Class XII Session 2025-26
Subject - Chemistry
Sample Question Paper - 7

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

Read the following instructions carefully.

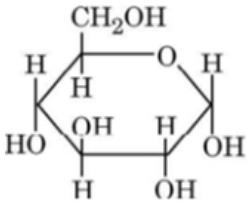
1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed.**

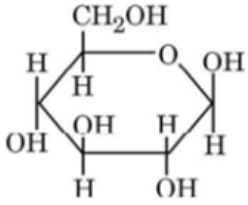
Section A

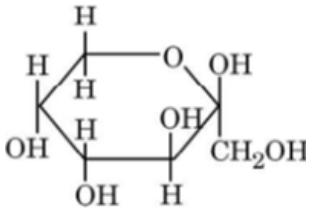
1. Butanenitrile may be prepared by heating: **[1]**

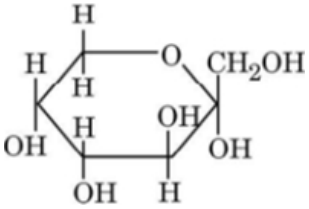
   a) propyl chloride with KCN
   b) propyl alcohol with KCN
   c) butyl alcohol with KCN
   d) butyl chloride with KCN

2. Which of the following structures represents α-D-glucose? **[1]**

   a)
   

   b)
   

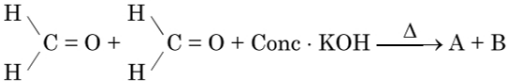
   c)
   

   d)
   

3. The formation of cyanohydrin from an aldehyde is an example of: **[1]**

   a) nucleophilic substitution
   b) electrophilic substitution
   c) nucleophilic addition
   d) electrophilic addition

4. Consider the following reaction: **[1]**



Identify A and B from the given options:

a) A - Methanol, B - Potassium acetate

b) A - Ethanol, B - Potassium formate

c) A - Methanol, B - Potassium formate

d) A - Methanal, B - Ethanol

5. The half-life of a reaction is halved as the initial concentration of the reactant is doubled. The order of the reaction is: **[1]**

a) 3

b) 1

c) 2

d) 0

6. Match the items given in column I with that in column II: **[1]**

Column I	Column II
(a) The cell reaction $2H_2 + O_2 \rightarrow 2H_2O$.	(i) Nickel-cadmium Storage Cell.
(b) Anodic Reaction is $Zn \rightarrow Zn^{2+} + 2e^-$.	(ii) Mercury Cell.
(c) Cathodic Reaction $HgO(s) + H_2O + 2e^- \rightarrow Hg(l) + 2OH^-$.	(iii) Bacon Cell.
(d) Anodic Reaction $Cd(s) + 2OH^-(aq) \rightarrow Cd(OH)_2(s) + 2e^-$.	(iv) Leclanche cell.

a) (a) - (iv), (b) - (ii), (c) - (iii), (d) - (i)

b) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

c) (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

d) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

7. Which one of the following compounds is more reactive towards S_N1 reaction? **[1]**

a) $C_6H_5CH_2Br$

b) $C_6H_5CH(CH_3)Br$

c) $C_6H_5CH(C_6H_5)Br$

d) $CH_2 = CHCH_2Br$

8. Deficiency of which of the following vitamins causes Pernicious anaemia? **[1]**

a) Vitamin B_2

b) Vitamin B_6

c) Vitamin B_1

d) Vitamin B_{12}

9. The expression which gives 3/4th life of the first-order reaction is: **[1]**

a) $\frac{k}{2.303}\log 4/3$

b) $\frac{2.303}{k}\log 4$

c) $\frac{2.303}{k}\log 3$

d) $\frac{k}{2.303}\log 3/4$

10. Which of the following compounds will give butanone on oxidation with alkaline $KMnO_4$ solution? **[1]**

a) Butan-2-ol

b) Butan-1-ol

c) Butan-3-ol

d) Both Butan-2-ol and Butan-1-ol

11. Which of the following is most acidic? **[1]**

a) Benzyl alcohol

b) m – Chlorophenol

c) Phenol

d) Cyclohexanol

12. In the reaction **[1]**

$C_6H_5NH_2 + CHCl_3 + 3\ KOH \rightarrow A + 3B + 3C$ the product A is

a) C_6H_5CN

b) C_6H_5NC

c) $C_6H_5NHCH_3$ d) C_6H_5Cl

13. **Assertion (A):** Oils float on water. **[1]**

Reason (R): Oils are the naturally occurring compounds that belong to lipid.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** Nucleophilic substitution of iodoethane is easier than chloroethane. **[1]**

Reason (R): Bond enthalpy of C-I bond is less than that of C-Cl bond.

a) Both (A) and (R) are true and (R) is the correct explanation of (A).

b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

c) (A) is true, but (R) is false.

d) (A) is false, but (R) is true.

