THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

DATE :2/12/2024 GRADE:12	MODEL EXAM 1 CHEMISTRY(043)	TIME : 3 HOURS MARKS:70

MS

Q NO	SECTION A	MARK
1.	Choose the correct statement. a)vapour pressure of solution is greater than vapour pr of solvent **b)vapour pressure of solvent is greater than that of solution** c)boiling point of solvent is higher than that of solution. d)freezing point increases when a solute is added to a solvent.	1
2.	The common name for pentanedioic acid is: a) Succinic acid b) Pimelic acid c) Oxalic acid d) **Glutaric acid**	1
3.	If 75% of a first order reaction was completed in 32 min, then 50% of the reaction was completed in . a) 24 min b) 4 min c) 16 min d) 8 min	1
4.	Among the following, which bivalent ion of the first transition series shows a maximum magnetic moment? a) Co^{2+} b) Ni^{2+} c) Mn^{2+} d) Fe^{2+}	1
5.	 Identify C: (a) Benzoquinione (b)Salicylaldehyde (c)**Salicylic acid** (d)Aspirin	
6.		1

	The slope of the graph will be a) -k/2.303　　**b) –k**　　　c)-2.303/k　　　d)k	
7.	Match the items of column I with appropriate entries of column II. Column　1　　　　　　　　　　　Column II (a) $\triangle P/p^0$　　　　　　　　(i)$\Delta Tb/m$ (b) K b　　　　　　　　　　(ii)　mol fraction of solute (c) i　　　　　　　　　　　(iii)$\triangle Tf$ /m (d)Kf 　　　　　　　　　　(iv)ratio of　normal molecular mass 　　　　　　　　　　　　to　abnormal molecular mass **a) (a)-(ii), (b)- (i),(c)-(iv), (d) -(iii)**　b)(a)- (iv), (b) - (i) (c) - (ii),(d)-(iii) c) (a)- (ii),(b)- (iv) (c)-(i), (d) -(iii)　d) (a)- (iv), (b)- (iii), (c) -(ii),(d)- (i)	1
8.	When diethyl ether is heated with excess of HI, it produces : **a)ethyl iodide**　　　　　　　　　　　　b) ethanol c) methyl iodide　　　　　　　　　　　d) iodoform	1
9.	Pt For a reaction 2NH3(g)----→N2+3H2 What is the order and molecularity of this reaction? **a)0 ,2**　　　b)2 ,2　　　c)0, 0　　d)cannot find out	1
10.	Which of the following pairs will not form ideal solution? a)benzene and toluene　　　　**b)nitric acid and water** c)chloroethane and bromoethane　d)hexane and heptane	1
11.	Which of the following doesnot undergo aldol condensation? a)CH3-CHO　b)CH3-CO-CH3　c)**C6H5CHO**　d)CH3-CH2-CHO	1
12.	In a coordination compound the central metal atom act as　a: a)Bronsted Lowry acid　　　b)Lewis base **c)Lewis acid**　　　　　　　　d)Bronsted Lowry base	1
	Questions 13 to 16 are assertion reason type. a. Both A and R are true and R is the correct explanation. b. Both A and R are true but R is not the correct explanation. c.　A is true but R is false. d.　A is false but R is true.	
13.	Assertion (A): Isopropyl chloride is less reactive than CH3Br in SN^2 reactions. Reason (R): SN^2 reactions are always accompanied by inversion of configuration. **Ans.b**	1
14.	Assertion (A): Glucose and fructose are reducing sugars. Reason (R): Glucose and fructose contain a free aldehydic and ketonic group adjacent to a >CHOH group respectively. **ANS.a**	1
15.	Assertion (A): The oxygen of OH group in alcohols is attached to sp3 hybridised carbon.	1

