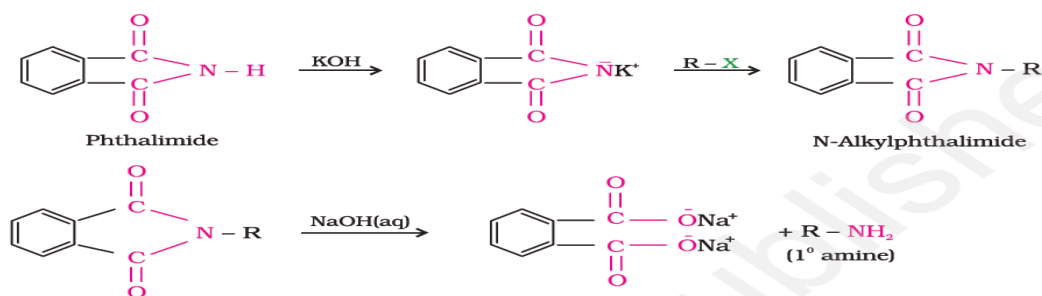
4) Carbylamine reaction:
Aliphatic and aromatic primary amines on heating with chloroform and ethanolic potassium hydroxide form isocyanides or carbylamine

$$R-NH_2 + CHCl_3 + 3KOH \xrightarrow{\text{Heat}} R-NC + 3KCl + 3H_2O$$

5) Sandmeyer reaction:
In this reaction, chlorine or bromine or cyanide can also be introduced in the benzene ring by treating the diazonium salt solution with corresponding halogen acid in the presence of copper(I) ion.

$$Ar\overset{+}{N_2}\overset{-}{X} \begin{cases} \xrightarrow{Cu_2Cl_2/HCl} & ArCl + N_2 \\ \xrightarrow{Cu_2Br_2/HBr} & ArBr + N_2 \\ \xrightarrow{CuCN \;/KCN} & ArCN + N_2 \end{cases}$$
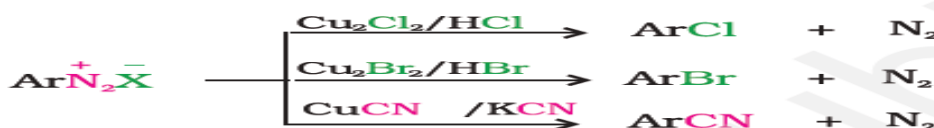
6) Gatterman reaction: In this reaction, chlorine or bromine or cyanide can also be introduced in the benzene ring by treating the diazonium salt solution with corresponding halogen acid in the presence of copper powder.

$$ArN_2X \xrightarrow{\begin{array}{c} Cu/HCl \\ Cu/HBr \end{array}} \begin{array}{l} ArCl + N_2 + CuX \\ ArBr + N_2 + CuX \end{array}$$

7) Diazotisation: Aromatic primary amines react with nitrous acid (prepared in situ from NaNO$_2$ and mineral acid like HCl) at low temperature (273-278 K) to form diazoniumsalts.This conversion of primary aromatic amines into diazonium salts is known as **diazotisation**.

$$C_6H_5NH_2 + NaNO_2 + 2HCl \xrightarrow{273-278K} C_6H_5 \overset{+}{N}_2 \overset{-}{Cl} + NaCl + 2H_2O$$
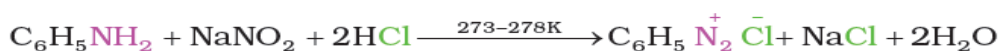
8) Coupling Reaction: The reaction of joining two aromatic rings through –N=N- is known as coupling reaction.

Benzenediazonium   Phenol   p-Hydroxyazobenzene
chloride   (Orange dye)

Benzenediazonium   Aniline   p-Aminoazobenzene
chloride   (yellow dye)
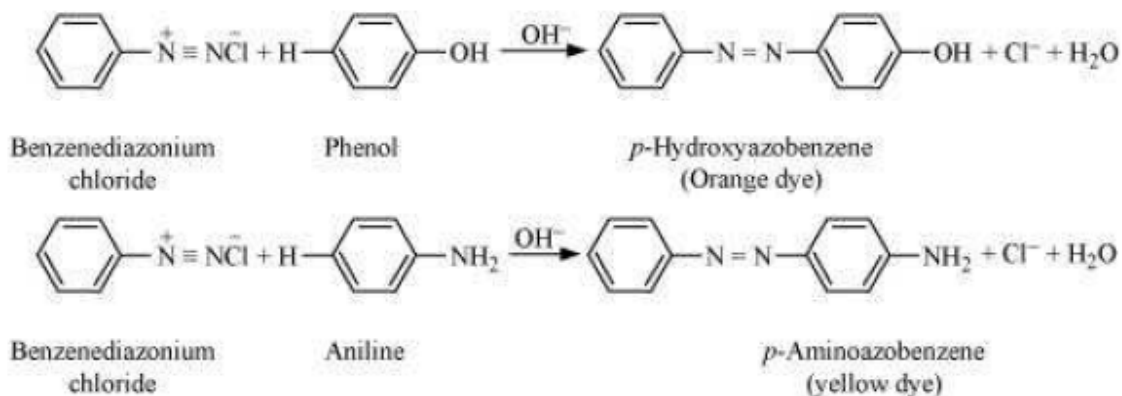
1.   **Give reason for the following:-**

        a)   p-methoxy aniline is a stronger base than aniline while p-nitro aniline is a weaker base than aniline.

Ans: Methoxy group is electron releasing group whereas Nitro group is electron withdrawing group therefore in p-methoxy aniline the electron density on

        N- atom of $-NH_2$ group increases making it more basic but in p-nitro aniline the electron density on N- atom of $-NH_2$ group is decreased making it less basic.

        b)   Aromatic primary amines can't be prepared by Gabriel Phthalamidesynthesis.

Ans: Aromatic primary amines cannot be prepared by Gabriel PhthalimideSynthesis because aryl halides do not undergo nucleophillic substitutionwith the anion formed by phthalimide on reaction with KOH.

        c)   CH3CONH2 is a weaker base than CH3CH2NH2.

Ans: Due to resonance in CH3CONH2 , the lone pair of electrons in CH3CONH2 is delocalised . Due to this electron density on N-atom in acetamide decreases. In CH3CH2NH2 due to +I effect of CH3CH2 group electron density on N- atom increases . As a result CH3CONH2 is a weaker base than CH3CH2NH2

d)   Carbon-nitrogen bond length is aromatic amines is shorter than in aliphatic amines.

Ans: It is because in aromatic amines C-N bond acquires some double bond character and thus becomes shorter than in aliphatic amines.

        e)   Aniline does not undergo Friedal-Craft reaction.

Ans: AlCl3 used as catalyst in Friedelcrafts reaction forms a salt with aniline

        Due to this nitrogen acquires positive charge . Thus it acts as strong deactivating group for electrophilic reaction. Hence aniline does not give Friedalcraft reaction.

2.   **i)   Arrange in decreasing order of pKb values**

        $C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2$ NH, $C_6H_5NH_2$

Ans: $C_6H_5NH_2 > C_6H_5NHCH_3 > C_2H_5NH_2 > (C_2H_5)_2NH$

ii)   Arrange in increasing order of basic character

        Aniline, p-nitro aniline, p-toulidine

Ans: p-nitroaniline< aniline<p-toulidine

3.   **Give reasons;**

a.   **pKb of aniline is more than methyl amine.**

Ans.   Due to resonance lone pair on nitrogen is delocalised due to which its basic character decreases.

b.   **Ethylamine is soluble in water while aniline is not.**

Ans. Due to +I effect of -C2H5 gp which increases electron density on nitrogen and results in strong intermolecular H-bonding with water, but in case of aniline due to resonance electron density on nitrogen decreases.

c. **Aniline does not undergo Friedal craft reactions.**

Ans. this is because aniline is a base it reacts with anhy AlCl3 lewis base to form salt.

d. **Diazonium salts of aromatic amines are more stable than those of aliphatic amines.**

Ans. this is due to resonance in case of diazonium salts of aromatic amines.

e. **Gabriel pthalimide synthesis is preferred for the synthesis of aliphatic amines and not for aromatic amines.**

Ans. This is because for aromatic amines potassium salt of phthalimide should react with aryl halides, but reactivity of aryl halides is less due to partial double bond character between C-X.

