LIBERTY PAPER SET

STD. 12 : Chemistry

Full Solution

Time : 3 Hours

ASSIGNMENT PAPER 12

Part A

1. (C) **2.** (A) **3.** (A) **4.** (A) **5.** (B) **6.** (C) **7.** (D) **8.** (A) **9.** (C) **10.** (A) **11.** (D) **12.** (B) **13.** (D) **14.** (C)
15. (C) **16.** (D) **17.** (A) **18.** (B) **19.** (D) **20.** (B) **21.** (D) **22.** (D) **23.** (A) **24.** (A) **25.** (C) **26.** (C)
27. (A) **28.** (B) **29.** (D) **30.** (C) **31.** (C) **32.** (C) **33.** (D) **34.** (C) **35.** (A) **36.** (B) **37.** (C) **38.** (A)
39. (D) **40.** (C) **41.** (D) **42.** (B) **43.** (A) **44.** (C) **45.** (C) **46.** (C) **47.** (B) **48.** (A) **49.** (C) **50.** (C)

Part B

Section A

➢ **Write the answer of the following questions : (Each carries 2 Mark)**

1.

➥ $Q = I \times t$

$= 0.5 \times 2 \times 3600$

$= 3600\ C$

$1.60 \times 10^{-19}\ C = 1$ electron

$\therefore 3600\ C = (?)$

No. of electron $= \dfrac{3600}{1.60 \times 10^{-19}}$

$= 2250 \times 10^{19}$

$= 2.25 \times 10^{22}$ electron

2.

➥ Suppose initial concentration $[R]_0 = 100$

➥ $\therefore$ Concentration at time t $[R]_t = 70$, (30% decomposition).

➥ $t = 40$ min.

➥ Comparing $k = \dfrac{2.303}{t} \log \dfrac{[R]_0}{[R]_t}$ and

$k = \dfrac{0.693}{t_{\frac{1}{2}}}$ we get,

$$\frac{0.693}{t_{\frac{1}{2}}} = \frac{2.303}{t} \log \frac{[R]_0}{[R]_t}$$

$$\therefore \frac{0.693}{t_{\frac{1}{2}}} = \frac{2.303}{40} \log \frac{100}{70} = \frac{2.303}{40} \times 0.1549$$

$$\therefore \frac{0.693}{t_{\frac{1}{2}}} = 0.0089185$$

$$\therefore t_{\frac{1}{2}} = 0.693 / 0.0089185 = 77.7 \text{ min}$$

3.

➥ Because of large number of unpaired electrons in their atoms they have stronger interatomic interaction and hence, stronger bonding between atoms resulting in higher enthalpies of atomization.

4.

Properties :

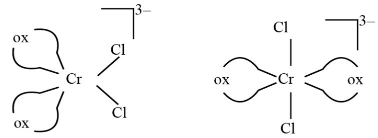
- Orange, crystalline, soluble in water
- Strong oxidising agent in acidic medium

$$K_2Cr_2O_7 \text{ orange} \underset{H^+}{\overset{OH^-}{\rightleftharpoons}} K_2CrO_4 \text{ yellow}$$

$$\begin{bmatrix} 2CrO_4^{-2} + 2H^+ \rightarrow Cr_2O_7^{-2} + H_2O \\ Cr_2O_7^{-2} + 2OH^- \rightarrow 2CrO_4^{-2} + H_2O \end{bmatrix} \quad \text{Interconvertable property}$$

5.

- Solution :



(a) cis – $[CrCl_2(ox)_2]^{3-}$ (b) trans – $[CrCl_2(ox)_2]^{3-}$

Out of the two, (a) cis – $[CrCl_2(ox)_2]^{3-}$ is (optically active).

6.

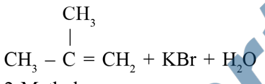
- A spectrochemical series is the arrangement of common ligands in the increasing order of their Crystal-Field Splitting Energy (CFSE) values.
- The ligands present on the R.H.S of the series are strong field ligands while that on the L.H.S are weak field ligands.
- Also, strong field ligands cause higher splitting in the d orbitals than weak field ligands.
- $I^- < Br^- < SCN^- < Cl^- < S^{2-} < F^- < OH^- < C_2O_4{}^{2-} < H_2O < NCS^- < edta^{4-} < NH_3 < en < CN^- < CO$

7.