15. **Assertion (A):** Nucleophilic substitution of iodoethane is easier than chloroethane. **[1]**

Reason (R): Bond energy of C - Cl bond is less than C - I bond.

a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

b) Both Assertion (A) and Reason (R) are true, but Reason (R) is **not** the correct explanation of the Assertion (A).

c) Assertion (A) is true, but Reason (R) is false.

d) Assertion (A) is false, but Reason (R) is true.

16. **Assertion (A):** p-nitrophenol is more acidic than phenol. **[1]**

Reason (R): Nitro group helps in the stabilization of the phenoxide ion by dispersal of negative charge due to resonance.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

17. Calculate Λ_m° for $CaCl_2$ and $MgSO_4$ from the following data : $\Lambda_m^\circ\left(Ca^{2+}\right)$ = 119.0, Mg^{2+} = 106.0, Cl^- = 76.3 and SO_4^{2-} = 160.05 $cm^2\ mol^{-1}$ **[2]**

OR

How much electricity in terms of Faraday is required to produce 40 grams of Al from Al_2O_3?

(Atomic mass of Al = 27 g/mol)

18. For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0·0821 L atm $K^{-1}\ mol^{-1}$] **[2]**

19. Why is Cr^{2+} reducing and Mn^{3+} oxidising when both have d^4 configuration? **[2]**

20. **Answer the following:** **[2]**

(a) The half-life of a first order reaction is 60 minutes. How long will it take to consume 90% of the reactant? **[1]**

[Given : log 2 = 0 3010, log 3 = 0 4771, log 10 = 1]

(b) Write units of rate constant k for zero, first, second and n^{th} order reactions. **[1]**

21. Write the steps for the conversion of Methanal to Ethanal. **[2]**

Section C

22. Consult the table of standard electrode potentials and suggest three substances that can oxidise ferrous ions under suitable conditions. **[3]**

23. **[3]**

a. On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_0 < P$.

b. Using valence bond theory, predict the hybridization and magnetic character of $[Ni(CN)_4]^{2-}$.

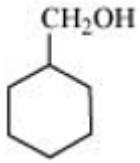
(Atomic number of Ni = 28)

c. Write the formula of the following complex using IUPAC norms:

Dichloridobis (ethane-1,2-diamine) cobalt (III)

24. Show how are the following alcohols prepared by the reaction of a suitable Grignard reagent on methanal? **[3]**

i. $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2OH$

ii. 

OR

Write the names of reagents and equations for the preparation of the following ethers by Williamson's synthesis:

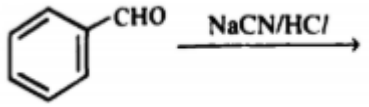
i. 1-Propoxypropane

ii. Ethoxybenzene

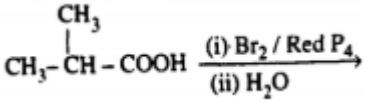
iii. 2-Methoxy-2-methylpropane

iv. 1-Methoxyethane

25. Complete the following reactions: **[3]**

i. 

ii. $(C_6H_5CH_2)_2Cd + 2CH_3COCl \rightarrow$

iii. 

26. What is understood by a normal hydrogen electrode? Give its significance? **[3]**

27. Out of $C_6H_5CH_2Cl$, and $C_6H_5CHClC_6H_5$, which is more easily hydrolysed by aqueous KOH? **[3]**

28. A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is: **[3]**

a. doubled

b. reduced to half

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

Living system are made up of complex molecules called Biomolecules. Carbohydrate, proteins, enzymes, nucleic acids, lipids, hormones ATP, DNA and RNA play an important role in our daily life. Carbohydrates provide us energy. Protein help in growth and maintenance of body. Nucleic acids, RNA helps in protein synthesis, DNA helps in transfer of genetic characteristics. Fat are source of energy and protect our vital organs.

i. Why are carbohydrates optically active? (1)

ii. Name two acidic amino acids. (1)

iii. Name a protein which has quarternary structure. (2)