	Reason (R): The bond angle in alcohols $C - O - H$ is $109°28'$. Ans.c	
16.	Assertion(A):Bromination of benzoic acid gives m-bromo benzoic acid. Reason(R):Carboxyl group increases the electron density at meta position. Ans.a	1
	SECTION B	
17.	Using the valence bond approach, deduce the shape and magnetic behaviour of $[Co(NH3)_6]^{3+}$ion. [Atomic number of Co = 27] **Ans**. Hexaamminecobalt (III) ion, [CO(NH3)6]3+ is a cationic complex, the oxidation state of cobalt is + 3 and the coordination number is 6. (2) Electronic configuration : 27CO[Ar]183d74s2 Electronic configuration : CO3+[Ar]183d64s°4p° (3) Since NH3 is a strong ligand, due to spin pairing effect, All the four unpaired electrons in 3d orbital are paired giving two vacant 3d orbitals. (4) Since the coordination number is Co3+ion gets six vacant orbitais by hybridisation of two 3d vacant orbitais,	2
18.	Why are Fe^{2+} compounds easily oxidises to Fe^{3+} as compared to Mn^{+2} compounds. **Ans**.Fe 3+ is more stable than Fe 2+ due to its configuration.	2
19.	Explain why dipole moment of chlorobenzene is lower than that of cyclohexyl **Ans**.Chlorobenzene due to resonance decreases it s polarity. chloride?	2
20.	Answer the following: a)Write the mathematical relation between rate constant and half-life of a first order reaction. b.What is collision frequency? **Ans**.k=.693/t1/2 No of collisions per sec **OR** a)If the rate equation is given below: Rate = k[A]²[B] then what will be the unit of its rate and rate constant? **Ans**.rate constant=mol-1 l1 sec-1 Rate=mol/l/sec	2
21.	Write the name reactions with equation. (a)Hell-Volhard-Zelinsky reaction. (b)Wolff-Kischner reduction. **Ans**.	2

Hell-Volhard-Zelinsky
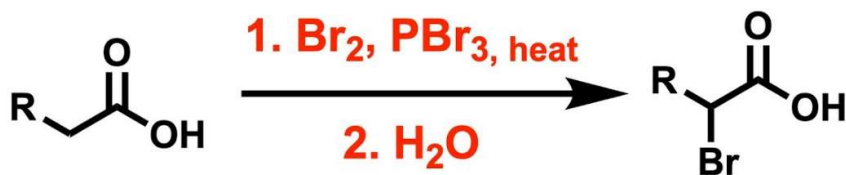
The Wolff-Kishner Reduction
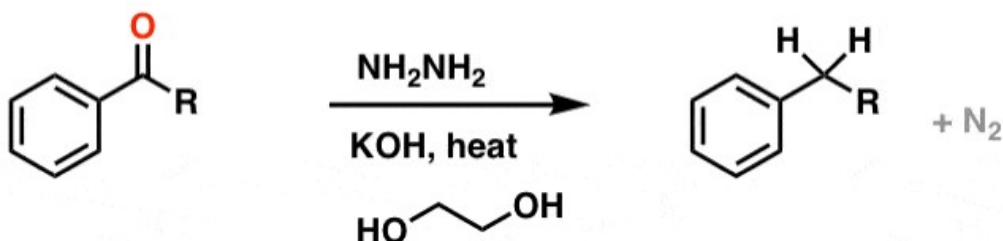
	SECTION C	
22.	Give reason for the following. (a)Aniline cannot be prepared by ammonolysis of chlorobenzene under normal conditions. b)Acetylation of aniline is carried out in the presence of pyridine. c)N-ethyl ethanamine boils at 329 K while butanamine boils at 350 K although both are isomers. **Ans**.a.Chlorobenzene has partial double bond. b.because here bye product is a acid. c.butanamine has more surface area and vander waals force is more	3
23.	What are fuel cells? Explain the electrode reactions involved in the working of H2 - O2 fuel cell. **Ans**	3

