LIBERTY PAPER SET

STD. 12 : Chemistry

Full Solution

Time : 3 Hours **ASSIGNTMENT PAPER 15**

Part A

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

Part B

Section A

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

1.

- $I = 1.5$ A

  $t = 10$ min

  $= 10 \times 60$ sec

  $= 600$ sec

  Quantity of electricity $Q = I \times t$

  $= 1.5 \times 600$

  $= 900$ C

- $$F = \frac{900}{96500} = 0.009326 \text{ F}$$

- cathode = $Cu^{2+} + 2e^{-} \rightarrow Cu$

  2F gives 1 mol copper

  $\therefore$ 2F gives → 63.5 g copper

  $\therefore$ 0.009326 F give (?)

  $$W_{Cu} = \frac{0.009326 \times 63.5}{2} = 0.296 \text{ g}$$

2.

- Molecularity of a reaction : The number of reacting species (atoms, ions or molecules) taking part in an elementary reaction, which must collide simultaneously in order to bring about a chemical reaction is called molecularity of a reaction.
- For elementary reaction, order of a reaction and molecularity of a reaction are same.
- The reaction can be unimolecular when one reacting species is involved. For example decomposition of ammonium nitrite.

  $NH_4NO_2 \rightarrow N_2 + 2H_2O$
- Bimolecular reactions involve simultaneous collision between two species, for example, dissociation of hydrogen iodide. $2HI \rightarrow H_2 + I_2$
- Trimolecular or tetramolecular reactions involve simultaneous collision between three reacting species, for example, $2NO + O_2 \rightarrow 2NO_2$
- The probability that more than three molecules can collide and react simultaneously is very small. Hence, the reaction with the molecularity three are very rare and slow to proceed.

3.

- Lanthanoids primarily show three oxidation states (+2, +3, +4).
- Among these oxidation states, +3 state is the most common. Lanthanoids display a limited number of oxidation states because the energy difference between 4f, 5d, and 6s orbitals is quite large.
- On the other hand, the energy difference between 5f, 6d, and 7s orbitals is very less. Hence, actinoids display a large number of oxidation states.
- For example, uranium and plutonium display +3, +4, +5, and +6 oxidation states while neptunium displays +3, +4, +5, +7. The most common oxidation state in case of actinoids is also +3.

4.

- (i) Transition metals show paramagnetic behaviour. Paramagnetism arises due to the presence of unpaired electrons with each electron having a magnetic moment associated with its spin angular momentum and orbital angular momentum.
  - However, in the first transition series, the orbital angular momentum is quenched. Therefore, the resulting paramagnetism is only because of the unpaired electron.
  - Magnetic moment is culculated by following formula.

    $\propto = \sqrt{n(n+2)}$ B.M.

    where n = No. of unpaired electron

- (ii) Transition elements have high effective nuclear charge and a large number of valence electrons. Therefore, they form very strong metallic bonds. As a result, the ethalpy of atomization of transition metals in high.
- (iii) Most of the complexes of transition metals are coloured. This is because of the absorption of radiation from visible light region to promote an electron from one of the d-orbitals to another.
  - In the presence of ligands, the d-orbitals split up into two sets of orbitals having different energies. Therefore, the transition of electrons can take place from one set to another.
  - The energy required for these transitions is quite small and falls in the visible region of radiation. The ions of transition metals absorb the radiation of a particular wavelength and the rest is reflected, imparting colour to the solution.
- (iv) The catalytic activity of the transition elements can be explained by two basic facts.

  (a) Owing to their ability to show variable oxidation states and form complexes, transition metals form unstable intermediate compounds. Thus, they provide a new path with lower activation energy, E_a, for the reaction.

  (b) Transition metals also provide a suitable surface for the reactions to occur.

  e.g. V_2O_5 in contact process, Fe in Haber's process.

5.

- (i) It involves a number of assumptions.

  (ii) It does not give quantitative interpretation of magnetic data.

  (iii) It does not explain the colour exhibited by coordination compounds.

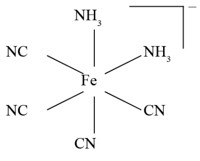
  (iv) It does not give a quantitative interpretation of the thermodynamic or kinetic stabilities of coordination compounds.

  (v) It does not make exact predictions regarding the tetrahedral and square planar structures of 4-coordinate complexes.

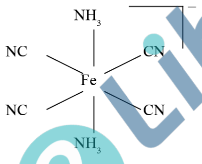
  (vi) It does not distinguish between weak and strong ligands.