OR

What are products of hydrolysis of fats? (2)

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The coordination compounds are of great importance. These compounds are widely present in the mineral, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems, industry and medicine. The selective estimation of these ions can be done due to the difference in the stability constants of calcium and magnesium complexes. Coordination compounds are of great importance in biological systems. The pigment responsible for photosynthesis, chlorophyll, is a coordination compound of magnesium. Among the other compounds of biological importance with coordinated metal ions are enzymes like carboxypeptidase and carbonic anhydrase (catalysts of biological systems). Coordination compounds are used as catalysts for many industrial processes. Articles can be electroplated with silver and gold much more smoothly and evenly from solutions of the complexes, $[Ag(CN)_2]^-$ and $[Au(CN)_2]^-$ than from a solution of simple metal ions.

i. How can excess of copper and iron are removed? (1)

ii. Purification of metals can be achieved through the formation and subsequent decomposition of their coordination compounds. Give one example. (1)

iii. Coordination compounds find use in many qualitative and quantitative chemical analysis. Justify. (2)

OR

Gold is a co-ordinate compound. Justify. (2)

Section E

31. **Attempt any five of the following:** **[5]**

(a) What is the composition of mischmetall? Give its one use. **[1]**

(b) What is meant by disproportionation of an oxidation state? Give an example. **[1]**

(c) Write the preparation of sodium dichromate from chromite ore. **[1]**

(d) Actinoid series members exhibit a large number of oxidation states compared to their corresponding lanthanoids. Why? **[1]**

(e) Draw and show manganate and permanganate ions, structurally? **[1]**

(f) How would you account for the following? Among lanthanoids, Ln (III) compounds are predominant. However, occasionally in solutions or in solid compounds, +2 and +4 ions are also obtained. **[1]**

(g) La^{3+} (Z = 57) and Lu^{3+} (Z = 71) do not show any colour in solutions. Give reason. **[1]**

32. **[5]**

a. An aromatic compound 'A' on treatment with aquecous 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 and IUPAC names of compounds A, B and C.

b. Complete the following reactions:

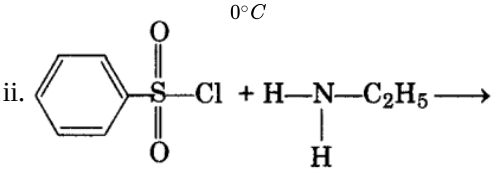
i. $C_6H_5NH_2 + CHCl_3 + \text{alc. KOH} \rightarrow$

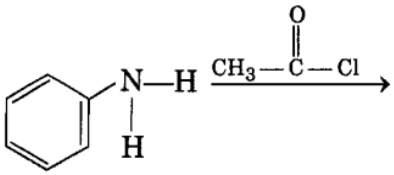
ii. $C_6H_5N_2Cl + H_3PO_2 + H_2O \rightarrow$

OR

Write the main products of the following reactions:

i. $CH_3CH_2NH_2 \xrightarrow[0^\circ C]{HNO_2}$

ii. 

iii. 

33. Benzene and toluene form ideal solution over the entire range of composition. The vapour pressure of pure benzene and naphthalene at 300 K are 50.71 mm Hg and 32.06 mm Hg respectively. Calculate the mole fraction of benzene in vapour phase if 80 g of benzene is mixed with 100 g of toluene. **[5]**

OR

a. The depression in freezing point of water observed for the same molar concentrations of acetic acid, trichloroacetic acid and trifluoroacetic acid increases in the order as stated above. Explain.

b. What mass of NaCl must be dissolved in 65.0 g of water to lower the freezing point of water by $7.50^0\ C$? The freezing point depression constant (K_f) for water is $1.86^0\ C/m$. Assuming van't Hoff factor for NaCl is 1.87. (Molar mass of $NaCl\ =\ 58.5\ g\ mol^{-1}$)

Solution

CBSE SAMPLE PAPER - 07

Class 12 - Chemistry

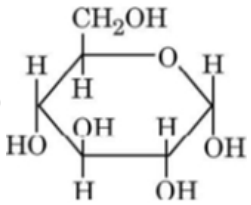
Section A

1. **(a)** propyl chloride with KCN

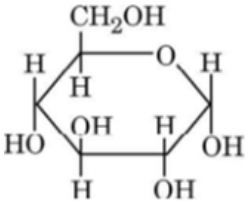
   Explanation:

   Butanenitrile can be prepared by heating propyl chloride with KCN.