H₂-O₂ Fuel cell

Anode : $2H_2 + 4OH^- \longrightarrow 4H_2O + 4e^-$

Cathode : $O_2 + 2H_2O + 4e^- \longrightarrow$

Overall reaction : $2H_2 + O_2 \longrightarrow 2H_2O$

24.	a)When a coordination compound PtCl₄ 6 NH₃ is mixed with AgNO₃ ,4 moles of AgCl was precipitated per mole of the compound.Find the structural formula and IUPAC name of the compound. b)Write the electronic configuration of d^4 in terms of crystal field theory when Δo>P. Ans.[Pt(NH3)6]Cl4 b. t2g 4 eg0 **OR** a)Draw the geometrical isomers of $[Co(en)2Cl2]^{2+}$Which geometrical isomer is optically active and why? b)Draw the crystal field splitting diagram for a tetrahedral complex. Trans [CoCl₂(en)₂]⁺ isomer-optically inactive (Superimposable mirror images) Cis [CoCl₂(en)₂]⁺ isomer-optically active **Ans**.a. (Non-superimposable mirror images)	3
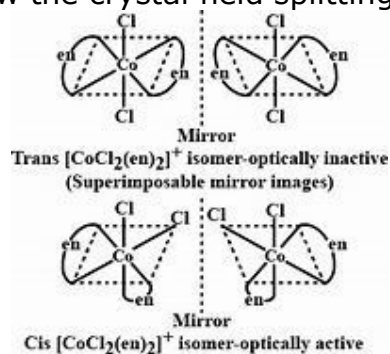
b.
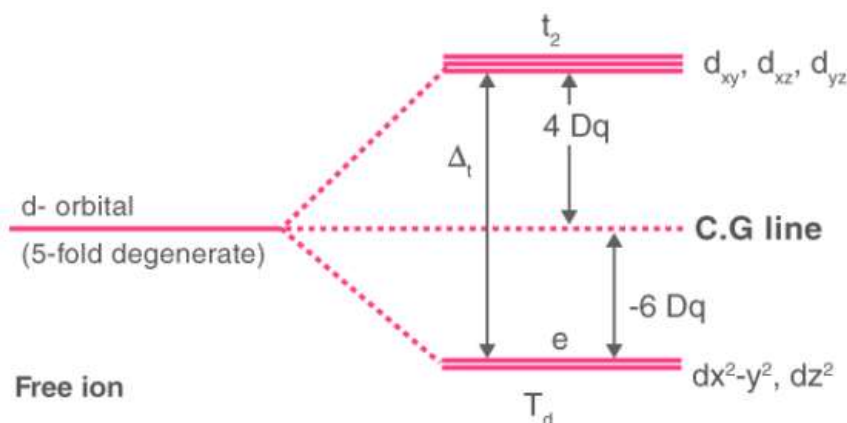
| 25. | How would you bring about the following conversions?
i.Ethanal to 3-hydroxy butanal
ii.Benzaldehyde to benzene.
iii.Ethanoic acid to 2-hydroxy ethanoic acid
Ans.a)
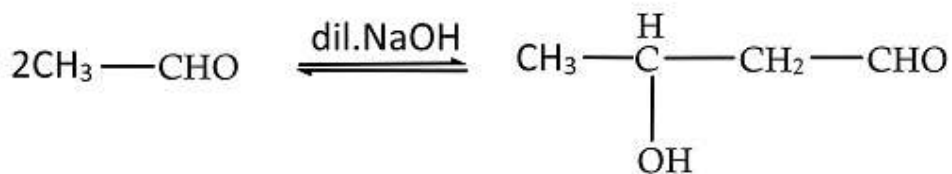
b)
Step 1: Convert Benzaldehyde to Benzoic Acid
- **Reaction**: Benzaldehyde (C6H5CHO) is oxidized to benzoic acid (C6H5COOH).
- **Reagent**: We can use Tollens' reagent (Ag(NH3)2OH), which is a mild oxidizing agent that oxidizes aldehydes to carboxylic acids.
Chemical Equation:
C6H5CHO+(O)→C6H5COOH
Step 2: Convert Benzoic Acid to Benzene
- **Reaction**: Benzoic acid (C6H5COOH) is then subjected to decarboxylation to produce benzene (C6H6).
- **Reagent**: This reaction is carried out using soda lime (a mixture of sodium hydroxide and calcium oxide) and involves heating.
Chemical Equation:
C6H5COOHsoda lime, heat−−−−−−−−−→C6H6+CO2 | 3 |
| 26. | Give equations of the following reactions:
(a)Sodium tert-butoxide is treated with CH$_3$Cl. | 3 |
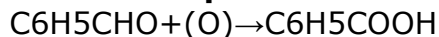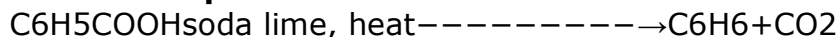
Ans.