4. **Arrange the following:-**

a. **decreasing order of pKb value**

$C_2H_5NH_2$, $C_6H_5NHCH_3$, $(C_2H_5)_2NH$, $C_6H_5NH_2$
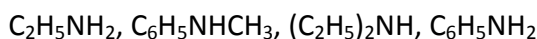
Ans. $(C_2H_5)_2NH > C_2H_5NH_2 > C_6H_5NHCH_3 > C_6H_5NH_2$

b. **decreasing order of basic strength**

$C_6H_5NH_2$, $C_6H_5N(CH_3)_2$, $(C_2H_5)_2NH$, $C_2H_5NH_2$
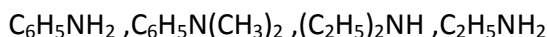
Ans. $(C_2H_5)_2NH > C_2H_5NH_2 > C_6H_5N(CH_3)_2 > C_6H_5NH_2$

c. **decreasing order of basic strength in aqueous phase**

$C_2H_5NH_2, (C_2H_5)_2NH, (C_2H_5)_3N, NH_3$
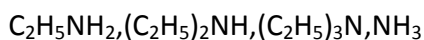
Ans. $(C_2H_5)_2NH > C_2H_5NH_2 > (C_2H_5)_3N > NH_3$

5. DISTINGUISH

1) C_6H_5OH AND $C_6H_5NH_2$ (AZO DYE TEST)

$C_6H5N_2^+ Cl^- + C_6H_5OH + OH^- \longrightarrow C_6H_5N=NC_6H_4OH + Cl^- + H_2O$
(ORANGE DYE)

$C_6H5N_2^+ Cl^- + C_6H_5NH_2 + H^+ \longrightarrow C_6H_5N=NC_6H_4NH_2 + Cl- + H_2O$
(YELLOW DYE)
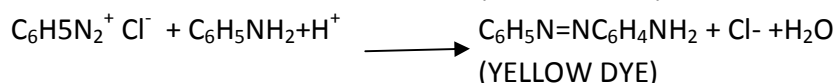
2) $C_6H_5NH_2$ AND $C_6H_5NH CH_3$ (CARBYLAMINE TEST)

$C_6H_5-NH_2 + CHCl_3 + 3KOH \longrightarrow R-NC + 3KCl + 3H_2O$
(FOUL SMELL)

$C_6H_5NH CH_3 + CHCl_3 + 3KOH \longrightarrow$ NO REACTION
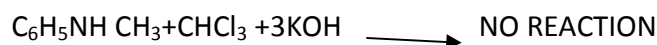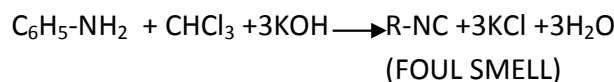
3) $C_2H_5NH_2$ AND $(C_2H_5)_2NH$ (HINSBERG TEST)
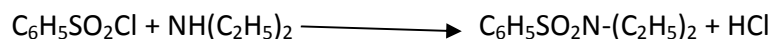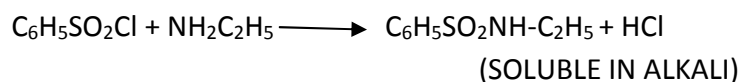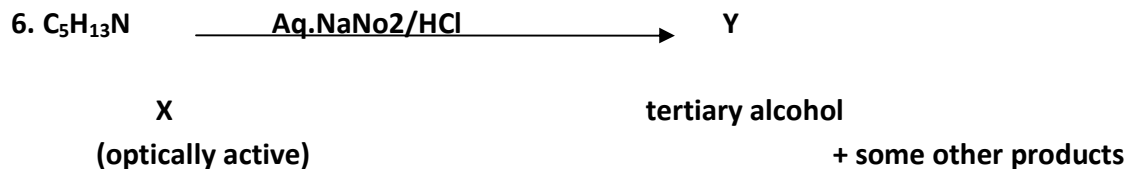
$C_6H_5SO_2Cl + NH_2C_2H_5 \longrightarrow C_6H_5SO_2NH-C_2H_5 + HCl$
(SOLUBLE IN ALKALI)

$C_6H_5SO_2Cl + NH(C_2H_5)_2 \longrightarrow C_6H_5SO_2N-(C_2H_5)_2 + HCl$

6. C$_5$H$_{13}$N _____**Aq.NaNo2/HCl**_____ ⟶ **Y**

   X   **tertiary alcohol**
  (optically active)   **+ some other products**

(i)Identify (X) and (Y)
(ii)Is (Y) optically active?
(iii)Give structures of intermediate(s), if any, in the formation of (Y) from (X)?
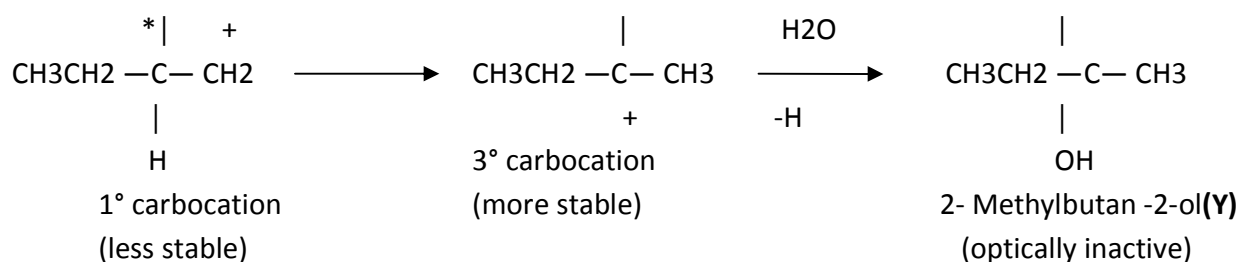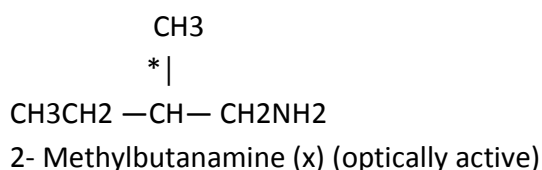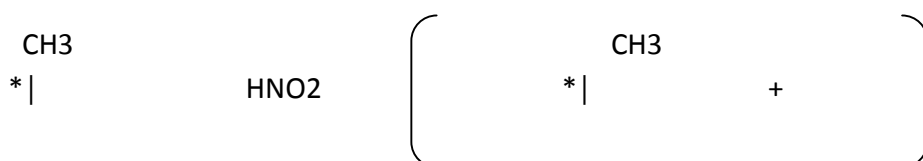
ANS:

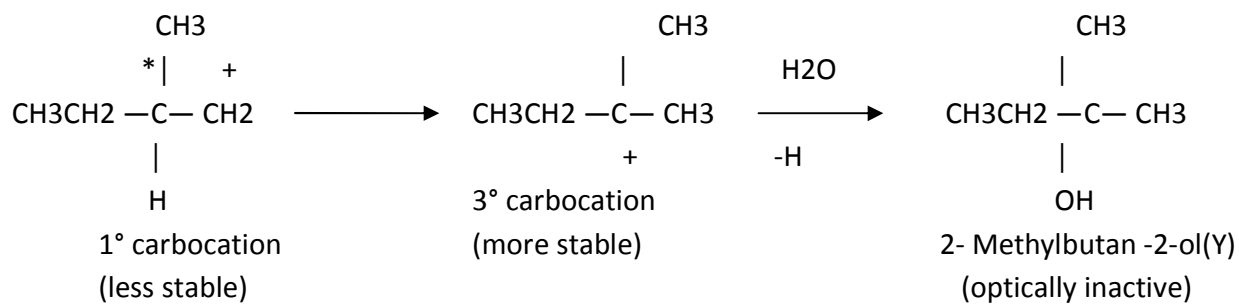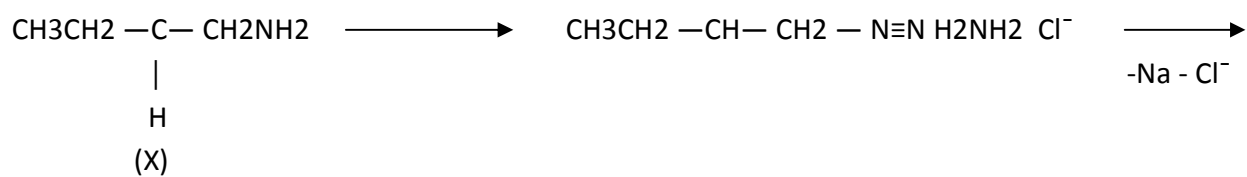. Step 1. To determine the structure of compound (X)