2. **(a)**



   Explanation:



   represents α-D-glucose

3. **(c)** nucleophilic addition

   Explanation:

   In the treatment of cyanide or nitriles with aldehyde or ketone, there is the formation of aldehyde or ketone cyanohydrin. This is a nucleophilic addition reaction

4. **(c)** A - Methanol, B - Potassium formate

   Explanation:

   A - Methanol, B - Potassium formate

5. **(c)** 2

   Explanation:

   For 2^{nd} order reaction, the half-life is inversely related to the concentration of the reactant.

   $t_{1/2}$ for second order reaction $\alpha \frac{1}{[R]}$

6. **(c)** (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

   Explanation:

   (a) - (iii), (b) - (iv), (c) - (ii), (d) - (i)

7. **(c)** $C_6H_5CH(C_6H_5)Br$

   Explanation:

   $C_6H_5CH(C_6H_5)^+$ carbocation formed is more stable.

8. **(d)** Vitamin B_{12}

Explanation:

Deficiency of vitamin B_{12} (cyanocobalamin) causes the disease pernicious anaemia.

9.

(b) $\frac{2.303}{k}\log 4$

Explanation:

For a first order reaction,

$t = \frac{2.303}{k}\log\frac{a}{a-x} = \frac{2.303}{k}\log\frac{a}{\frac{a}{4}} = \frac{2.303}{k}\log 4$

10. **(a)** Butan-2-ol

Explanation:

$CH_3CH_2\underset{\underset{Bu\tan-2-ol}{|}}{\underset{OH}{C}}HCH_3 \xrightarrow[KMnO_4]{alk} \underset{Bu\tan one}{CH_3CH_2COCH_3}$ Butan-2-ol converted to butanone

11.

(b) m – Chlorophenol

Explanation:

In cases of halogen derivatives of phenols or aniline or benzoic acid etc, it is very helpful to understand that all halogens, when attached to benzene ring, exerts -I as well as +R effect.

In case of Cl, Br and I, the +R effect has almost no effect on reactivity, acidic character or basic character of the benzene ring. It is due to very less effective overlapping involving 2p of carbon and 3p or 4p or 5p of halogen.

Hence, only -I effect becomes the deciding factor, which is most dominant from ortho-position and least effective from para-position. So m chlorophenol is most acidic.

12.

(b) C_6H_5NC

Explanation:

C_6H_5NC

13.

(b) Both A and R are true but R is not the correct explanation of A.

Explanation:

Oils float on water due to low specific gravity.

14. **(a)** Both (A) and (R) are true and (R) is the correct explanation of (A).

Explanation:

Both (A) and (R) are true and (R) is the correct explanation of (A).

15.

(c) Assertion (A) is true, but Reason (R) is false.

Explanation:

C – Cl bond is more ionic than C – I bond because of the greater difference in the electronegativities of C and Cl as compared to that of carbon and iodine. Therefore, C – Cl bond is stronger than the C – I bond.

16. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

p-Nitrophenol is more acidic than phenol because the nitro group stabilizes phenoxide ion by dispersal of negative charge.

Section B

17. $\Lambda^{\circ}_{m(CaC_2)} = \Lambda^{\circ}_{m\left(Ca^{2+}\right)} + 2\Lambda^{\circ}_{m\left(Cr^{-}\right)}$

= 119 + (2 × 76.3) = 271.6 S cm^2 mol^{-1}

$\Lambda^{\circ}_{m(MgSO_4)} = \Lambda^{\circ}_{m(Mg^{2+})} + 2\Lambda^{\circ}_{m\left(SO_4^{2-}\right)}$

= 106 + 160 = 266 S cm^2 mol^{-1}

OR

$Al^{3+} + 3e^- \rightarrow Al$

27 gram of Al require electricity = 3F

40 gram of Al require electricity $= \frac{3F}{27} \times 40$ = 4.44 F

18. Osmotic pressure (π) = $\frac{W \times R \times T}{M \times V}$

W = 5 gm, R = 0·0821 L atm K^{-1} mol^{-1}

V(Volume in litres) = $\frac{100}{1000}$

= 0.1 litres, M = 60 gm/mole, T = 300 K

$\pi = \frac{5 \times 0.0821 \times 300}{60 \times 0.1}$

Osmotic pressure at 300K = 20.525 atm

19. Chromium Cr^{2+} is reducing as its configuration changes from d^4 to d^3, the latter having a half-filled t_{2g} level. On the other hand, the change from (Manganese) Mn^{3+} to Mn^{2+} results in the half-filled (d^5) configuration which has extra stability.

