QUESTION PAPER CODE 56/1

EXPECTED ANSWERS/VALUE POINTS

1. Their conductivity is increased by adding an appropriate amount of suitable impurity / by doping. 1

2. The process of converting precipitates of a substance into colloidal form by adding small amount of electrolyte is called peptization. 1

3. By hydrometallurgy 1

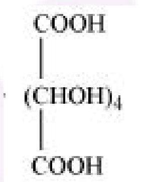
4. BiH_3, because the stability of hydrides decreases on moving from SbH_3 to BiH_3. ½ + ½

5. $CH_2{=}CH{-}CH_2{-}C{\equiv}CH + Br_2 \longrightarrow \underset{Br}{CH_2}{-}\underset{Br}{CH}{-}CH_2{-}C{\equiv}CH$ 1

   or colour of Bromine get discharged or any other correct suitable answer.

6. Pent–2–enal 1

7. 1



Saccharic acid

8. Antiseptics are applied to the living tissues whereas disinfectants are applied to inanimate objects / non-living objects. 1

9. k = 1/R (**l**/A)

   Where k is conductivity, R is resistance and **l**/A is cell constant 1

   $\Lambda m = k/C$

   Where Λm is molar conductivity

   C is concentration 1

OR

$\Lambda m = 138.9 \text{ S cm}^2 \text{ mol}^{-1}$ M = 1.5 M K = ?

$$\Lambda_m = \frac{1000\ K}{M} \qquad K = \frac{\Lambda_m \times M}{1000}$$ 1

$$K = \frac{138.9 \times 1.5}{1000} = 0.20835\ \text{Scm}^{-1}$$ 1

10. For the reaction $A \longrightarrow$ Product

(i) Rate of reaction becomes 4 times

(i) Rate of reaction decreases by 4 times 1+1

11. (i) **Nickel:-** Mond Process

Principle the metal is converted into its volatile compound which is then decomposed to give pure metal at higher temperature. ½ + ½

(ii) **Germanium:-** Zone refining

Principle that the impurities are more soluble in the melt than in the solid state of the metal. ½ + ½

12. (i) Because bond energy of F_2 is lower than that of Cl_2 and therefore F forms stronger bond with N with the release of energy. 1

(ii) SF_4 has trigonal bipyramidal structure with one l.p. Due to l.p-b.p repulsion two axial S-F bonds are longer than two S-F equatorial bonds. 1

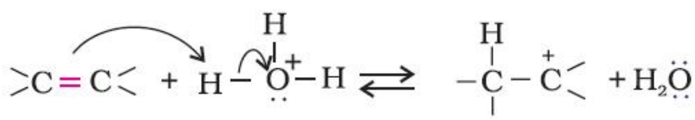
13. (i) $Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow 2Cr^{3+} + 3I_2 + 7H_2O$ 1

(ii) $2MnO_4^- + 6H^+ + 5NO_2^- \longrightarrow 2\ Mn^{2+} + 5NO_3^- + 3H_2O$ 1

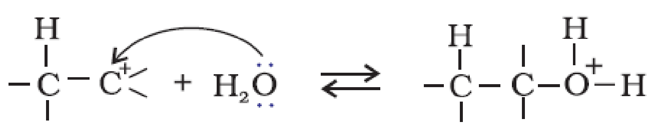
14. **Mechanism:-** The mechanism of the reaction involves the following three steps:

Step 1: Protonation of alkene to form carbocation by electrophillic attack of H_3O^+.

$H_2O + H^+ \rightarrow H_3O^+$ 1

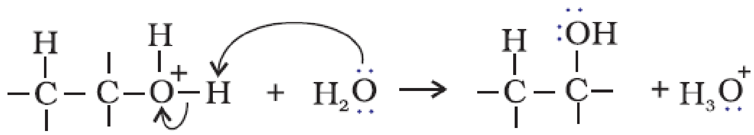


Step 2: Nucleophilic attack of water on carbocation



½

Step 3: Deprotonation to form an alcohol



½

15. (i) Alcohols are more soluble in water because of the formation of hydrogen bond whereas hydrocarbon cannot form hydrogen bond with water.

(ii) This is because $-NO_2$ group is electron withdrawing and therefore stabilize phenoxide ion whereas $-OCH_3$ group is electron donating which destabilize phenoxide ion.