6.

- Solution :

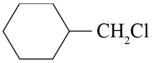


cis



trans

7.

- 

  It is primary halide and therefore undergoes S_N2 reaction faster.

- 

  As iodine is a better leaving group because of its large size, it will be released at a faster rate in the presence of incoming nucleophile.

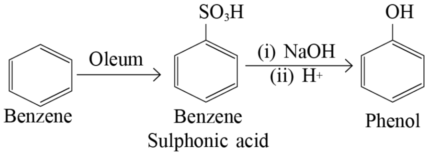
8.

- **But-l-ene to n-butyliodide**

$$\underset{\text{but-1-ene}}{CH_3-CH_2-CH=CH_2} \xrightarrow[\text{Peroxide}]{\text{HBr}} \underset{\text{1-Bromobutane}}{CH_3-CH_2-CH_2-CH_2-Br} \xrightarrow[\text{Dry Acetone}]{\text{NaI} \atop -\text{NaBr}} \underset{\text{1-Iodobutane}}{CH_3-CH_2-CH_2-CH_2-I}$$

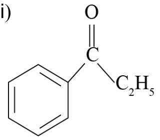
9.

- From benzenesulphonic acid :
  - Benzene is sulphonated with oleum and benzene sulphonic acid so formed is converted to sodium phenoxide on heating with molten sodium hydroxide. Acidification of the sodium salt gives phenol.

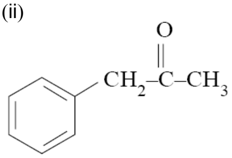


10.

- (i)

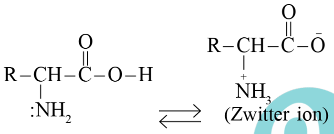


- (ii)



11.

- 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 acid 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."*
- This is neutral but contains both positive and negative charges.



$$R-\underset{:NH_2}{CH}-\overset{O}{\overset{\|}{C}}-O-H \rightleftharpoons R-\underset{\overset{+}{N}H_3}{CH}-\overset{O}{\overset{\|}{C}}-\overset{-}{O}$$

(Zwitter ion)

- In zwitter ionic form, amino acids show amphoteric behaviour as they react both with acids and bases.

12.

- *"Protein found in a biological system with a unique 3-D structure and biological activity is called a native protein."*
- When a protein in its native form, 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.
- The coagulation of egg white on boiling is a common example of denaturation. Another example is curdling of milk is caused due to the formation of lactic acid by the bacteria present in milk.

Section B

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

13.

- Cane Sugar : 5% W/W

➥ $W_2 = 5\ g$ $\quad W_1 = 95\ g$

$M_2 = 342\ g/Mol$ $\quad T_f = 271\ K,$ $\quad T_f^0 = 273.15\ K$

$\Delta T_f = T_f^0 - T_f$

$= 273.15 - 271$

$= 2.15\ K$

$$\Delta T_f = K_f \cdot \frac{W_2 \times 1000}{M_2 \times W_1}$$

$$\therefore K_f = \frac{\Delta T_f \times M_2 \times W_1}{W_2 \times 1000}$$

$$= \frac{2.15 \times 342 \times 95}{5 \times 1000}$$

$K_f = 13.97\ K.kg.Mol^{-1}$

➥ glucose : 5% W/W

$W_2 = 5g\ W_1 = 95\ g$

$M_2 = 180\ g.Mol^{-1}\ \Delta T_f = (?)$

$$\Delta T_f = K_f \cdot \frac{W_2 \times 1000}{M_2 \times W_1}$$

$$= 13.97 \times \frac{5 \times 1000}{180 \times 95}$$

$\Delta T_f = 4.08\ K$

$\therefore \Delta T_f = T_f^0 - T_f$

$\therefore 4.08 = 273.15 - T_f$

$\therefore T_f = 273.15 - 4.08$

$= 269.06\ K$

14.

➥ $2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$

$E^0_{cell} = 0.236\ V,\ \Delta_rG^6 = ?,\ K = ?$

(1) $\Delta_rG^6 = -nF\ E^0_{cell}$

$= -2 \times 96487 \times 0.236$

$= -45542\ J$

$= -45.54\ kJ$

(2) $\Delta_rG^6 = -2.303\ RT\ \log K_C$

$-45542 = -2.303 \times 8.314 \times 298 \times \log K_C$

$\therefore \log K_C = 7.9816$

$\therefore K_C = \text{Antilog}\ (7.9816) = 9.6 \times 10^7$

15.