20. Answer the following:

(i) $t_{1/2} = \frac{0.693}{k}$

k = $\frac{0.693}{60}$ min^{-1}

k = $\frac{2.303}{t} \log \frac{[R]_0}{[R]}$

$\frac{0.693}{60} = \frac{2.303}{t} \log \frac{100}{10}$

t = $\frac{2.303 \times 60}{0.693}$ min

t = 199.3 min

(ii)

Order of Reaction	**Unit of k**
1. Zero order reaction	$mol\, L^{-1} s^{-1}$
2. First order reaction	s^{-1}
3. Second order	$mol^{-1}\, L s^{-1}$
4. n^{th} order reaction	$(mol/\, L)^{1-n} s^{-1}$

21. Methanal to Ethanal

$$H - CHO \; + \; CH_3MgBr \; \rightarrow H - \underset{H}{\overset{OMgBr}{\overset{|}{\underset{|}{C}}}} - CH_3 \xrightarrow{H^+/H_2O} CH_3 - CHO$$

Section C

22. Oxidation of ferrous ion means:

$Fe^{2+} \rightarrow Fe^{3+} + e^-$; $E^0_{Fe^{3+}/Fe^{2+}} = 0.77V$

Any substance in which standard electrode potential is more than that of Fe^{+3}/F^{+2} can oxidize ferrous ions.

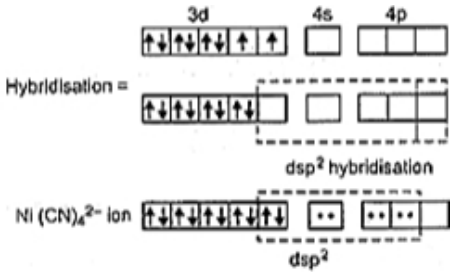
The EMF of the substance whose reduction potentials greater than 0.77v will oxidized ferrous ion. For example Br_2, Cl_2, and F_2.

23. a. On the basis of crystal field theory, for a d^4 ion, if $\Delta_0 < P$, then the complex is a high spin complex formed by the association of weak field ligands with the metal ion. As a result, the fourth electron enters one of the e_g orbitals, thereby, exhibiting the electronic configuration $t^3_{2g} e^1_g$.

b. Ni atom (z = 28)

E.C of Ni. = $[Ar]4s^2 3d^8$

E.C. of Ni^{2+} = $[Ar]4s^0 3d^8$

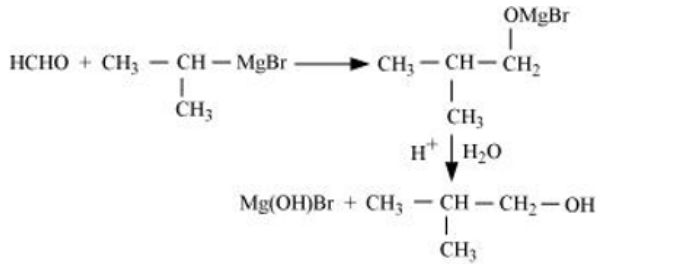


It is diamagnetic, due to the absence of unpaired electrons.

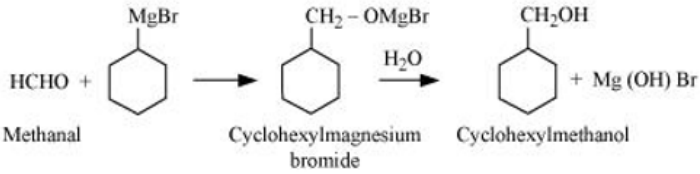
Shape - square planar.

c. $[CoCl_2(en)_2]$

24. i.



ii.