- (i)

$$\underset{\text{1-Chloropropan}}{CH_3CH_2CH_2 - Cl} + NaI \xrightarrow[\Delta]{\text{Acetone}} \underset{\text{1-Iodopropane}}{CH_3CH_2CH_2I} + NuCl$$

- (ii)



$$\underset{\text{2-Bromo-2-methylpropane}}{(CH_3)_3CBr} + KOH \xrightarrow[\Delta]{\text{Ethanol}} \underset{\text{2-Methylpropene}}{CH_3 - \overset{\overset{\large CH_3}{|}}{C} = CH_2} + KBr + H_2O$$

8.

- Finkelstein reaction :
    - Alkyl iodides are often prepared by the reaction of alkyl chlorides/ bromides with NaI in dry acetone.
    - This reaction is known as Finkelstein reaction.

      $R–X + NaI \rightarrow R–I + NaX$

      $X = Cl, Br$

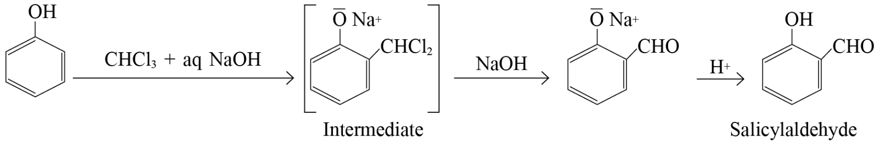
      Example :

      (i) $CH_3 - Cl + NaI \rightarrow CH_3 - I + NaCl$

      (ii) $CH_3 - CH_2 - Br + NaI \rightarrow CH_3 - CH_2 - I + NaBr$
    - NaCl or NaBr thus formed is precipitated in dry acetone. It facilitates the forward reaction according to Le Chatelier's Principle.

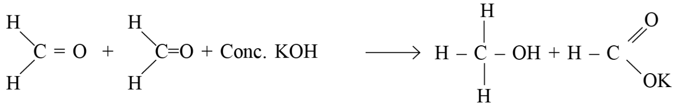
9.

- On treating phenol with chloroform in the presence of sodium hydroxide, a –CHO group is introduced at ortho position of benzene ring. This reaction is known as Reimer - Tiemann reaction.
- The intermediate substituted benzal chloride is hydrolysed in the presence of alkali to produce salicylaldehyde.

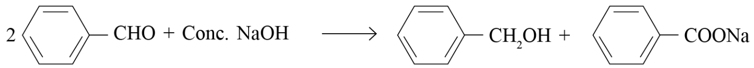


10.

- Cannizzaro reaction : *"Aldehydes which do not have an α-hydrogen atom, undergo self oxidation and reduction (disproportionation) reaction on treatment with concentrated alkali. In this reaction, one molecule of the aldehyde is reduced to alcohol while another is oxidised to carboxylic acid salt."*



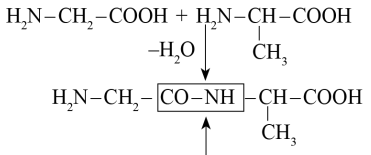
Formaldehyde Methanol Potassium formate



Benzaldehyde Benzyl alcohol Sodium benzoate

11.

- Proteins are the polymers of α-amino acids and they are connected to each other by peptide bond or peptide linkage.
- Chemically peptide linkage is an amide formed between –COOH group and $-NH_2$ group.
- *"The reaction between two molecules of similar or different amino acids, proceeds through the combination of the amino group of one molecule with the carboxyl group of the other. This results in the elimination of water molecule and formation of a peptide bond – CO – NH –."*
- The product of the reaction is called a dipeptide because it is made up of two amino acids.
- For example when carboxyl group of glycine combines with the amino group of alanine we get a dipeptide glycylalanine.



$$H_2N-CH_2-COOH + H_2N-\underset{CH_3}{\underset{|}{CH}}-COOH \xrightarrow{-H_2O} H_2N-CH_2-\boxed{CO-NH}-\underset{CH_3}{\underset{|}{CH}}-COOH$$

Peptide linkage
Glycylalanine (Gly-Ala)

- The third amino acids combines to a dipeptide, the product is called a tripeptide.
- A tripeptide contains three amino acids linked by two peptide linkages.
- Similarly, when four, five or six amino acids are linked to the respective products are known as tetrapeptide, pentapeptide or hexapeptide, respectively.
- When the number of such amino acids is more than ten, then the products are called polypeptides.
- A polypeptide with more than hundred amino acid residues, having molecular mass higher than 10,000 u is called a protein.
- However, the distinction between a polypeptide and a protein is not very sharp. Polypeptides with fewer amino acids are likely to be called proteins if they ordinarily have a well defined conformation of a protein such as insulin which contains 51 amino acids.