   (i)Since compound (X) on treatment with NaNO$_2$/HCl evolves N$_2$ gas, therefore, (X) must be a primary amine. Further since compound (X) is optically active, therefore, it must contain a chiral carbon. Now NH$_2$ group cannot be directly attached to the chiral carbon since such amines readily undergo racemization due to nitrogen inversion. Therefore, the structure of the compound (X) is

                     CH3
                     *|
            CH3CH2 —CH— CH2NH2
            2- Methylbutanamine (x) (optically active)

   Step 2. To determine the structure of tertiary alcohol (X)
   The formation of compound (Y) from compound (X) may be explained as follows:

            CH3   ⎡   CH3   ⎤
            *| HNO2   ⎢   *| +   ⎥
   CH3CH2 —C— CH2NH2   ⟶   ⎢ CH3CH2 —CH— CH2 — N≡N H2NH2 Cl⁻ ⎥ ⟶
            | ⎣   ⎦   -Na - Cl⁻
            H
           (X)

            CH3   CH3   CH3

```
      *|    +                      |           H2O              |
CH3CH2 —C— CH2    ————————→   CH3CH2 —C— CH3    ————————→   CH3CH2 —C— CH3
       |                            +           -H               |
       H                      3° carbocation                     OH
   1° carbocation            (more stable)              2- Methylbutan -2-ol(Y)
   (less stable)                                        (optically inactive)
```
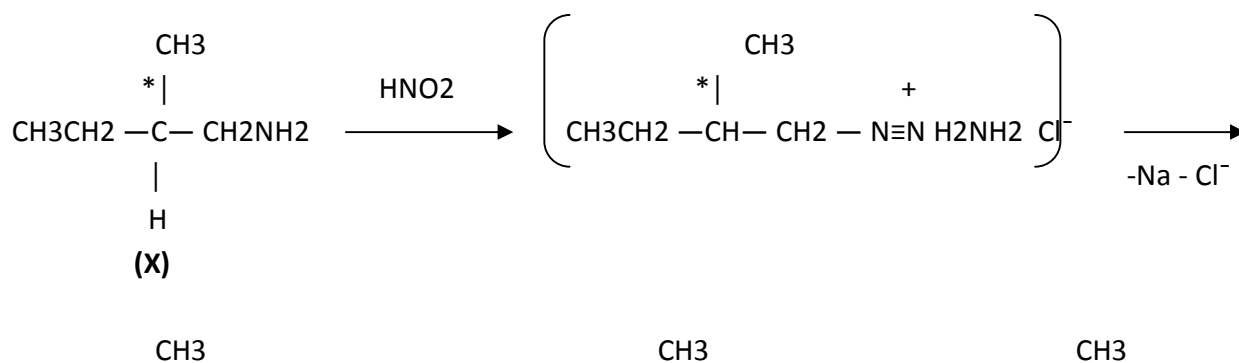
Thus, the compound   is 2-methylbutan-2-ol. It is optically inactive.

7.**Give reasons for the following:**

    i) Diazonium salts of aromatic amines are more stable than those of aliphatic amines.

    ii) Gabriel Phthalimide Reaction is preferred for synthesizing primary amines.

    iii) Gabriel Phthalimide Reaction is not preferred for synthesizing primary aromatic amines.

    iv) $(CH_3)_3N$ reacts with BF_3 while . $(C_6H_5)_3N$ does not react with BF_3.

    v) p- aminobenzoic acid does not exist as dipolar ion while aminoacetic acid exist as dipolar ion.

Ans1. i) Diazonium salts of aromatic amines undergoes resonance. Due to resonance Diazonium salts of aromatic amines are more stable than those of aliphatic amines.

ii) Gabriel Phthalimide Reaction results in formation of primary amines only. Sec & Tert. Amines are not formed in the reaction . Thus pure primary amines can be obtained.

iii) Gabriel Phthalimide Reaction involves nucleophilic substitution of alkyl halides by the anion formed by phthalimide. As aryl halides do not undergo nucleophilic substitution reactions , primary aromatic amines cannot be prepared.

iv) In $(C_6H_5)_3N$ the lone pair of electrons on nitrogen is delocalized over three benzene rings and hence it is not available for co-ordinate bond formation with electron deficient BF_3. Such delocalization is not possible in case of trimethyl amine, hence it readily reacrts with BF_3.

v) P-aminobenzoic acid shows resonance due to which it reduces the availability of lone pair of electrons on N but also decreases the acidic nature of –COOH group.Thus –NH2 group in . p- aminobenzoic acid cannot extract a proton from –COOH group and it does

not exist as dipolar ion.On the other hand no such resonance as seen in aminoacetic acid so it can easily extract a proton from –COOH group and it exist as dipolar ion.
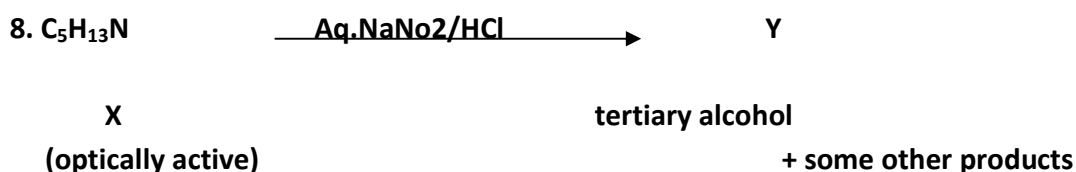
8. C₅H₁₃N   **Aq.NaNo2/HCl**   ⟶   **Y**

     X   **tertiary alcohol**

  (optically active)   **+ some other products**

(i)Identify (X) and (Y)
(ii)Is (Y) optically active?
(iii)Give structures of intermediate(s), if any, in the formation of (Y) from (X)?

Ans 8. Step 1. To determine the structure of compound (X)
(i)Since compound (X) on treatment with NaNO₂/HCl evolves N₂ gas, therefore, (X) must be a primary amine. Further since compound (X) is optically active, therefore, it must contain a chiral carbon. Now NH₂ group cannot be directly attached to the chiral carbon since such amines readily undergo racemization due to nitrogen inversion. Therefore, the structure of the compound (X) is

                   CH3
              *|
        CH3CH2 —CH— CH2NH2
        2- Methylbutanamine (x) (optically active)

 Step 2. To determine the structure of tertiary alcohol (X)
 The formation of compound (Y) from compound (X) may be explained as follows:

       CH3   CH3
      *| HNO2   ⎡   *| +   ⎤

CH3CH2 —C— CH2NH2 $\longrightarrow$ CH3CH2 —CH— CH2 — N≡N H2NH2 Cl⁻ $\longrightarrow$
     | -Na - Cl⁻
     H
     (X)

       CH3   CH3   CH3
      *| + | H2O |
CH3CH2 —C— CH2 $\longrightarrow$ CH3CH2 —C— CH3 $\longrightarrow$ CH3CH2 —C— CH3
     | +   -H |
     H   3° carbocation   OH
  1° carbocation   (more stable)   2- Methylbutan -2-ol(Y)
  (less stable)   (optically inactive)

       Thus, the compound   is 2-methylbutan-2-ol. It is optically inactive.

Q1.What happens when : (i) aluminium reacts with t-butylalcohol (ii) phenol is oxidised with chromic acid (iii) cumene isoxidised in the presence of air and the product formed is treated with dilute acid. (iv) phenol is treated with conc. HNO3 . (v) phenol is treated with chloroform in presence of dilute NaOH.