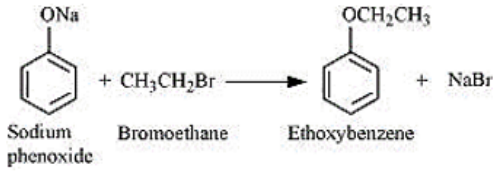


OR

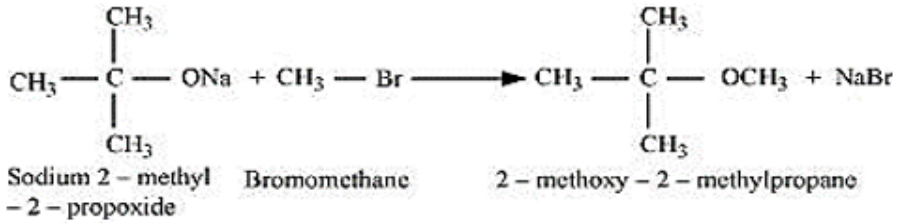
i. $CH_3CH_2CHONa + CH_3CH_2CH_2Br \rightarrow C_2H_sCH_2 - O - CH_2C_2H_5 + NaBr$

Sodium propoxide — I - Bromopropane — I - Propoxypropane

ii.



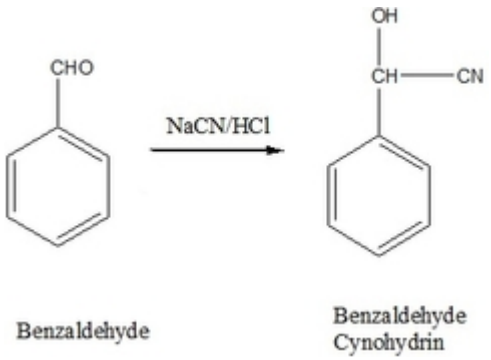
iii.



iv. $CH_3CH_2 - ONa + CH_3 - Br \rightarrow CH_3CH_2 - O - CH_3 + NaBr$

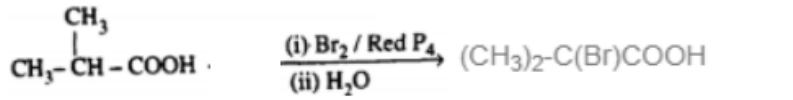
Sodium ethoxide — Bromomethane — I - Methoxyethane

25. i.



ii. $2CH_3 - \overset{O}{\overset{\|}{C}} - Cl + (C_6H_5CH_2)_2Cd \longrightarrow 2CH_3 - \overset{O}{\overset{\|}{C}} - CH_2C_6H_5 + CdCl_2$

Acetyl chloride — Dibenzyl cadmium — Benzyl methyl ketone

iii. 

2-methyl propanoic acid 2-methyl-2-bromo propanoic acid

26. It is used as reference electrode. Its electrode potential is taken as 0.00 volt. Hydrogen electrode consists of platinum wire coated with finely divided platinum black containing pure hydrogen gas at 1 atm and solution of HCl (1 M) so as to maintain equilibrium between H^+ ions and H_2(g).

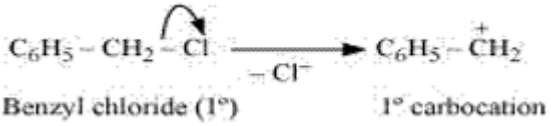
At cathode

$2H^+ + 2e \rightarrow H_2$

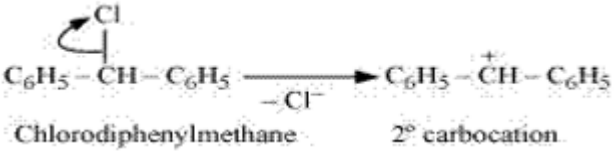
At anode

$H_2 \rightarrow 2H^{2+} + 2e^-$

significance: In the measurement of electrode potential.



27.



Hydrolysis by aqueous KOH proceeds through the formation of carbocation. If carbocation is stable, then the compound is easily hydrolyzed by aqueous KOH.

Now $C_6H_5CH_2Cl$ forms $1^\circ-$ carbocation, while $C_6H_5CHClC_6H_5$ forms $2^\circ-$ carbocation, which is more stable than $1^\circ-$ carbocation. Hence, $C_6H_5CHClC_6H_5$ is hydrolyzed more easily than $C_6H_5CH_2Cl$ by aqueous KOH.

28. Let the concentration of the reactant be [A] = a

Rate of reaction, $R = k[A]^2 = ka^2$

a. If the concentration of the reactant is doubled, i.e. [A] = 2a, then the rate of the reaction would be

$R' = k(2a)^2 = 4ka^2$

= 4R

Therefore, the rate of the reaction would increase by 4 times.

b. If the concentration of the reactant is reduced to half, i.e., $[A] = \frac{1}{2}a$ then the rate of the reaction would be $R' = k\left(\frac{1}{2}a\right)^2$

$= \frac{1}{4}ka^2 = \frac{1}{4}R$

Therefore, the rate of the reaction would be reduced to $\frac{1}{4}th$.