12.

- Proteins can be classified into two types on the basis of their molecular shape.
- (a) Fibrous protein compounds :
  - When the polypeptide chains run parallel and are held together by hydrogen and disulphide bonds, then fibre-like structure is formed. Such proteins are generally insoluble in water. Some common example are keratin (present in hair, wool, silk) and myosin (present in muscles) etc.
- (b) Globular protein compounds :
  - This structures results when the chains of polypeptides coil around to give a spherical shape. These are usually soluble in water. Insulin and albumins are the common examples of globular proteins.

Section B

- **Write the answer of the following questions : (Each carries 3 Mark)**

13.

- heptane = 1
  $p_1^0 = 105.2$ kPa
  $W_1 = 26.0$ g
  $p_{Total} = (?)$

  octane = 2
  $p_2^0 = 46.8$ K·Pa
  $W_2 = 35$ g

- Molar mass of heptane $(M_1) = 7(C) + 16(H)$

  $= 7(12) + 16(1)$

  $= 84 + 16$

  $= 100$ g.Mol^{-1}

  Molar mass of Octane $(M_2) = 8(C) + 18(H)$

  $= 8(12) + 18(1)$

  $= 96 + 18$

  $= 114$ g.Mol^{-1}

- Moles of heptane $(n_1) = \frac{W_1}{M_1}$

  $= \frac{26}{100}$

  $= 0.26$ Mol

  Moles of octane $(n_2) = \frac{W_2}{M_2}$

  $= \frac{35}{114}$

  $= 0.31$ Mol

- Mole-fraction of heptane $(x_1) = \frac{0.26}{0.26 + 0.31} = 0.456$
- Mole-fraction of octane $(x_2) = 1 - 0.456 = 0.544$
- According to Raoult's Law

  $p_{Total} = p_1 + p_2$

  $= p_1^0 \, . x_1 + p_2^0 \, . x_2$

  $= (105.2)(0.456) + (46.8)(0.544)$

  $= 47.97 + 25.459$

  $= 73.43$ K.Pa

14.

- Concentration of Electrolyte in Electrochemical cell is Unity (1M). It is not true always.
- Nernst derive equation for calculating E_{cell} when concentration of electrolyte is not unity this equation is known as nernst equation.

  $M^{n+}(aq) + ne^- \rightarrow M(s)$

- Electrode potential of above reaction is

  $$E_{(Mn+ \mid M)} = E^6{}_{(Mn+ \mid M)} - \frac{RT}{nF} \ln \frac{[M]}{[M^{n+}]}$$

  but concentration of solid M is taken as unity and we have

$$E_{(Mn+ \mid M)} = E^{6}_{(Mn+ \mid M)} - \frac{RT}{nF} \ln \frac{1}{[M^{n+}]}$$

Where, $E^{6}_{Mn+ \mid M}$ = Standard Electrode potential

R = gas constant

T = Temperature

F = Faraday (96427 $C \cdot mol^{-1}$)

$[M^{n+}]$ = concentration of M^{n+}

n = No. of Electron

- ➥ For Daniell Cell Zn act as anode and Cu act as cathode so,

For cathode :

$$E_{(Cu2+ \mid Cu)} = E^{6}_{(Cu2+ \mid Cu)} - \frac{RT}{2F} \ln \frac{1}{[Cu^{2+}(aq)]}$$

For Anode :

$$E_{(Zn2+ \mid Zn)} = E^{6}_{(Zn2+ \mid Zn)} - \frac{RT}{2F} \ln \frac{1}{[Zn^{2+}(aq)]}$$

The cell potential,

$$E_{cell} = E_{(Cu2+ \mid Cu)} - E_{(Zn2+ \mid Zn)}$$

$$= E^{6}_{(Cu2+ \mid Cu)} - \frac{RT}{2F} \ln \frac{1}{[Cu^{2+}(aq)]} - E^{6}_{(Zn2+ \mid Zn)} + \frac{RT}{2F} \ln \frac{1}{[Zn^{2+}(aq)]}$$

$$= E^{6}_{(Cu2+ \mid Cu)} - E^{6}_{(Zn2+ \mid Zn)} - \frac{RT}{2F} \ln \left(\ln \frac{1}{[Cu^{2+}(aq)]} - \ln \frac{1}{[Zn^{2+}(aq)]} \right)$$

$$E_{cell} = E^{6}_{cell} - \frac{RT}{2F} \ln \frac{[Zn^{2+}]}{[Cu^{2+}]}$$

- ➥ It can be seen that $E_{(cell)}$ depends on the concentration of both Cu^{2+} and Zn^{2+} ions. It increase with increase in the concentration of Cu^{2+} ions and decrease in the concentration of Zn^{2+} ions.
- ➥ R = 8.314 J mol^{-1} k^{-1}