Ans.(i) Hydrogen gas is released (ii) benzoquinone(iii) Phenol and Acetone (iv) Picric acid (v) Salicylaldehyde.

Q2.An alcohol A (C4H10O) on oxidation with acidified potassium dichromate gives carboxylic acid B (C4H8O2). Compound A when dehydrated with conc. H2SO4 at 443 K gives compound C. Treatment of C with aqueous H2SO4 gives compound D. (C4H10O) which is an isomer of A. Compound D is resistant to oxidation but compound A can be easily oxidised. Identify A, B, C and D and write their structures.

Ans. : [A] = (CH3)2CHCH2OH ,[B] = CH3CH(CH3)COOH ,[C] = (CH3)2C = CH2, [D] = (CH3)3C – OH

Q3. An ether A (C5H12O) when heated with excess of hot concentrated HI produced two alkyl halides which on hydrolysis from compounds B and C. Oxidation of B gives an acid D whereas oxidation of C gave a ketone E. Deduce the structures of A, B, C, D and E.

Ans : A = $CH_3 CH_2 OCH (CH_3)_2$,B = CH_3CH_2OH , C = $CH_3CH(OH)CH_3$,, D = CH_3COOH , E = CH_3COCH_3

Q4. An alcohol A ($C_4H_{10}O$) on oxidation with acidified potassium dichromate gives carboxylic acid B ($C_4H_8O_2$). Compound A when dehydrated with conc. H_2SO_4 at 443 K gives compound C. Treatment of C with aqueous H_2SO_4 gives compound D. (C4H10O) which is an isomer of A. Compound D is resistant to oxidation but compound A can be easily oxidised. Identify A, B, C and D and write their structures.

Ans: [A] = $(CH_3)_2CHCH_2OH$ [B] = $CH_3CH(CH_3)COOH$ [C] = $(CH_3)_2C = CH_2$ [D] = $(CH_3)_3C – OH$

Q5.Convert (i)Propene to Propan-2-ol (ii)Benzyl chloride to Benzyl alcohol (iii)Ethyl magnesium chloride to Propan-1-ol.

Ans.(i)If propene is allowed to react with water in the presence of an acidas a catalyst, then propan-2-ol is obtained

(ii) If benzyl chloride is treated with NaOH (followed by acidification) then benzyl alcohol is produced.

(iii) When ethyl magnesium chloride is treated with methanol, an adduct is the produced which gives propan-1-ol on hydrolysis.

Q6. Account for the following:

i)Phenols has a smaller dipole moment than methanol

ii)Phenols do not give protonation reactions readily.

iii) Nitration of phenol gives ortho- and para- products only.

Ans.(i). In phenol the electron withdrawing inductive effect of –OH group is opposed by electron releasing the resonance effect of –OH.

(ii). The lone pair on oxygen of–OH in phenol is being shared with benzene ring through resonance. Thus, lone pair is not fully present on oxygen and hence phenols do not undergo protonation reactions.

iii) -OH group increases the electron density more at ortho and para positions through its electron releasing resonance effect.

Q7. How will you carrySynthesis of

(i)1- phenyl ethanol from suitable alkene

(ii)cyclohexyl methanol using an alkyl halide by an SN2reaction.

(iii) pentan-1-ol using a suitable alkyl halide?

Ans.(i) By acid-catalyzed hydration of ethyl benzene (styrene), 1-phenyl ethanol can be synthesized. (ii)When chloro methyl cyclohexane is treated with sodium hydroxide, cyclohexyl methanol is obtained .

(iii)When 1-chloropentane is treated with NaOH, pentan-1-ol is produced.

Q8.Explain why can Sodium metal can be used for drying diethyl ether but not ethylAlcohol?

Ans. Ethyl alcohol contains active hydrogen attached to O and react with Na but diethylether do not react with Na.

Q9.Phenol is an acid but does not react with Sodium bicarbonate solution. Why?

Ans.Phenol is weaker acid than carbonic acid and hence does not liberate CO_2 from sodium bicarbonate solution.

....

Q-1 **An organic compound (A) {C8H16O2} was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B)and an alcohol (C). Oxidation of (C)with chromic acid produced (B).(C) on dehyration gives but-1-ene .Identity A,B,C.**

Q-2 **An organic compound with the molecular formula C9H10O forms 2,4 DNP derivative reduces tollens reagent and undergoes cannizaro reaction . On vigorous oxidation ,it gives 1,2 benzenecarboxylic acid . Identify the compound .**

Ans:-

Q-3 **An organic compound (A) with molecular formula C8H8O forms an orange red precipitate with 2,4 DNP reagent and gives yellow precipitate on heating with iodine in the presence of sodium hydroxide. It neither reduces tollen's or fetiling's reagent , nor does it decolourise bromine water or baeyer's**

reagents .On drastic oxidation with chromic acid .it gives a carboxylic acid (B) having molecular formula C7H6O2. Identify the compounds (A) and (B).

$COCH_3$

(A)

$+ NH_2 - NH -$ benzene ring with NO_2 and NO_2

↓

CH_3

$C = N - NH -$ benzene ring with NO_2 and NO_2

(2,4,DPN derivative)

⇨ $COOH$ (B) $\xleftarrow{H_2CrO_4}$ $COCH_3$ (A) $\xrightarrow[I_2]{NaOH}$ $COONa$ $+ CHI_3$

Q-4 Two moles of organic compound A on treatment with a strong base gives two compounds B and C. Compound B on dehydrogenation with Cu/573 K gives A while acidification of C yields carboxylic acid D having molecular formula of CH2O2 .Identify the compoundsA,B,C,D

Ans:- $2HCHO \xrightarrow[KOH]{Conc.} HCOOK + CH_3OH$

(A)   (C)   (B)

$CH_3OH \xrightarrow[573\ K]{Cu} HCHO$

(B)   (A)

$HCOOK + HCL \longrightarrow HCOOH + KCL$

(c)   (D)

Q-5 An aliphatic compound _A' with a molecular formula of C3H6O reacts with phenylhydrazine to give compound _B' . Reaction of _A' with I2 in alkaline medium on warming gives a yellow precipitate _C'. Identify the component A,B,C

Ans:- $CH_3COCH_3 + C_6H_5\ NH - NH_2 \longrightarrow CH_3C=N-HN-C_6H_5$

     O   (A) CH_3 (B) |

     ‖

$CH_3\overset{O}{\overset{‖}{C}} - CH_3 + 3I_2 + NaOH \longrightarrow CHI_3$

(A)   (Iodoform)

                                     (c)

Q-6 A compnent _A' with molecular formula C5H10O gave a positive 2,4 DNP test but a negative Tollen's reagents test . It was oxidised to carboxylic acid _B' with molecular formula C3H602 when treated with alkaline $KMnO_4$ under vigrous condition . sodium salt of _B' gave hydrocarbon _C' on kolbe eletrolysis reaction . Identify A,B,C and D.

Ans:- $CH_3 - CH_2 - \underset{\underset{O}{\|}}{C} - CH_2 - CH_3 \xrightarrow[\text{KOH}]{\text{KMnO}_4} CH_3CH_2COOH$

(A)   (B)

$\Rightarrow CH_3 - CH_2 - \underset{\underset{CH_3}{\overset{|}{CH_2}}}{\overset{|}{C}} = O + NH_2 - NH\text{—}$ NO$_2$

$CH_3 - CH_2 - \underset{\underset{CH_3}{\overset{|}{CH_2}}}{\overset{|}{C}} = N\text{- } NH\text{—}$ NO$_2$

$\Rightarrow$ 2

CH_3CH_2COONa electrolysis $CH_3CH_2CH_2CH_3$

Sodium propanoate   (c) +   2CO$_2$

Q-7 An organic compound _A' has the molecular formula C5H10O .It does not reduce fehling's solution but forms a bisulphite compound .It also gives positive Iodoform test. What are possible structure of _A' ?Explain your reasoning.