Section D

29. i. It is because they contain 'Chiral' carbon atoms.

ii. Aspartic acid and Glutamic acid.

iii. Haemoglobin.

OR

Glycerol and fatty acids.

30. i. Excess of copper and iron are removed by the chelating ligands D-penicillamine and desferrioxime B via the formation of coordination compounds.

ii. Impure nickel is converted to $[Ni(CO)_4]$, which is decomposed to yield pure nickel.

iii. The familiar colour reactions given by metal ions with a number of ligands (especially chelating ligands), as a result of formation of coordination entities, form the basis for their detection and estimation by classical and instrumental methods of analysis.

OR

Gold, for example, combines with cyanide in the presence of oxygen and water to form the coordination entity $[Au(CN)_2]^-$ in aqueous solution.

Section E

31. Attempt any five of the following:

(i) Mischmetall is an alloy which consists of a Lanthanoid metal (95%) and iron(5%) and traces of S, C, Ca & Al. A good amount of this alloy is used in magnesium based alloy to produce bullets, shell and lighter Flint.

(ii) When the particular oxidation state becomes less stable relative to the other oxidation states, one lower and one higher, it is said to undergo a disproportionation reaction.

For example, $3Mn^{VI}O_4^{2-} + 4\,H^+ \longrightarrow 2\,Mn^{VII}O_4^- + Mn^{IV}O_2 + 2H_2O$

(iii) Fusion of chromite ore ($FeCr_2O_4$) with sodium or potassium carbonate in free access of air to form sodium chromate

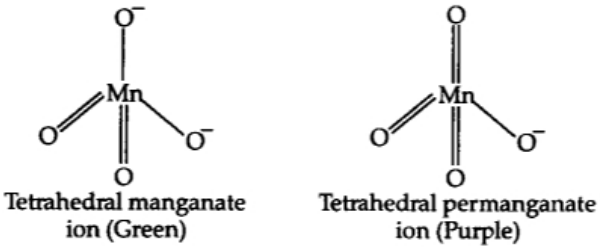
$4\,FeCr_2O_4 + 8\,Na_2CO_3 + 7\,O_2 \rightarrow 8\,Na_2CrO_4 + 2\,Fe_2O_3 + 8\,CO_2$

On acidification of Sodium chromate with sulphuric acid to form sodium dichromate

$2\,Na_2CrO_4 + 2\,H^+ \rightarrow Na_2Cr_2O_7 + 2\,Na^+ + H_2O$

(iv) Due to comparable energies of 5f, 6d and 75 levels members of actinoid series exhibit a large number of oxidation states.

(v)



(vi) +2 and +4 oxidation states are due to high stabilities of f^0, f^7 and f^{14} configuration.

(vii) La^{3+} (lanthanum) have $4f^0$ and Lu^{3+} (lutetium) have $4f^{14}$ configuration. Because of the absence of unpaired electrons, these ions impart no colour to the solution.

32. a. i. Since the compound C of molecular formula C_6H_7N is formed B on treatment with Br_2 and KOH (Hoffmann bromamide reaction), therefore, the compound 'B' must be an amide and 'C' must be an amine. The only aromatic amine having molecular formula C_6H_7N is $C_6H_5NH_2$ (aniline).

ii. Since 'C' is aniline, the amide from which is formed by must be benzamide ($C_6H_5CONH_2$).

$$\underset{Aniline\ (C)}{C_6H_5NH_2} \xleftarrow{Br_2,\ KOH} \underset{Benzamide\ (B)}{C_6H_5CONH_2}$$

Thus, B is benzamide.

iii. Since B is formed from A with aqueous ammonia and heating, therefore, compound 'A' must be benzoic acid.

$$\underset{Benzoic\ acid\ (A)}{C_6H_5COOH} \xrightarrow[Heat]{aq.NH_3} \underset{Benzamide\ (B)}{C_6H_5CONH_2}$$

Thus, A = C_6H_5COOH, B = $C_6H_5CONH_2$, C = $C_6H_5NH_2$.