T = 298 K

F = 96487 C

ln = 2.303 log

Substituting this value in above equation.

$$E_{(cell)} = E^{6}_{(cell)} - \frac{0.059}{2} \log \frac{[Zn^{2+}]}{[Cu^{2+}]}$$

15.

- ➥ The order of a reaction is sometimes altered by conditions.
- ➥ There are many reactions which obey first order rate law although they are higher order reactions.
- ➥ Consider the hydrolysis of ethyl acetate which is a chemical reaction between ethyl acetate and water. In reality, it is second order reaction and concentration of both ethyl acetate and water affect the rate of the reaction.
- ➥ But water is taken in large excess for hydrolysis, therefore, concentration of water is not altered much during the reaction.
- ➥ Thus, the rate of reaction is affected by concentration of ethyl acetate.
- ➥ For e.g. 0.01 mol ethyl acetate react with 10 mol of water amounts of the reactants and products at the beginning (t = 0) and completion (t) of the reaction are give as under.

$$CH_3COOC_2H_5 + H_2O \xrightarrow{H^+} CH_3COOH + C_2H_5OH$$

	$CH_3COOC_2H_5$	H_2O	CH_3COOH	C_2H_5OH
t = 0	0.01 mol	10 mol	0 mol	0 mol
t = t	0 mol	9.99 mol	0.01 mol	0.01 mol

The concentration of water does not get altered much during the course of the reaction. So, the reaction behaves as first order reaction. Such reactions are called pseudo first order reactions.

Inversion of cane sugar is another pseudo first order reaction.

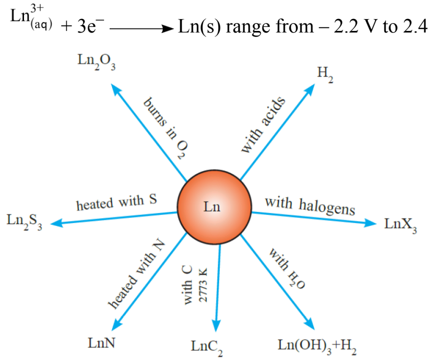
$$\underset{\text{cane sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\text{Rate} = k\,[C_{12}H_{22}O_{11}]$$

16.

- In their chemical behaviour, in general, the earlier members of the series are quite reactive similar to calcium but, with increasing atomic number, they behave more like aluminium.
- The value of E^0 of half reaction

$Ln^{3+}_{(aq)} + 3e^- \longrightarrow Ln(s)$ range from – 2.2 V to 2.4 V except for Eu that has – 2.0 V.

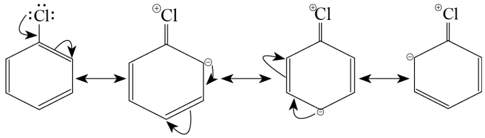


Chemical processes of lanthanoids

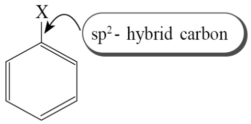
- Lanthanoids heated with carbon forms carbides Ln_3C, Ln_2C_3 and LnC_2.
- Lanthanoids form trihalides LnX_3 with halogen and liberates hydrogen gas when treated with dilute acids.
- These metals combine with oxygen to form oxides of type Ln_2O_3
- Oxides are basic in nature and when dissloved in water they form hydroxide $Ln(OH)_3$.

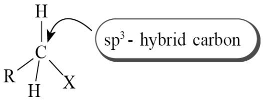
17.

- Aryl halides are extremely less reactive towards nuncleophilic substituion reactions due to the following reasons :
- (i) Resonance effect : In haloarenes, the electron pairs on halogen atom are in conjugation with π–electrons of the ring and the following resonating structures are possible :



  - C-CI bond acquires a partial double bond character due to resonance.
  - As a result, the bond cleavage in haloarene is more difficult than haloalkane and therefore, they are less reactive towards nuncleophilic substitution reaction.
- (ii) Difference in hybridization of carbon atom in C-X bond :
  - In haloalkane, the carbon atom attached to halogen is sp^3 hybridised while in case of haloarene, the carbon atom attached to halogen is sp^2 hybridised.