$$(CH_3)_3 - C - ONa + Br - CH_3$$
Sodium tert butoxide.

$$\longrightarrow (CH_3)_3 - C - O - CH_3$$
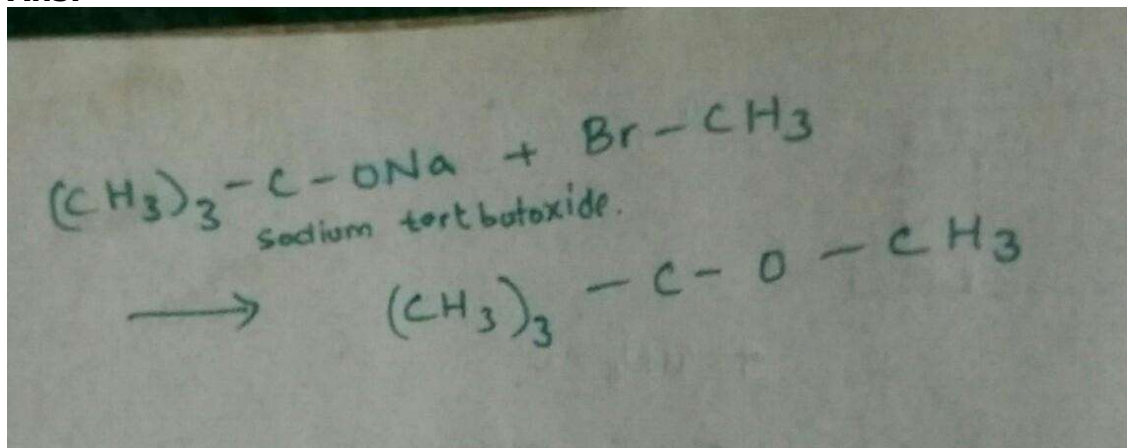
(b)Methanal on reaction with ethylmagnesium bromide followed by acid hydro

Q.1   ethanal ⟵— methal + GR

$H-\overset{\overset{\ominus}{O}}{\underset{\oplus}{C}}-H$ + $\overset{\ominus}{C}H_3\overset{\oplus}{M}gBr$ → $H-\overset{\overset{O^{\ominus} \quad \overset{\oplus}{M}gBr}{|}}{\underset{\underset{CH_3}{|}}{C}}-H$

OO. CH_3-CH_2OH ⟵ $\overset{H^{\oplus}}{\underset{H_2O}{}}$
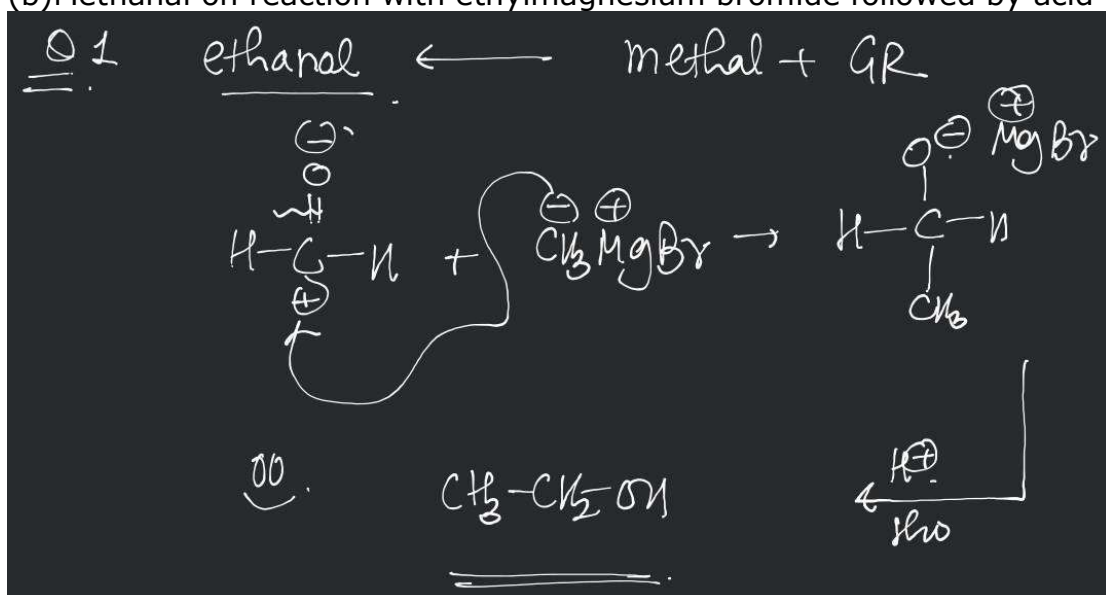
(c)Bromine in CS₂ with phenol.