(or any other correct suitable answer) 1+1

16. (i) **Carbylamine reaction:-**

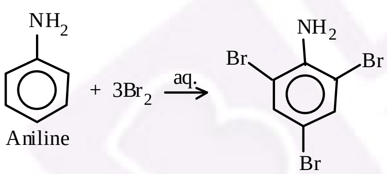
$$RNH_2 + CHCl_3 + 3KOH \xrightarrow{\text{Heat}} R{-}NC + 3KCl + 3H_2O$$

(ii) **Hoffmann bromamide reaction:-**

$$RCONH_2 + Br_2 + 4NaOH \longrightarrow R{-}NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$ 1+1

17. (i) $C_6H_5N_2^+Cl^- + H_3PO_2 + H_2O \longrightarrow C_6H_6 + N_2 + H_3PO_3 + HCl$

(ii)



Aniline

Sym. tribromoaniline or
2, 4, 6-Tribromoaniline

1+1

18. Food preservatives are chemicals that prevent food from spoilage due to microbial growth.

Examples of food preservatives: - Table salt, sugar, vegetable oil, sodium benzoate (C_6H_5COONa), and salts of propanoic acid. (any two) 1+ ½ + ½

19. $d = \dfrac{z \times M}{a^3 \times N_A}$ ½

For fcc lattice for copper

$a = 2\sqrt{2}\ r$ ½

$a^3 = (2\sqrt{2}\,r)^3 = 8 \times 2\sqrt{2}\ (1.278 \times 10^{-8} cm)^3$

$= 4.723 \times 10^{-23} cm^3$

$$d = \frac{4 \times 63.55\ g\ mol^{-1}}{4.723 \times 10^{-23}\ cm^3 \times 6.02 \times 10^{23}\ mol^{-1}}$$ 1

= **8.95 g cm^{-3}** 1

Or

$$N_A = \frac{z \times M}{d \times a^3}$$ 1

$$= \frac{2 \times 56\ g\ mol^{-1}}{7.87\ g\ cm^{-3} \times (2.8665)^3 \times 10^{-24} cm^3}$$ 1

$N_A = 6.043 \times 10^{23}\ mol^{-1}$ 1

20 $A = \pi r^2 = 3.14 \times 0.52\ cm^2 = 0.785\ cm^2 = 0.785 \times 10^{-4}\ m^2$ $l = 50\ cm = 0.5\ m$

$R = \frac{\rho \ell}{A}$ or $\rho = \frac{RA}{\ell}$

$$\rho = \frac{5.55 \times 10^3\ \Omega \times 0.785\ cm^2}{50\ cm} = 87.135\Omega cm$$ 1

Conductivity = $K = \frac{1}{\rho}$

$$= \frac{1}{87.135}\ S\ cm^{-1} = 0.01148\ S\ cm^{-1}$$ 1

Molar conductivity, $\Lambda_m = \frac{1000\ K}{M}$

$$= \frac{0.01148\ S\ cm^{-1} \times 1000\ cm^3\ L^{-1}}{0.05} = 229.6\ S\ cm^2\ mol^{-1}$$ 1

21 $N_{2(g)} + O_{2(g)} \longrightarrow 2NO_{(g)}$

Initial Conc.	0.80M	0.20M	0
Final Conc.	(0.80 – x)	(0.20 – x)	2x

1

$$K_c = \frac{[NO]^2}{[N_2] \times [O_2]}$$

$$1 \times 10^{-5} = \frac{[2x]^2}{[0.80 - x] \times [0.20 - x]}$$ Thus $x = 0.66 \times 10^{-3}$ (approx) 1

At equilibrium $[NO] = 2x = 1.32 \times 10^{-3}$.

(Note: any attempt whichsoever made may be awarded full marks.) 1

22 (i) **Aerosol:** A colloidal solution having a gas as the dispersion medium and a solid / liquid as the dispersed phase is called an aerosol. For example: fog,smoke,dust **(any one)** ½+ ½

(ii) **Emulsion:** The colloidal solution in which both the dispersed phase and dispersion medium are liquids is called an emulsion. For example: milk, cold cream **(any one)** ½+ ½

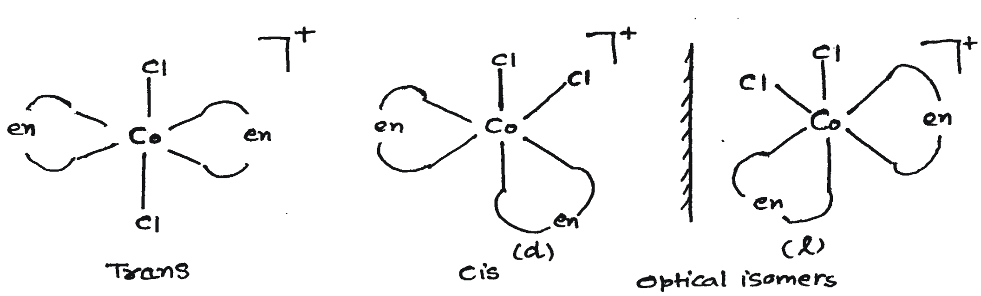
(iii) Micelles: There are some substances which at low concentrations behave as normal strong electrolytes, but at higher concentrations exhibit colloidal behaviour due to the formation of aggregates. The aggregated particles thus formed are called **micelles.**
eg. Soap,detergents **(any one)** ½+ ½