  - The sp^2 hybridised carbon with a greater s-character is more electronegative and can hold the electron pair of C-X bond more tightly than sp^3 hybridised carbon in haloalkane with less s-charater.

- Thus, C-CI bond length in haloalkane is 177 pm while in haloarenes is 169 pm.
- Since it is difficult to break a shorter bond than a longer bond, therefore, haloarences are less reactive than haloalkanes towards nucleophilic substitution reaction.

➥ (iii) Instability of phenyl cation :

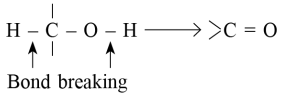
- In case of haloarenes, the phenyl cation formed as a result of self-ionization will not be stabilised by resonance and therefore, SN^1 mechanism is ruled out.

➥ (iv) Repulsion :

- Because of the possible repulsion, it is less likely for the electron rich in nucleophile to approach electron rich arenes.

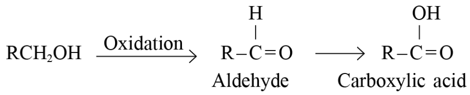
18.

➥ Oxidation : Oxidation of alcohols involves the formation of a carbon oxygen double bond with cleavage of an O-H and C-H bonds.



$$H - \overset{|}{\underset{|}{C}} - O - H \longrightarrow >C = O$$

➥ Such a cleavage and formation of bonds occur in oxidation reactions. These are also known as dehydrogenation reactions as these involve loss of dihydrogen from an alcohol molecule. Depending on the oxidising agent used, a primary alcohol is oxidised to an aldehyde which in turn is oxidised to a carboxylic acid.



$$RCH_2OH \xrightarrow{Oxidation} R-\overset{H}{\overset{|}{C}}=O \longrightarrow R-\overset{OH}{\overset{|}{C}}=O$$

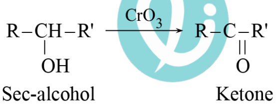
➥ Strong oxidising agents such as acidified potassium permanganate are used for getting carboxylic acids from alcohols directly. CrO_3 in anhydrous medium is used as the oxidising agent for the isolation of aldehydes.

$$RCH_2OH \xrightarrow{CrO_3} RCHO$$

➥ A better reagent for oxidation of primary alcohols to aldehydes in good yield is pyridinium chlorochromate (PCC), a complex of chromium trioxide with pyridine and HCl.

$$CH_3 - CH = CH - CH_2OH \xrightarrow{PCC} CH_3 - CH = CH - CHO$$

➥ Secondary alcohols are oxidised to ketones by chromic anhydride (CrO_3).

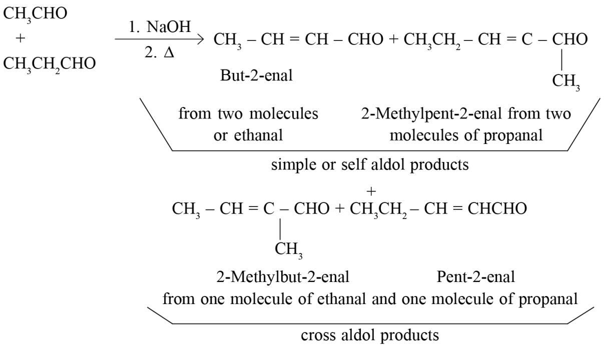


$$R-\underset{\underset{OH}{|}}{CH}-R' \xrightarrow{CrO_3} R-\underset{\underset{O}{||}}{C}-R'$$

➥ Tertiary alcohols do not undergo oxidation reaction. Under strong reaction condition such as strong oxidizing agents ($KMnO_4$) and elevated temperature, cleavage of various C-C bonds place and mixture of carboxylic acid containing lesser number of carbon atoms is formed.

19.