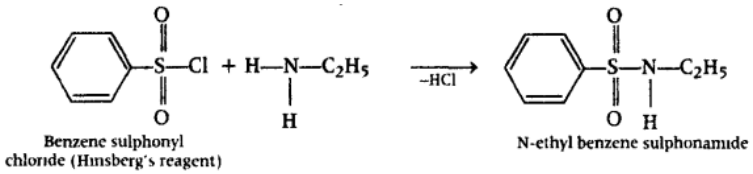
b. i. $C_6H_5NH_2 + CHCl_3 + 3\underset{(alc)}{KOH} \rightarrow \underset{Phenyl\ isocyanide}{C_6H_5NC} + 3KCl + 3H_2O$

ii. $C_6H_5N_2Cl + H_3PO_2 + H_2O \rightarrow \underset{Benzene}{C_6H_6} + N_2 + H_3PO_3 + HCl$

OR

i. $\underset{\text{Ethylamine}}{CH_3CH_2NH_2} + HNO_2 \xrightarrow{0^\circ C} \underset{\text{Ethyl alcohol}}{CH_3CH_2OH} + N_2 + H_2O$

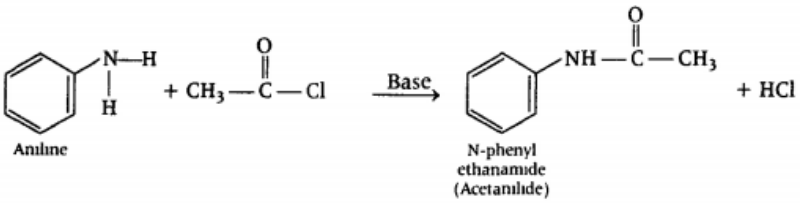
ii.



Benzene sulphonyl chloride (Hinsberg's reagent)

N-ethyl benzene sulphonamide

iii.



Aniline

N-phenyl ethanamide (Acetanilide)

33. Molar mass of benzene $(C_6H_6) = (6 \times 12) + (6 \times 1)$

$= 78\ g\ mol^{-1}$

Molar mass of toluene $(C_6H_5CH_3) = (7 \times 12) + (8 \times 1)$
= $92\ g\ mol^{-1}$
Now, no. of moles present in 80 g of benzene = $\frac{80}{78} mol$
= 1.026 mol
And, no. of moles present in 100 g of toluene = $\frac{100}{92} mol$
=1.087 mol
Therefore, Mole fraction of benzene, $x_b = \frac{1.026}{1.025+1.087}$
= 0.486
And, mole fraction of toluene, $x_t = 1 - 0.486$ = 0.514
It is given that vapour pressure of pure benzene, $p_b^0 = 50.71\ mm\ Hg$
And, vapour pressure of pure toluene, $p_1^0 = 32.06\ mm\ Hg$
Therefore, partial vapour pressure of benzene, $p_b = x_b \times p_b$
$= 0.486 \times 50.71$
= 24.645 mm Hg
And, partial vapour pressure of toluene, $p_1 = x_t \times p_t$
$= 0.514 \times 32.06$
= 16.479 mm Hg
Hence, mole fraction of benzene in vapour phase is given by:
$\frac{p_b}{p_b+p_t}$
$= \frac{24.645}{24.645+16.479}$
$= \frac{24.645}{41.124}$
= 0.599

OR

a. The order of depression in freezing point is $CH_3COOH < Cl_3C - COOH < F_3C - COOH$. As fluorine is most electronegative so causes highest electron withdrawing inductive effect (-I effect). Consequently, it is strongest acid. Hence CF_3COOH ionises to the largest extent while acetic acid ionises to minimum extent. As we know greater the ions produced, more will be depression in freezing point. Hence, the depression in freezing point is maximum for the fluoroacetic acid and minimum for acetic acid.

b. Given, $w_A = 65.0g$
$\Delta T_f = 7.5^0\ C$
$K_f = 1.86^0\ C/m$
i = 1.87
$M_B = 58.5\ g\ mol^{-1}$
As we know,
$\Delta T_f = \frac{i \times K_f \times w_B \times 1000}{M_2 \times w_A}$
$\Rightarrow\ w_B = \frac{\Delta T_f \times M_B \times w_A}{i \times K_f \times 1000}$
$w_B = \frac{7.5^\circ C \times 58.5g\ mol^{-1} \times 65g}{1.87 \times 1.86^\circ C/m \times 1000g\ kg^{-1}}$
= 8.199 g.