Q-8 An organic compound _A' which has characterstic odour , on treatment with NaOH forms two compounds _B' and _C'. Compound _B' has the molecular formula C7H8O which on oxidation gives back compound _A'. Compound 'C' is the sodium salt of an acid which when heated with soda lime yields an aromatic hydrocarbon _D'. Deduce A,B,C,D

Q-9 An organic compound _A' is resistant to oxidation forms a compound 'B_(C3H8O) on reduction ._B'reacts with HBr to form a bromide _C' which on treatment with alkoholic KOH forms an alkene _D' (C3H6). Deduce A,B,C,D.

Q. 10   Identify A, B, C, D, E, R, R¹ in the following :

Dry ether   H$_2$O

(i)   Br + Mg $\longrightarrow$ A $\longrightarrow$ B

(ii) $\quad$ R — Br + Mg $\xrightarrow{\text{Dry ether}}$ C $\xrightarrow{\text{D}_2\text{O}}$ CH$_3$ — CH — CH$_3$
$$\hspace{11cm}|$$
$$\hspace{11cm}\text{D}$$

(iii) $\quad$ CH$_3$ — C — C — CH$_3$ $\xleftarrow{\text{Na/ether}}$ R¹X $\xrightarrow{\text{Mg}}$ D $\xrightarrow{\text{H}_2\text{O}}$ E

with substituents:
$$\text{CH}_3\ \text{CH}_3 \text{ (above)}$$
$$\text{CH}_3\ \text{CH}_3 \text{ (below)}$$

Q-11 **Identify A, B and C and give their structures :**

$$\xrightarrow[\text{NaOH}]{\text{Br}_2} \text{A + B} \xrightarrow[\Delta]{\text{H}^+} \text{C (C}_8\text{H}_8\text{O)}$$

Q-12 Give the structures of A, B and C in the following compounds :

(i) CH$_3$CH$_2$I $\xrightarrow{\text{NaCN}}$ A $\xrightarrow[\text{Partial Hydrolysis}]{\text{OH}^-}$ B $\xrightarrow{\text{NaOH + Br}_2}$ C

(ii) CH$_3$COOH $\xrightarrow[\text{D}]{\text{NH}_3}$ A $\xrightarrow{\text{NaOBr}}$ B $\xrightarrow{\text{NaNO}_2\text{/HCl}}$ C

HOTS ORGANIC CONVERSIONS

Q-1 **An organic compound (A) {C8H16O2} was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B)and an alcohol (C). Oxidation of (C)with chromic acid produced (B).(C) on dehyration gives but-1-ene .Identity A,B,C.**

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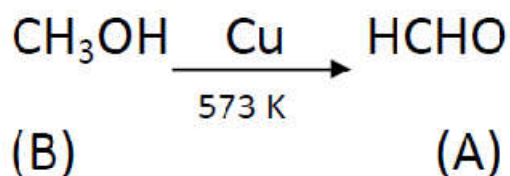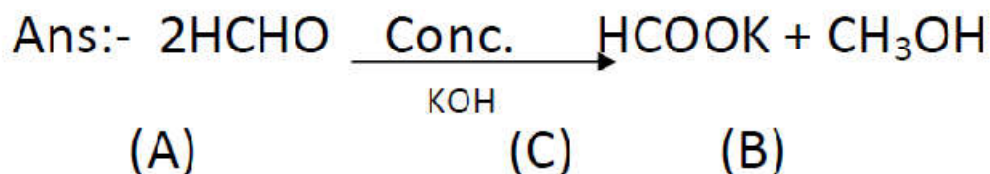
Ans:-

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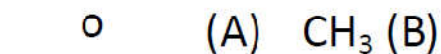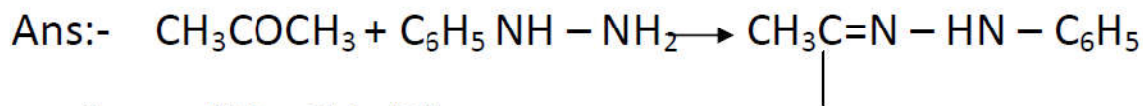
COCH₂

(A)

+ NH₂ - NH —

NO₂

NO₂

↓

CH₃

C = N —— NH— NO₂

NO₂

(2,4,DPN derivative)

⇨ COOH

(B)

←H_2CrO_4—
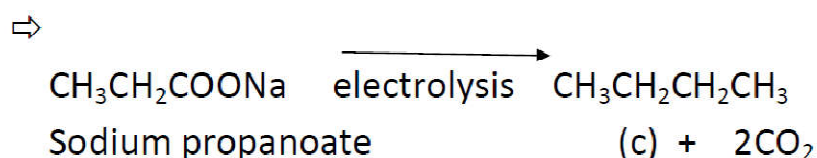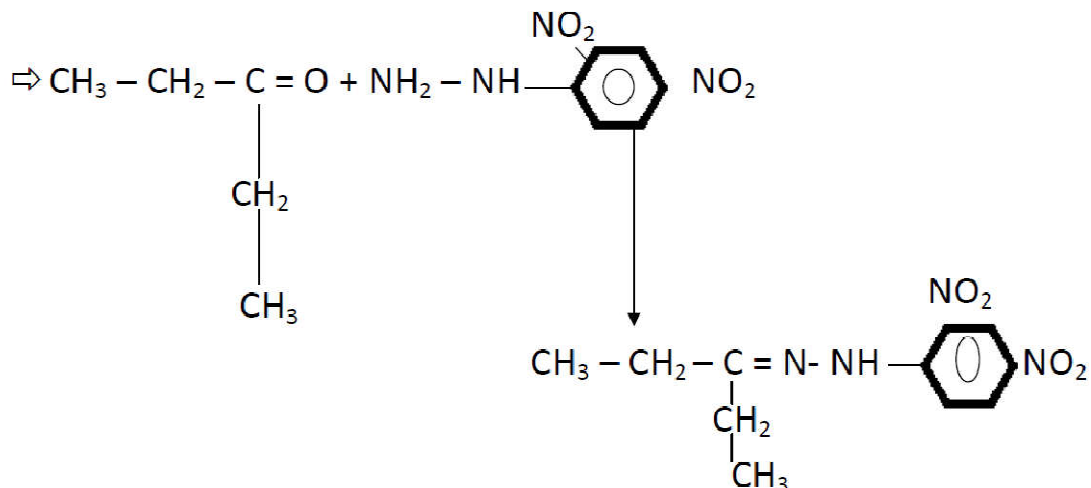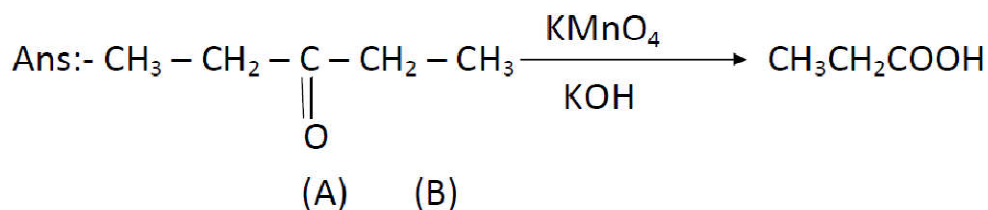
COCH₃

(A)

—NaOH / I_2→

COONa

+ CHI_3

Q-4 Two moles of organic compound A on treatment with a strong base gives two compounds B and C. Compound B on dehydrogenation with Cu/573 K gives A while acidification of C yields carboxylic acid D having molecular formula of CH2O2 .Identify the compoundsA,B,C,D

Ans:- 2HCHO $\xrightarrow[\text{KOH}]{\text{Conc.}}$ HCOOK + CH$_3$OH

(A)   (C)   (B)

CH$_3$OH $\xrightarrow[\text{573 K}]{\text{Cu}}$ HCHO

(B)   (A)

HCOOK + HCL ⟶ HCOOH + KCL

(c)   (D)

Q-5 **An aliphatic compound _A'with a molecular formula of C3H6O reacts with phenylhydrazine to give compound _B' . Reaction of _A' with I2 in alkaline medium on warming gives a yellow precipitate _C'. Identify the component A,B,C**