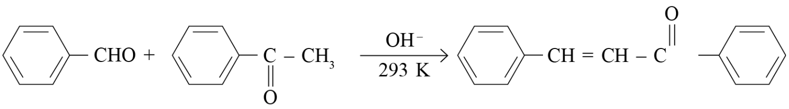
➥ Cross aldol condensation : *"When aldol condensation is carried out between two different aldehydes and / or ketones, it is called cross aldol condensation."* If both of them contain α-hydrogen atoms, it gives a mixture of four products. This is illustrated below by aldol reaction of a mixture of ethanal and propanal.



$$\begin{matrix} CH_3CHO \\ + \\ CH_3CH_2CHO \end{matrix} \xrightarrow[2.\ \Delta]{1.\ NaOH} CH_3 - CH = CH - CHO + CH_3CH_2 - CH = \underset{\underset{CH_3}{|}}{C} - CHO$$

$$+ \; CH_3 - CH = \underset{\underset{CH_3}{|}}{C} - CHO + CH_3CH_2 - CH = CHCHO$$

- Ketones can also be used as one component in the cross aldol reactions.

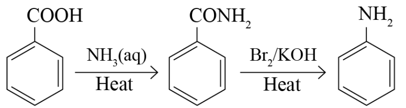


Benzaldehyde Acetophenone

1, 3-Diphenylprop-2-en-1-one
(Benzalacetophenone)
(Major product)

20.

- Since the compound 'C' of molecular formula C_6H_7N formed from 'B' on treatment with Br_2 and KOH, therefore the compound 'B' must be an amide and 'C' must be amine. The only aromatic amine having molecular formula is $C_6H_5NH_2$ (Aniline). Thus, B is benzamine.
- Since 'B' is formed from 'A' with aqueous ammonia and heating, therefore compound 'A' must be benzoic acid.
- Compound A, B, C their structure and IUPAC names are as follows :



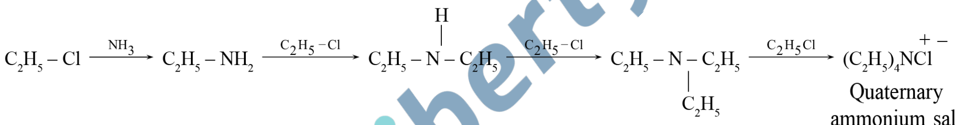
Benzoic Acid (A)

Benzamide (B)

Aniline (C) (C_6H_7N)

21.

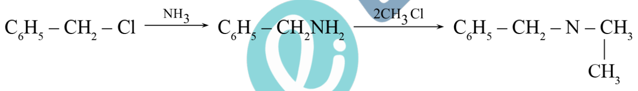
- (i) Reaction of ethanolic NH_3 with C_2H_5Cl



$$C_2H_5-Cl \xrightarrow{NH_3} C_2H_5-NH_2 \xrightarrow{C_2H_5-Cl} C_2H_5-\overset{H}{\overset{|}{N}}-C_2H_5 \xrightarrow{C_2H_5-Cl} C_2H_5-\underset{C_2H_5}{\underset{|}{N}}-C_2H_5 \xrightarrow{C_2H_5Cl} (C_2H_5)_4\overset{+}{N}\overset{-}{Cl}$$

chloroethane Ethanamine N-Ethylethanamine N,N-Diethyl ethanamine Quaternary ammonium salt

(ii) Ammonolysis of benzyl chloride and reaction of amine so formed with two moles of



$$C_6H_5-CH_2-Cl \xrightarrow{NH_3} C_6H_5-CH_2NH_2 \xrightarrow{2CH_3Cl} C_6H_5-CH_2-\underset{CH_3}{\underset{|}{N}}-CH_3$$

Benzylchloride Benzylamine N, N-Dimethylphenylmethanamine

Section C

➢ **Write the answer of the following questions : (Each carries 4 Mark)**

22.

- Benzene – 1 Benzene – 2

$p_1{}^0 = 50.71$ mm Hg $p_2{}^0 = 32.06$ mm Hg

$W_1 = 80$ g $W_2 = 100$ g

$y_1 = (?)$

- Molar mass of Benzene(C_6H_6)

$M_1 = 6(12) + 6(1)$

$= 72 + 6$

$= 78$ g.Mol^{-1}

- Molar mass of toluene($C_6H_5CH_3$)

$$M_2 = 7(12) + 8(1)$$
$$= 84 + 8$$
$$= 92 \text{ g.Mol}^{-1}$$

- Moles of benzene (n_1) = $\frac{W_1}{M_1} = \frac{80}{78} = 1.02$
- Moles of toluene (n_2) = $\frac{W_2}{M_2} = \frac{100}{92} = 1.087$
- Mole-fraction of benzene (x_1) = $\frac{1.02}{1.02 + 1.087} = 0.484$
- Mole-fraction of toluene (x_2) = 1 – 0.484 = 0.515
- According to Raoult's Law

$$p_{\text{Total}} = p_1^0 \,.\, x_1 + p_2^0 \,.\, x_2$$
$$= (50.71)(0.484) + (32.06)(0.515)$$
$$= 24.54 + 16.51$$
$$= 41.05 \text{ mm Hg}$$