Minor   Major
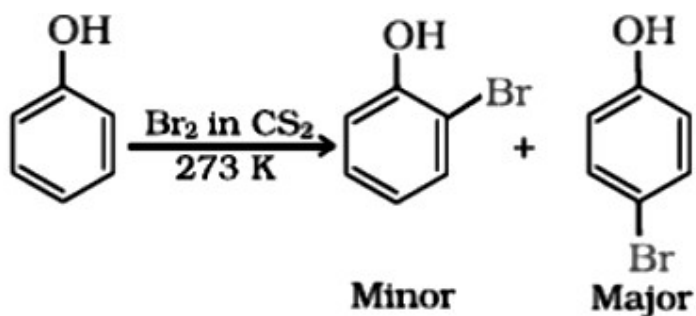
| 27. | .Among all the isomers of molecular formula C4H9Br, identify
(a)the one isomer which is optically active.
(b)the one isomer which is highly reactive towards SN2.
(c)the two isomers which give same product on dehydrohalogenation with alcoholic KOH.
Ans.a)CH3-CH2-CH(Br)-CH3 | 3 |

	b.CH3-CH2-CH2-CH2-Br c.CH3-CH(CH3)2-Br	
28.	Write the Nernst equation and calculate the the emf of the following cell at 298 K. Zn/Zn^{2+}(.001M)// H+(.01M)/H2(g)(1 bar)/Pt Given :E^0 Zn^{2+}/Zn =-0.76 V E^0 H+/H$_2$=0.00 V(log 10 =1) **Ans** According to Nernst equation : $E\,cell = E\circ cell - 0.0591\,V\,n \log [Zn2+][H+]2$ $E\,cell = E\,cell\circ - 0.0591\,V\,n \log [Zn2+][H+]2$ E c e l l = (0.76 V) − (0.0591 V) 2 log 10 − − 3 (10 − 2) 2 $E\,cell = (0.76\,V) - (0.0591\,V) 2 \log 10 - - 3 (10 - 2) 2 = 0.76\,V - (0.02955\,V) \log 10 = (0.76 - 0.2955)\,V = 0.7305\,V = 0.76\,V - (0.02955\,V) \log 10 = (0.76 - 0.2955)\,V = 0.7305\,V$	3
	SECTION D	
29.	.Read the following text carefully and answer the questions that follow: Transition metal oxides are generally formed by the reaction of metals with oxygen at high temperatures. The highest oxidation number in the oxides coincides with the group number. In vanadium, there is a gradual change from the basic V2O3 to less basic V2O4 and to amphoteric V2O5. V2O4 dissolves in acids to give VO2+ salts.Potassium dichromate is a very important chemical used in the leather industry and as an oxidant for the preparation of many azo compounds. Dichromates are generally prepared from chromate. Sodium dichromate is more soluble than potassium dichromate. The latter is, therefore, prepared by treating the solution of sodium dichromate with potassium chloride. Sodium and potassium dichromates are strong oxidising agents; sodium salt has a greater solubility in water and is extensively used as an oxidising agent in organic chemistry. Potassium dichromate is used as a primary standard in volumetric analysis. i.Which of the 3d series of the transition metals exhibits the largest number of oxidation and why? ii.A transition metal exhibits highest oxidation state in oxides and fluorides. Give reason. iii)How would you account for the increasing oxidising power in the series: V O_2^+ < Cr_2O_7 $^{2-}$ < MnO_4 $^-$? **OR** iii)MnO is basic whereas Mn_2O_7 is acidic in nature. Give reason. **Ans**.a)Mn because of the no of unpaired electrons. b)They are electronegatice and small in size. c)As the oxidation no increases,the ability to get reduced increases. OR	1+1+2