Ans:- CH$_3$COCH$_3$ + C$_6$H$_5$NH−NH$_2$ ⟶ CH$_3$C=N−HN−C$_6$H$_5$

           O   (A)   CH$_3$ (B)

CH$_3$C−CH$_3$ + 3I$_2$ + NaOH ⟶ CHI$_3$

(A)   (Iodoform)

                                   (c)

Q-6 A compnent _A' with molecular formula C5H10O gave a positive 2,4 DNP test but a negative Tollen's reagents test . It was oxidised to carboboxylic acid _B' with molecular formula C3H602 when treated with alkaline KMnO$_4$ under vigrous condition . sodium salt of _B' gave hydrocarbon _C' on kolbe eletrolysis reaction . Identify A,B,C and D.
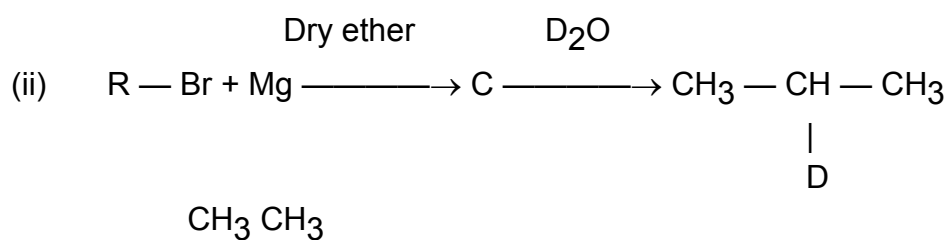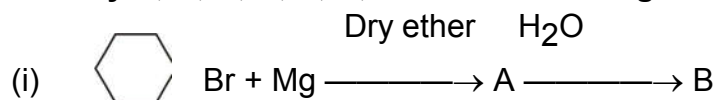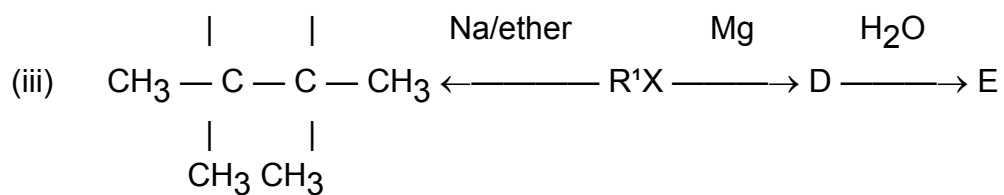
Ans:- $CH_3 - CH_2 - \underset{\underset{O}{\|}}{C} - CH_2 - CH_3 \xrightarrow[KOH]{KMnO_4} CH_3CH_2COOH$

(A)　　(B)

⇨ $CH_3 - CH_2 - C = O + NH_2 - NH-$⬡$\overset{NO_2}{}$ NO_2

$\underset{\underset{CH_3}{|}}{\underset{CH_2}{|}}$

⬡ $\xrightarrow{}$ $CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{\underset{CH_2}{|}}C = N- NH-$⬡$\overset{NO_2}{}NO_2$

⇨ 　　　　　　　　　　　　　　　　　　　　　　2

CH_3CH_2COONa 　electrolysis　$CH_3CH_2CH_2CH_3$
Sodium propanoate 　　　　　　　　(c) + $2CO_2$

Q-7 An organic compound _A' has the molecular formula C5H10O .It does not reduce fehling's solution but forms a bisulphite compound .It also gives positive Iodoform test. What are possible structure of _A' ?Explain your reasoning.

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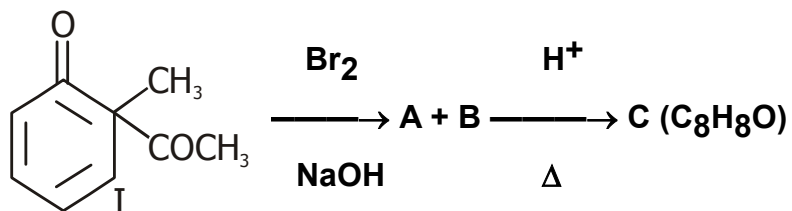
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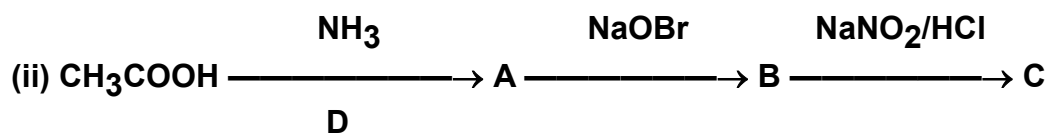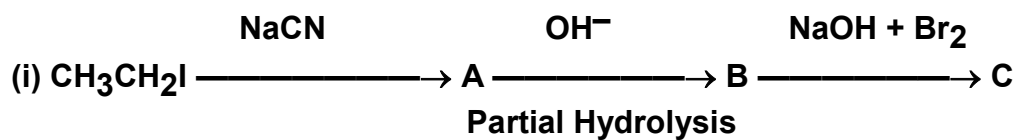
Q. 10 Identify A, B, C, D, E, R, R¹ in the following :

(i) 　⬡　$Br + Mg \xrightarrow[]{\text{Dry ether}} A \xrightarrow[]{H_2O} B$

(ii) 　$R — Br + Mg \xrightarrow[]{\text{Dry ether}} C \xrightarrow[]{D_2O} CH_3 — \underset{\underset{D}{|}}{CH} — CH_3$

　　$CH_3\ CH_3$

(iii)

$$CH_3 - \overset{\displaystyle |}{\underset{\displaystyle |}{C}} - \overset{\displaystyle |}{\underset{\displaystyle |}{C}} - CH_3 \xleftarrow{\quad Na/ether \quad} R^1X \xrightarrow{\quad Mg \quad} D \xrightarrow{\quad H_2O \quad} E$$
$$\underset{CH_3 \ CH_3}{}$$

Q-11 Identify A, B and C and give their structures :

$$\xrightarrow[NaOH]{Br_2} A + B \xrightarrow[\Delta]{H^+} C \ (C_8H_8O)$$

Q-12 Give the structures of A, B and C in the following compounds :

(i) $CH_3CH_2I \xrightarrow{\quad NaCN \quad} A \xrightarrow[\text{Partial Hydrolysis}]{\quad OH^- \quad} B \xrightarrow{\quad NaOH + Br_2 \quad} C$

(ii) $CH_3COOH \xrightarrow[D]{\quad NH_3 \quad} A \xrightarrow{\quad NaOBr \quad} B \xrightarrow{\quad NaNO_2/HCl \quad} C$

Material For High Achievers

Q.1:The compound in which oxygen shows +2 oxidation state is :

(a) O2F2

(b) OF2

(c) Cl2O

(d) HOF

Q.2: OF6 Compound is not known because:

(a) high electronegativity of fluorine

(b) small size of fluorine

(c) absence of d-orbitals oxygen can not possess +6 oxidation state

(d) low ionization energy of oxygen than fluorine

Q.3: Which of the following statements is not correct:

(a) SF6 is kinetically an inert substance because in SF6 , S is protected by six F atoms and hence does not allow water molecules to attack on S atom .

(b) sulphur has greater tendency for catenation than oxygen because S-S single bond is stronger than O-O single bond, as there is more inter- electronic repulsions in O-O than S-S bond.

(c) In vapour state , sulphur exists as S2 molecule which has two unpaired electrons in antibonding molecular orbitals.

(d) H2S is more acidic than H2Te as bond dissociation energy of H-S bond is less than H-Te bond.

Q.4: Which of the following statements is not correct:

 (a) SF4 involves sp3 d hybridization with trigonal bipyramidal structure and one lone pair at the equatorial positionwhich repels the axial bond pairs greater than equatorial bond pair, so all bonds in SF4 are not equivalent.

 (b) O-O bond lengths in ozone molecule are equal due to resonance in O3 molecule.

(c) Decomposition of ozone molecule is a spontaneous process because ozone is thermodynamically unstable than oxygen since its decomposition into oxygen results in the liberation of heat and increase in entropy.