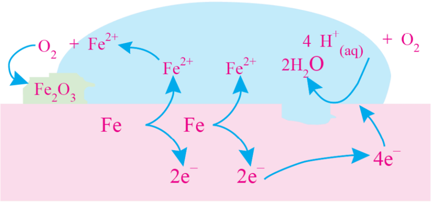
- Mole-fraction of benzene in vapour phase,

$$p_1 = y_1 \cdot p_{\text{Total}}$$
$$\therefore\ p_1^0 \,.\, x_1 = y_1 \cdot p_{\text{Total}}$$
$$\therefore\ \frac{(50.71)(0.484)}{41.05} = y_1$$
$$\therefore\ y_1 = \frac{24.54}{41.05}$$
$$y_1 = 0.6$$

23.

- In corrosion, a metal is oxidised by loss of electrons to oxygen and informal of oxides.
- Corrosion of iron (commonly known as rusting) occurs in presence of water and air.
- At a particular spot of an object made of iron, oxidation takes place and that spot behaves as anode and we can write the reaction.

Anode : $2Fe(s) \rightarrow 2Fe^{2+} + 4e^-$



Oxidation : $Fe(s) \rightarrow Fe^{2+}(aq) + 2e^-$

Reduction : $O_2(g) + 4H^-(aq) + 4e^- \rightarrow 2H_2O(l)$

Atmospheric oxidation :

$$2Fe^{2+}(aq) + 2H_2O(l) + \frac{1}{2} O_2(g) \rightarrow Fe_2O_3(s) + 4H^+(aq)$$

- Electrons released at anodic spot move through the metal and go to another spot on the metal, where they reduce oxygen in presence of H^+ (which is believed to be available from H_2CO_3 formed due to dissolution of carbon dioxide from air into water.

Cathode : $O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$

$E^6_{H+ | O2 | H2O} = 1.23$ V

The overall reaction being :

$2Fe(s) + O_2(g) + 4H^+(aq) \rightarrow 2Fe^{2+}(aq) + 2H_2O(l)$

$E^6_{(cell)} = 1.67V$

- The ferrous ions are further oxidised by atmosphere oxygen to ferric ions which come out as rust in the form of hydrated ferric oxide ($Fe_2O_3 . x\ H_2O$) and with further production of hydrogen ions.

24.

- Suppose,

Order of reaction with respect to A = x

Order of reaction with respect to B = y

$\therefore$ Rate = $k[A]^x[B]^y$

$\therefore r_1 = k[0.1]^x[0.1]^y = 6.0 \times 10^{-3}$ ... ... (1)

$r_2 = k[0.3]^x[0.2]^y = 7.2 \times 10^{-2}$ ... ... (2)

$r_3 = k[0.3]^x[0.4]^y = 2.88 \times 10^{-1}$ ... ... (3)

$r_4 = k[0.4]^x[0.1]^y = 2.40 \times 10^{-2}$ ... ... (4)

Dividing (4) and (1) we get,

- $\frac{r_4}{r_1} = \frac{k[0.4]^x[0.1]^y}{k[0.1]^x[0.1]^y} = \frac{2.40 \times 10^{-2}}{6.0 \times 10^{-3}} = 4$

$\therefore \frac{r_4}{r_1} = [4]^x = [4]^1$

$\therefore x = 1$

- Order of reaction with respect to A = 1

Dividing (3) and (2) we get,

$\frac{r_3}{r_2} = \frac{k[0.3]^x[0.4]^y}{k[0.3]^x[0.2]^y} = \frac{2.88 \times 10^{-1}}{7.2 \times 10^{-2}} = 4$

$\therefore \frac{r_3}{r_2} = [2]^y = 4 = [2]^2$

$\therefore y = 2$

$\therefore$ order of reaction with respect to A = 1

- order of reaction with respect to B = 2
- overall order of reaction = 3

$\therefore$ rate equation,

Rate = $k[A]^1[B]^2$

- Calculation of rate constant k

From equation (1)

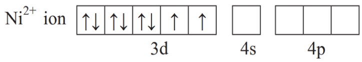
- $r_1 = k[0.1]^1[0.1]^2 = 6.0 \times 10^{-3}$

$k = \frac{6.0 \times 10^{-3}}{[0.1]^1[0.1]^2} = \frac{6.0 \times 10^{-3}}{[10]^{-1}[10]^{-2}}$

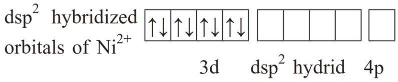
$= 6.0\ mol^{-2}\ L^{-2}\ min^{-1}$

25.