➥ Arrhenius equation,

➥ $$\log k = \log A - \frac{E_a}{2.303RT}$$

$$\therefore \log A = \log k + \frac{E_a}{2.303RT}$$

➥ Here, $T = 546\ K,\ k = 2.418 \times 10^{-5}\ s^{-1}$

$E_a = 179.9\ kJ/mol = 179900\ J/mol$

$A = ?$

$$\therefore \log A = \log 2.418 \times 10^{-5} + \frac{179900}{2.303 \times 8.314 \times 546}$$

$$\therefore \log A = \log 2.418 + \log 10^{-5} + 17.2082$$

$$\therefore \log A = 0.3834 - 5.0 + 17.2082$$

$$\therefore \log A = 12.5917$$

$$\therefore A = \text{antilog } 12.5917 = 3.9057 \times 10^{12}\ \text{sec}^{-1}.$$

16.

- Dichromates are generally prepared from chromate. which in turn are obtained by the fusion of chromite ore ($FeCr_2O_4$) with sodium or potassium carbonate in free access of air.
- The reaction with sodium carbonate occurs as follows

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

- The yellow solution of sodium chromate is filtered and acidified with sulphuric acid to give a solution from which orange sodium dichromate, $Na_2Cr_2O_7$. $2H_2O$ can be crystallised.

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

- Sodium dichromate is more soluble than potassium dichromate. The latter is therefore, prepared by treating the solution of sodium dichromate with potassium chloride.

$$Na_2Cr_2O_7 + 2\ KCl \rightarrow K_2Cr_2O_7 + 2\ NaCl$$

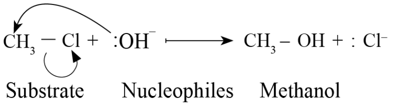
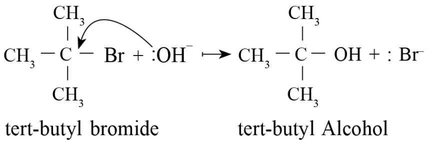
- Orange crystals of potassium dichromate crystallise out.
- The chromates and dichromates are interconvertible in aqueous solution depending upon pH of the solution.

$$2\ CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$$

$$Cr_2O_7^{2-} + 2\ OH^- \rightarrow 2\ CrO_4^{2-} + H_2O$$

17.

-

	SN^2 Reaction	SN^1 Reaction
1	SN^2 reaction means it is bimolecular nucleophilic substitution reaction.	SN^1 reaction means it is unimolecular nucleophilic substitution reaction.
2	The rate of SN^2 reaction depends on the concentration of Substrate and Nucleophiles both. Rate = $K\ [S]^1 \cdot [Nu]^1$	The rate of SN^1 reaction depends on the concentration of Substrate on.Rate = $K\ [S]^1$
3	SN^2 reaction follow second order kinetics.	SN^1 reaction follows first order kinetics.
4	The reaction of chloromethane and hydroxide ion gives methanol and chloride ion is example of SN^2 reaction.  	The reaction of tert-butyl bromide with hydroxide ion gives tert-butyl alcohol is example of SN^1 reaction. 
5	SN^2 reaction complete in a single step without formation of an intermediate.	SN^1 reaction complete in two steps. Step 1 : Formation of carbocation by cleavage of C – X in haloalkane Step 2 : Attack of nucleophiles on carbocation to form product.
6	Reactivity order :	Reactivity order

	CH_3-X > 1°– halide > 2°– halide > 3°– halide	1°– halide > 2°– halide > 3°– halide > CH_3-X
7	SN^2 reaction shows inversion of configuration.	SN^1 reaction shows reacemic mixture.

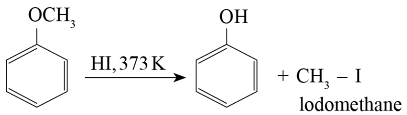
18.

➥ (i) 1-propoxypropane :

$$CH_3CH_2CH_2OCH_2CH_2CH_3 \xrightarrow[373\,K]{HI} CH_3CH_2CH_2-OH + CH_3CH_2CH_2I$$

1-propoxypropane propan-1-ol 1-iodopropane

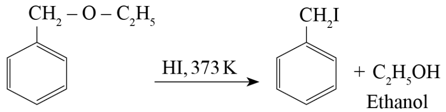
➥ (ii) methoxybenzene :



Iodomethane

Methoxybenzene phenol

➥ (iii) benzyl ethyl ether :



Ethanol

benzyl ethyl ether benzyliodide

19.