(d) Halogens are strong reducing agents

Q.5:Halogens are highly reactive because :

(a) halogens has high tendency to gain on elctron to attain nearest noble gas configuration

(b) Large negative values of electron gain enthalpies

(c) low (X-X) bod dissociation energy

(d) all of the above

Q.6: Which of the interhalogenis not known :

(a) IF7

(b) FCl3

(c) ClF5

(d) BrF3

Q.7: F2 is a better oxidizing agent than Br2 . It is due to :

(a) smaller size of fluorine

(b) non-mettallic nature of fluorine

(c) more electron repulsion in fluorine

(d) more electronegativity of fluorine

Q.8:Which of the following halogens exibits only one oxidation state in its compounds ?

(a) Bromine

(b) Flourine

(c) Iodine

(d) Chlorine

Q.9: Which one of the following is a pseudohalide?

(a) CN-

(b) ICl-

(c) N3 –

(d) both (a) and (c)

Q.10: Which of the following is the correct order of decreasing oxidizing power of perhalates :

(a) ClO_4^- > BrO_4^- > IO_4^-

(b) IO_4^- > BrO_4^- > ClO_4^-

(c) BrO_4^- > ClO_4^- > IO_4^-

(d) BrO_4^- > IO_4^- > ClO_4^-

Q.11: ClF3 exists but FCl3 does not due to :

(a) its hifh electronegativity

(b) small size of fluorine

(c) low bond enthalpy of F – F bond

(d) non-availibility of vacant d-orbitals in fluorine

Q.12:Noble gases form compounds mainly with :

(a) F

(b) Cl

(c) N

(d) S

Q.13: T-shape is possible for :

(a) XeF2

(b) XeF4

(c) XeOF2

(d) XeOF4

Q.14:Partial hydrolysis of XeF4 gives :

(a) XeO3

(b) XeOF2

(c) XeOF4

(d) XeF2

Q.15: XeF2 reacts with PF5 to give :

(a) XeF4

(b) [XeF]+ [PF6] –

(c) [XeF4] - [PF4] +

(d) [XeF4] -2 [PF3] +2

Q.16: XeF6 on complete hydrolysis gives :

(a) Xe

(b) XeO2

(c) XeO3

(d) XeO4

Q.17: The reason that only xenon fluorides are known but the corresponding chlorides have not been reported is :

(a) The high bond energy of Xe – F bond and low dissociation energy of F2 molecule

(b) smaller bond energy of Xe – Cl bond and larger bond dissociation energy of Cl2 molecule

(c) both (a) and (b)

(d) none of the above

Q.18:Noble gases are sparingly soluble in water due to:

(a) dipole – dipole interactions

(b) hydrogen bonding

(c) dipole – induced dipole interactions

(d) induced dipole – induced dipole interactions

Q.19: In the preparation of compounds of Xe , N.Bartlett had taken O2 + [PtF6] - dioxygenyl hexafloroplatinate (V) , as a base compound. This is because :

(a) both O2 and Xe have same size

(b) both O2 and Xe have same electron gain enthalpy

(c) both O2 and Xe have almost same ionization enthalpy

(d) both O2 and Xe are gases

Q.20:Reason for bleaching action of Cl2 is :

(a) Cl2 react with H2O to form nascent oxygen which bleaches the coloured substance.

(b) Cl2 react with H2O to form nascent hydrogen and this nascent hydrogen bleaches the coloured substance.

(c) Cl2 react with H2O to form HOCl which bleaches the coloured substance.

(d) none of these

Questions

Q.1:What happens when

1. SO2 gas is passed through an aqueous solution of Fe(III) salt :

2. Cl2 react with cold and dilute NaOH :

3.Cl2 react with hot and conc. NaOH :

4.The acidic strength of these compounds increases in following order:

PH3<H2S<HCl

5.The oxiding power of oxoacids of chlorine follows the order:

HCl04<HClO3<HClO2<HCLO

6.Ozone is thermodynamically unstable

STUDY MATERIAL FOR BRIGHT STUDENTS (HOTS)

p-Block elements

Q1. When NaBr is heated with conc. H2SO4, Br2 is produced but when NaCL is heated with conc .H2SO4,HCL

Ans. When NaBr is heated with Concs H2SO4,HBr is first produced with being a reducing agent reduces H2SO4 to SO4 while itself get oxidized to Br2

$$NaBr + H2SO4 \text{ ---> } NaHSO4+HBr$$

$$2 HBr+H2SO4 \text{ ---> } 2H2O+SO2+Br2$$
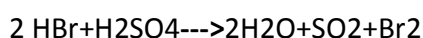
Similarly NaCL reacts with concs .H2SO4 to forms HCL which does not act as a reducing agent.

Q2. Aluminium sulphide gives a foul odour when it becomes damp. Write balanced equation for it.

Ans. AL2S3+6H2O--->2AL(OH)3+H2S.

Q3. Tin vessels are not used for packing in cold countries. Explain.

Ans. At low temperature it converts to grey tin which is very brittle and crumbles to powder.

Q4. Why nitrous oxide support combustion more vigorously in air?

Ans. Air has oxygen about 1/5 of volume, while N2O on decomposition produces oxygen about 1/3 of the volume.

Q5. Why fluorine cannot be prepared from fluorides by chemical treatment?

Ans. The standard reduction potential of fluorine is maximum. And thus it cannot be oxidized by any reagent.

Q6. Why mixture of He and O2 is used for respiration by deep sea divers.

Ans. Helium is not soluble in blood even under high pressure. So He & O2 in the ratio 80:20 is used instead of ordinary air by divers for respiration.

Q7. Although HNO3 is a stronger than HNO2, but H3PO2, H3PO3, H3PO4 are of approximately same strength. Explain.

Ans. Acidic strength increases with increase in O.S of central atom, but in oxoacids of phosphorus unprotonated oxygen responsible for acidic character hence it remains the same.

Q8.Although the ionization energy of boron(8.3 ev) is less than gold (9.22 ev) yet former is a non-metal while later is a metal.

Ans. Lattice structures of boron and gold are different. Boron has 6 or less atoms as its nearest neighbours in solid state while gold has 12 atoms. Good metal has large no. of neighbouring atoms.

Q9.Calculate the volume of .1 M NaOH solution required to neutralize the solution produced by dissolving 1.1g of P4O6 in water.

Ans.P4O6 + 12NaOH--->4Na3PO3 + 6H2O

220g of P4O6 requires NaOH = 12M

1.1g P4O6 requiresNaOH = 12*1.1/220=06M=600ml

Q10.Why NaOCl solution become unstable on warning .what happens to it ?

Ans. On heating NaOCl decomposes as 3NaOCl--->NaClO3 + 2NaCl

Some More Important Questions

Q 1   PH3 has lower boiling point than NH3. Why?

Q 2   Draw structure of H4P2O7.

Q 3   Which form of sulphur shows paramagnetic behaviour ?

Q 4   Comment on the nature of two S–O bonds formed in SO2 molecule. Are the two S–O bonds in this molecule equal ?

Q 5   Why is N2 less reactive at room temperature .

Q 6   State the hybridization of sulphur in

   (i) SF4   (ii) SO3

Q 7   Why H2S is acidic while H2O is neutral?

Q 8   Draw the structure of Br F3. Write its shape.

Q 9   Give formula of noble gas compound .Which is iso structural

   with (i) I Cl4- (ii) BrO3-

Q 10   Bond angle in PH4 + is higher than that in PH3. Why?

Q 11   How do you account for the reducing behaviour of H_3PO_2 on

the basis of its structure ?

Q 12   What is the basicity of H_3PO_4?

Q 13   Give the resonating structures of NO_2 and N_2O_5.

Q 14   Why does R P = O exist but R N = O does not (R = alkyl group)?

Q 15   Are all the five bonds in PCl_5 molecule equivalent? Justify

your answer.

Q 16   Draw the structure of (a) NO (b) N_2O_3

Q17   Which form of sulphur shows paramagnetic behaviour ?

Q 18   Give the structures of a) XeF_2 b) ClF_3 c) $H_2S_2O_8$

Q 19   What is oxidation number of O and F in OF_2? Predict the structure of OF_2 using VSEPR theory.