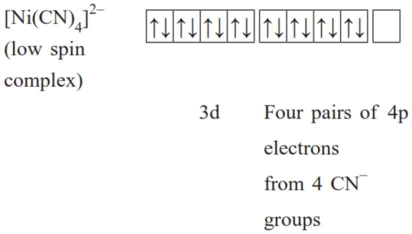
- In $[Ni(CN)_4]^{2-}$ nickel is in +2 oxidation state and has the electronic configuration.



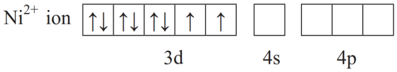
- Here, CN^- is strong ligand so electrons of 3d orbital gets paired so hybridization involved is dsp^2



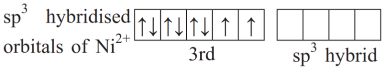
- Each of the hybridized orbitals receives a pair of electrons from a cyanide ion.

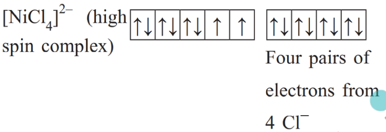


- The compound is diamagnetic as evident from the absence of unpaired electron, and square planar complexes.
- In $[NiCl_4]^{2-}$ nickel is in +2 oxidation state and has the electronic configuration



- Cl^- is weak ligand so electron does not get paired.
- In tetrahedral complexes one s and three p orbitals are hybridized to form four equivalent orbitals oriented tetrahedrally.





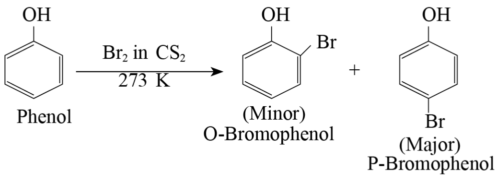
- Each Cl^- ion donates a pair of electrons. The compound is paramagnetic since, it contains two unpaired electrons, and tetrahedral complex.

26.

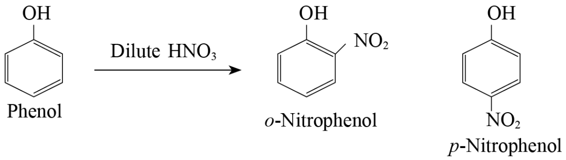
- (i) Oxidation of propan-1-ol with alkaline $KMnO_4$ solution.

$$CH_3CH_2CH_2OH + 2[O] \xrightarrow[\text{Oxidation}]{\text{Alk.KMnO}_4} CH_3CH_2COOH + H_2O$$

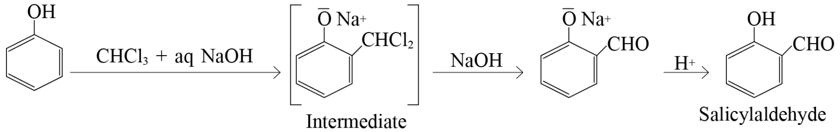
(ii) Bromine in CS_2 with phenol.



(iii) Dilute HNO_3 with phenol.

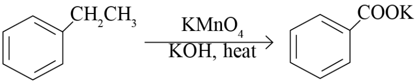


(iv) Treating phenol with chloroform in presence of aqueous NaOH.

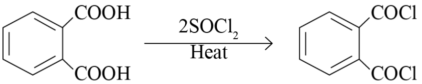

OH
CHCl₃ + aq NaOH
Ō Na⁺
CHCl₂
Intermediate
NaOH
Ō Na⁺
CHO
H⁺
OH
CHO
Salicylaldehyde

27.

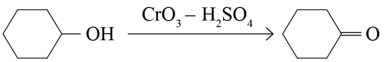
➥ (i)


CH₂CH₃
KMnO₄
KOH, heat
COOK

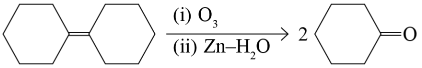
➥ (ii)


COOH
COOH
2SOCl₂
Heat
COCl
COCl

➥ (iii)


OH
CrO₃ – H₂SO₄
O

➥ (iv)


(i) O₃
(ii) Zn–H₂O
2
O