|	C)As oxidation number increases acidity increases.	
30.	.Metallic conductance involves the movement of electrons throughout a metal. Electronic conductance consists of the movement of ions throughout a pure liquid or result. The measurement of electrolytic conductivity is widely applied as a control parameter and its relevance is continuously increasing, not only in industrial applications but also in the environmental monitoring domain. Electrochemistry plays a very important part in our daily life. Primary cells like dry cell is used in torches, wall clock, mercury cell is used in hearing aids, watches. Secondary cells Ni—Cd cell is used in cordless phones, lithium battery is used in mobiles, lead storage battery is used in vehicle and inverter. Fuel cells like H2-Oz cell was used in Apollo space programme. A 38% solution of sulphuric and is used in lead storage battery. Its density is 1.30 g/ mL The battery holds 3.5 L of the acid. During the dischargeof the battery, the density of H2SO4 falls to 1.14 g/ mL . Answer the following : (a)Calculate the potential of hydrogen electrode in contact with a solution having pH value 10 (b)Write the overall cell reaction in lead storage battery during recharging? (c)The conductivity of 0.001M CH3COOH is 4.95 x 10^{-5} S/cm. Calculate its degree of dissociation, if limiting molar conductivity of acetic acid is , 390.5 Scm^2 mol ' **Ans.** given $pH = 10$ we known that $pH = -\log[H^+]$ $\Rightarrow [H^+] = 10^{-10} M$ also for hydrogen electrode : $E_{cell} = E^0 - \dfrac{0.0591}{1} \log \dfrac{|H_2|}{|H^+|}$ (no of electron included $= 1$) $\boxed{E = 0}$ $E_{cell} = \dfrac{-0.0591}{1} \log \left(\dfrac{1}{10^{-10}}\right)$ $\boxed{E_{cell} = -0.591V}$ b)Pbso4--->Pb+PbO2+H2SO4 c) C = 0.001 M = 10-3 M K = 4 x 10-5 Ka = ? λ 0 m λ m 0 = 390 λ m = K × 1000 M / c λ m = K × 1000 M / c = 4 × 10 − 5 × 10 3 10 − 3 = 4 × 10 − 5 × 10 3 10 − 3 = 40 s cm2 mol-1 ∝ = λ m λ 0 m ∝ = λ m λ m 0 = 40 390 = 40 390 ⇒ ∝ = 0.1 **OR** (i)Calculate the time required to deposit 1.27g of copper at cathode when a current of 2A was passed through the solution of CuSO4. (Molar mass of Cu = 63.5g mol 1, IF = 96500 C)	

Ans.Q=IXt

 Q=2X t

Cu --$\rightarrow$2x 965000 C

To get 1.27 gm =1.27x 2x96500/63.5

Time =1.27x2x96500/63.5x2

(ii)The molar conductivity vs √C curve for NaCl, HCl, and NH4OH are shown below in random order. Identify which graph corresponds to HCl, NaCl, and NH4OH and give reason.
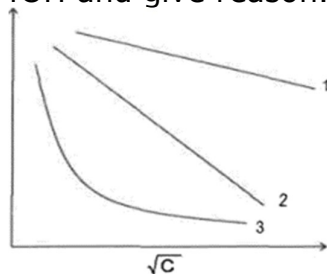
Ans.1=HCl