Q 20. Give reason for the following.

a) NO_2 dimerises to form N_2O_4

b) ICl is more reactive than Cl_2

c) Nitrogen exist as N_2 but phosphorus as P_4.

Q. 21. $R_3P = 0$ exist but $R_3N = 0$ can not exist.

Q. 22.   N-N, bond is weaker than P-P, on the contrary N_2 is very inert.

Q. 23.   Why the stability order is :

$ClF_3 > BrF_3 > IF_3$ (Stable)

Q. 24.   Give the No. of P – O and lone pair in P_4O_6.

Q. 25.   Why the bond angle is in the following order ?

NH_3	PH_3	AsH_3	SbH_3
106.5°	93.5°	91.5°	91.3°

Q. 26.   Apply VSEPR throry to derive the structure of XeO_3.

Q 27.How do you account for the reducing behaviour

of H3PO2 on the basis of its structure ?

Q 29.Deduce the molecular shape of BrF3 on the basis of VSEPR theory

Q 30.What are the oxidation states of phosphorus in the following:

(i)   H3PO3 (ii) PCl3 (iii) Ca3P2 (iv) Na3PO4 (v) POF3?

Q 31Give the formula and describe the structure of a noble gas species which is isostructural with:

(i) ICl4   (ii) IBr2   (iii) BrO3
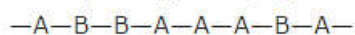
Short Answer Type

1. A natural linear polymer of 2-methyl-1, 3-butadiene becomes hard on treatment with sulphur between 373 to 415 K and —S—S— bonds are formed between chains. Write the structure of the product of this treatment?
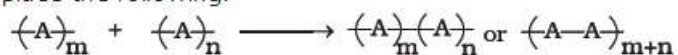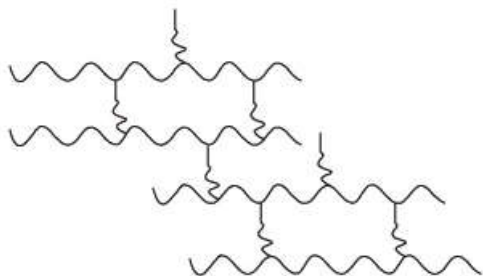
2. Identify the type of polymer.
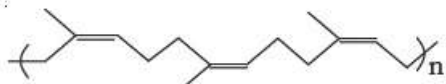
   —A—A—A—A—A—A—
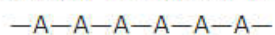
3. Identify the type of polymer.

   —A—B—B—A—A—A—B—A—

4. Out of chain growth polymerisation and step growth polymerisation, in which type will you place the following.

   $$\left(A\right)_m + \left(A\right)_n \longrightarrow \left(A\right)_m\left(A\right)_n \text{ or } \left(A-A\right)_{m+n}$$

5. Identify the type of polymer given in the following figure.

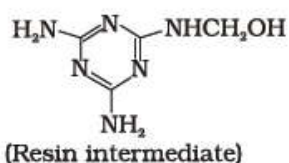
6. Identify the polymer given below :

7. Why are rubbers called elastomers?

8. Can enzyme be called a polymer?

9. Can nucleic acids, proteins and starch be considered as step growth polymers?

10. How is the following resin intermediate prepared and which polymer is formed by this

monomer unit?

(Resin intermediate)

11. To have practical applications why are cross links required in rubber?
12. Why does cis-polyisoprene possess elastic property?
13. What is the structural difference between HDP and LDP? How does the structure account for different behaviour and nature, hence the use of a polymer?
14. What is the role of benzoyl peroxide in addition polymerisation of alkenes? Explain its mode of action with the help of an example.
15. Which factor imparts crystalline nature to a polymer like nylon?
16. Name the polymers used in laminated sheets and give the name of monomeric units involved in its formation.
17. Which type of biomolecules have some structural similarity with synthetic polyamides? What is this similarity?
18. Why should the monomers used in addition polymerisation through free radical pathway be very pure?

Long Answer Type Question

1. Synthetic polymers do not degrade in the environment for a long time. How can biodegradable synthetic polymers be made. Differentiate between biopolymers and biodegradable polymers and give examples of each type.
2. Differentiate between rubbers and plastics on the basis of intermolecular forces.
3. Phenol and formaldehyde undergo condensation to give a polymar (A) which on heating with formaldehyde gives a thermosetting polymer (B). Name the polymers. Write the reactions involved in the formation of (A). What is the structural difference between two polymers?
4. Low density polythene and high density polythene, both are polymers of ethene but there is marked difference in their properties. Explain.
5. Which of the following polymers soften on heating and harden on cooling? What are the polymers with this property collectively called? What are the structural similarities between such polymers? Bakelite, urea-formaldehyde resin, polythene, polyvinyls, polystyrene.

MATERIAL FOR HIGH ACHIEVERS
(SALT ANALYSIS)

1. Which of the following halide is soluble in water ?

○ AgF

○ AgCl

○ AgBr

○ AgI.

2.A colourless solid A produces black spots on the skin. Its aqueous solution gives brown ring test and also gives yellow precipitate with potsssium iodide solution. A could be

○ Copper nitrate

○ Zinc nitrate

○ Silver nitrate

○ Lead nitrate.

3.Which of the following sulphide is completely precipitated only when the acidic solution is made dilute ?

○ HgS

○ PbS

○ CdS

○ CuS.

4.In qualitative analysis of basic radicals, hydrochloric acid preferred to nitric acid for preparing a solution of given substance. This is because

○ nitrates are not decomposed to sulphides

○ nitric acid contains nitrogen

○ hydrochloric acid is not an oxidising acid

○ chlorides are easily converted to sulphides.

5.Addition of KI to Pb salt in water gives precipitate. The colour of the precipitate is

○ Yellow

○ Black

○ White

○ Red.

7. Certain inorganic salt, when introduced in flame produces crimson red colour. It indicates the presence of

○ Dichromate ion

○ Thiosulphate ion

○ Strontium ion

○ Calcium ion.

8.Sodium sulphidereact with sodium nitroprusside to form a purple coluredcompund. During the reaction, the oxidation state of iron

○ Changes from + 2 to + 3

○ Changes from + 3 to + 2

○ Changes from + 2 to + 4

○ Remains unchanged.

9.The metal whose salts do not give the borax bead test is

○ Cr

○ Ni

○ Pb

○ Mn.

10.Which of the following is soluble in yellow ammonium sulphide ?

○ CuS

○ CdS

○ SnS

○ PbS.

11.A metal salt solution forms a yellow precipitate with potassium chromate in acetic acid and a white precipitate with dilute sulphuric acid, but gives no precipitate with sodium chloride or iodide. The white precipitate obtained when sodium carbonate is added to the metal salt solution comsists of

○ Lead carbonate

○ Basic lead carbonate

○ Barium carbonate

○ Strontium carbonate.

12.A moisten salt is rubbed with oxalic acid between the fingers and smells like vinegar. It indicates the presence of:

○ Sulphur

○ Nitrate

○ Nitrite

○ Acetate.

13.Which types of salt produce crackcling noise in dry heating test?

○ Salts which have lot of water of crystallisation

○ Salts which are hygroscopic

○ Salts which have lost water of crystallisation

○ Salts which entrap mother liquor in crystals.

14.Which of the following is not a preliminary test ?

○ Flame test

○ Borax bead test

○ Permanganate test

○ Brown ring test.

15.A minute quantity of cupric salt is heated on borax bead in reducing foame of bunsen burner, the colour of bead aftercooling will be

○ Blue

○ Brown red

○ Colourless

○ Green.

ANSWERS:
   1. **AgF**
   2. **Silver Nitrate**
   3. **PbS**
   4. **HCl is not an oxidising acid**
   5. **Yellow**
   7. **Strontium Ion**
   8. **Remains unchanged**
   9. **Pb**
   10. **SnS**
   11. **Barium Carbonate**
   12. **Acetate**
   13. **Salts which entrap mother liquor in crystals**
   14. **Brown ring test**
   15. **Colourless**