23 (i) Lanthanoid Metals show +2 and +4 oxidation states to attain stable f^0 and f^7 configurations.

(ii) Because of high enthalpy of atomization and ionization which is not compensated by the enthalpy of hydration of Cu^{2+}.

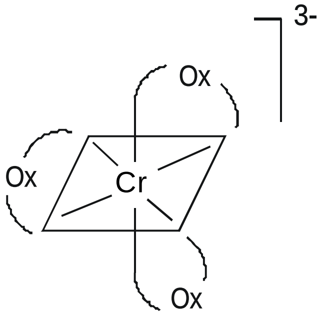
ii) Due to lanthanoid contraction. 1x3=3

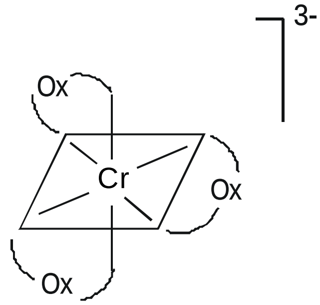
24 (i) Dichloridobis (ethane-1,2-diamine) cobalt(III) ion



½ +½

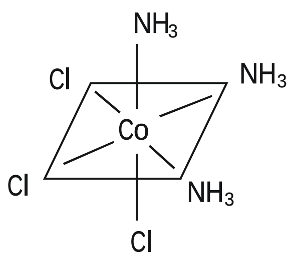
(ii) Trioxalatochromate(III)





½ +½

(iii) Triamminetrichloridocobalt(III)



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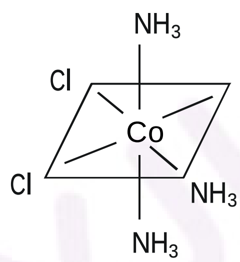


mar-

½ +½

25. (i) The objects which are non superimposable on their mirror image are said to be **chiral** and this property is known as **chirality**

eg. Butan-2-ol ½ +½

(ii) $CH_3CHClCH_2CH_3$

because it will form secondary carbocation which is more stable (SN_1 mechanism) or $CH_3CH_2CH_2CH_2Cl$ is easily hydrolysed as it is primary alkyl halide (SN_2 mechanism) ½ +½

(iii) 

reacts faster than 

½ +½

Because Iodine has larger size and therefore good leaving group.

26. α-glucose & β-glucose differ only in the orientation of the hydroxyl group at C_1 position. In α-glucose the OH group is on right hand side at C_1 position whereas in β-glucose the OH group is on left hand side at C_1 position. 1 1

The six membered hetero cyclic structure of glucose is called **pyranose structure (or structures)** 1

27 Thermoplastic polymers: - These are the linear or slightly branched long chain molecules capable of repeatedly softening on heating and hardening on cooling. 1

Some common examples are polythene, polystyrene, polyvinylchloride **(any one)** ½

Thermosetting polymers:- These polymers are cross linked or heavily branched molecules, which on heating undergo extensive cross linking in moulds and again become infusible. These cannot be reused. Some common examples are bakelite, urea-formaldelyde resins **(any one)** 1 ½

28 (a) (i) The Ratio of number of moles of one component to the total number of moles of solution. / or mathematical expression. 1+1

(ii) The Solution which follows Raoult's law over the entire range of concentrations.

(b) $W_B = 15$ g $\quad W_A = 450$ g

$\Delta T_f = 0.34^{\circ}C \quad K_f = 1.86$ Kkg/mol $\quad M_B = ?$ 1

$$M_B = \frac{1000 \times K_f \times W_B}{\Delta T_f \times W_A}$$

$$= \frac{1000 \times 1.86K\ kg\ mol^{-1} \times 15g}{0.34K \times 450\ g}$$ 1

$= 182.35$ g / mol 1

Or

(a) (i) The Partial pressure of the gas above the liquid is directly proportional to the mole fraction of the gas dissolved in the liquid. 1