2=NaCl

3=NH4OH

SECTION E

31.	(a)An aromatic compound A on treatment with aqueous ammonia and heating forms compound B which on heating with Br_2 and KOH forms a compound C of molecular formula C_6H_7N.Write the structures of A,B and C. (b)Give reasons for the following : (i)Reduction with iron scrap and HCl is preferred for the preparation of amines from nitro compounds. (ii)Although amino group is o- and p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives substantial amount of m-nitroaniline. Ans a) b)because HCl is again formed c)because anilinium ion is meta directing **OR** a)A hydrocarbon A (C4H8) on reaction with HCl gives a compound B (C4H9Cl) which on reaction with 1 mole of NH3 gives a compound(C4H11N).On reacting	3+1+1 5
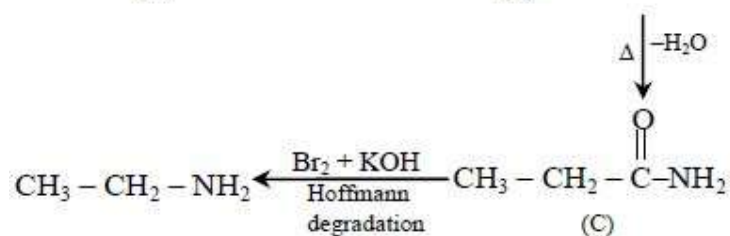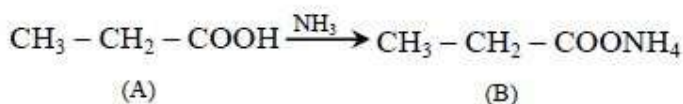
	with NaNO2 and HCl at low temperature followed by hydrolysis ,compound C yields optically active alcohol.Ozonolysis of A gives 2 moles of ethanal.Identify the compounds and write the equations.	
32	The minimum pressure which can be applied to a solution for stopping the flow of solvent through a semipermeable membrane is known as osmotic 1pressure. On the basis of the data answer the following questions. a)Give reason : i)Osmotic pressure method is considered to be the best method for determining the molecular mass of biomolecules and polymers. ii)Oxygen is mixed with helium for use by deep sea divers. b)Define isotonic solution. c)Calculate the molarity of a solution when 18 gm glucose (C6H12O6) is mixed with water to form 250ml solution. **Ans** a)They are unstable at high temperatures b)helium is a diluant AND doesnot mix with blood. c)M=18x1000/180x250 **OR** a)Give reason. i)Patients having sore throats are advised saline gargles. ii)Salt is added to water to get hard boiled eggs. b)The molar mass of a solute is 120 gm/mol and its vant hoff factor is 4.What is its abnormal molecular mass? c)Calculate the mole fraction of benzene in solution containing 30% by mass of it in CCl4. (Molar mass of benzene=78 gm/mol and that of CCl4 =154gm/mol **Ans**. a)due to osmosis the fluid with infection will come out b)when salt is added boiling point increases. c)mole fraction =n1/n1+n2 n1=30/78 n2=70/154	5
33.	31.Attempt any five of the following: (a)Explain the term denaturation of protein. (b)Define the following terms: i).Polysaccharides ii).Nucleotides (c)Deficiency of which vitamin causes scurvy? (d)What happens when D-glucose is treated with the following? Give equations to support your answer. i) HI ii) HNO3 (e)Name the disaccharide which on hydrolysis gives glucose and galactose. (f)Explain about the secondary structre of protein.	5

| | (g)Give the reaction of glucose with hydrogen cyanide. Presence of which group is confirmed by this reaction?
Ans.
a)when protein heated or ph changes its biological activity is lost
b)more than 10 monosaacharides
ii)when nucleoside +phosphate group.
c)scurvy
d)n hexane
ii)saacharic acid
e)lactose
f)alpha helix and beta pleated
g)cyanohydrin is formed.Shows the presence of carbonyl group | |
| | ** | |