(ii) **Boiling Point Elevation Constant.** It is equal to elevation in boiling point of 1molal solution, i.e., 1 mole of solute is dissolved in 1 kg of solvent. (or mathematical expression) 1

(b) $W_B = ?$ $\quad W_A = 500$ g $\quad \Delta T_b = 100.42^{\circ}C - 100^{\circ}C = 0.42^{\circ}C$ or 0.42K

$K_b = 0.512$ Kkg/mol $\quad M_B = 92$g/mol

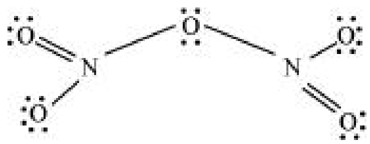
$$\Delta T_b = K_b \frac{W_B \times 1000}{M_B \times W_{A(in\ grams)}}$$

$$W_B = \frac{\Delta T_b \times M_B \times W_{A(in\ grams)}}{1000 \times K_b}$$ 1

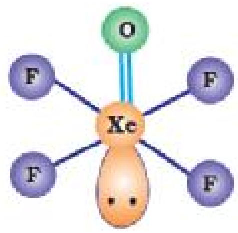
$$= \frac{042K \times 92g\ mol^{-1} \times 500kg}{1000 \times 0.512K\ kg\ mol^{-1}}$$ 1

$W_B = 37.73$ g 1

29. a) (i)



(ii)



1+1

(b)

(i) Because S-S single bond is stronger than O-O single bond.

(ii) Because I-Cl bond has lower bond dissociation enthalpy than I-I bond.

(iii) Because of lower bond dissociation enthalpy and high hydration enthalpy of Fluorine. 1×3=3

Or

(a) (i) $3Cu + 8HNO_{3(dilute)} \longrightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$

(ii) $XeF_4 + O_2F_2 \longrightarrow XeF_6 + O_2$ 1+1

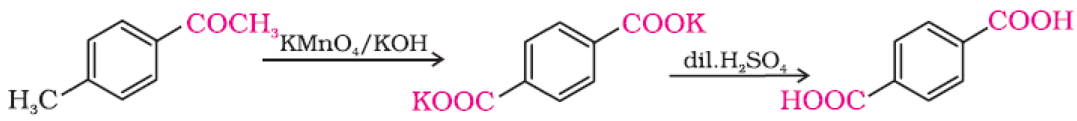
(b) (i) Because P-P single bond is stronger than N-N single bond.

(ii) Due to smaller size of oxygen it forms pπ-pπ bonds and form O_2 (O=O) which is absent in sulphur due to which it acquires a stable ring structure.

(iii) Because halogens absorb radiations in the visible region. This results in the excitation of valence electrons to a higher energy region. 1×3=3

30. (a) (i) $CH_3CH_2CH_2CH_2OH \xrightarrow{[O]\ KMnO_4/H^+ \text{ or } K_2Cr_2O_7/H^+} CH_3CH_2CH_2COOH$

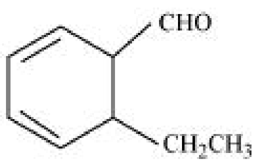
(ii)



1+1

4-Methylacetophenone | Dipotassium benzene-1, 4-dicarboxylate | Benzene-1, 4-dicarboxylic acid (Terephthalic acid)

(b) It is given that the compound (with molecular formula $C_9H_{10}O$) forms 2, 4-DNP derivative and reduces Tollen's reagent. Therefore, the given compound must be an aldehyde. Again, the compound undergoes cannizzaro reaction and on oxidation gives 1, 2-benzenedicarboxylic acid. Therefore, the -CHO group is directly attached to a benzene ring and this benzaldehyde is ortho-substituted. Hence, the compound is 2-ethylbenzaldehyde. 2



1

2 – Ethylbenzaldehyde

(or the given reactions can be explained by the equations)

Or

(a) (i) Add I_2 & NaOH (Iodoform test) in both the compounds, propanone give yellow ppt of CHI_3 Iodoform. (Or any other suitable test) 1

(ii) Add I_2 & NaOH (Iodoform test) in both the compounds, acetophenone give yellow ppt of CHI_3 Iodoform. Or benzaldehyde will give silver mirror test with tollens reagent. 1

(b) (i) Methyl tert – butyl ketone < acetone < acetaldehyde.

(ii) 4 – Methoxy benzoic acid < Benzoic acid < 3, 4 – Dinitobenzoic acid. 1×3 = 3

(iii) $(CH_3)_2CHCOOH < CH_3CH(Br)CH_2COOH < CH_3CH_2CH(Br)COOH$.