➥ A is an organic compound with a molecular formula $C_8H_{16}O_2$. This gives a carboxylic acid (B) and alcohol (C) on hydrolysis with dilute sulphuric acid. Thus, compound A must be an ester.

➥ Further, oxidation of alcohol (C) with chromic acid gives acid B. Thus, B and C must contain an equal number of carbon atoms.

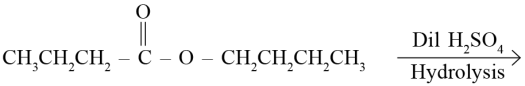
➥ A total of 8 carbon atoms are present in compound A, each of B and C contain 4 carbon atoms.

➥ Again, alcohol C gives but-1-ene on dehydration. Therefore, C is of straight-chain and hence, it is butan-1-ol.

➥ On oxidation, Butan-1-ol gives butanoic acid. Hence, acid B is butanoic acid.

➥ Hence, the ester with molecular formula $C_8H_{16}O_2$ is butylbutanoate.

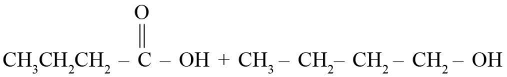
➥ All the given reactions can be explained by the following equations.



$$CH_3CH_2CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-O-CH_2CH_2CH_2CH_3 \xrightarrow[Hydrolysis]{Dil\ H_2SO_4}$$

Butylbutanoate (A)

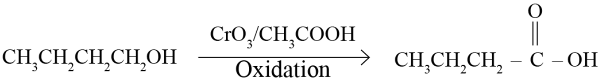
Molecular formula = $C_8H_{16}O_2$



$$CH_3CH_2CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-OH + CH_3-CH_2-CH_2-CH_2-OH$$

Butanoic acid Butan-1-ol

(B) (C)



$$CH_3CH_2CH_2CH_2OH \xrightarrow[Oxidation]{CrO_3/CH_3COOH} CH_3CH_2CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-OH$$

Butan-1-ol Butanoic acid

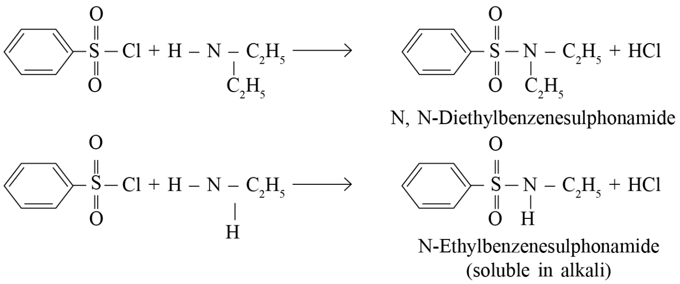
(C) (B)

$$CH_3CH_2CH_2CH_2OH \xrightarrow[-H_2O]{Dehydration} CH_3CH_2CH=CH_2$$

But-1-ene

20.

- Benzenesulphonyl chloride ($C_6H_5SO_2Cl$) which is also known as Hinsberg's reagent, reacts with primary and secondary amines to form sulphonamides.
- (a) The reaction of benzene sulphonylchloride with primary amine yields N-ethyl benzenesulphonyl amide.
  - The hydrogen attached to nitrogen in sulphonamide is strongly acidic due to the presence of strong electron withdrawing sulphonyl group. Hence it is soluble in alkali.
- (b) In the reaction with secondary amine, N, N-diethyl benzene sulphonamide is formed.



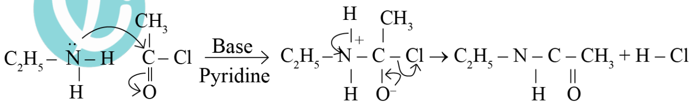
N, N-Diethylbenzenesulphonamide

N-Ethylbenzenesulphonamide (soluble in alkali)

  - Since, N, N-diethylbenzene sulphonamide does not contain any hydrogen atom attached to nitrogen atom, it is not acidic and hence, it insoluble in alkali.
- (c) Tertiary amines do not react with benzenesulphonyl chloride. This property of amines reacting with benzenesulphonyl chloride in a different manner is used for the distinction of primary, secondary, and tertiary amines and also for the separation of a mixture of amines. However these days benzenesulphonyl chloride is replaced by p-toluenesulphonyl chloride. (PTS)

21.

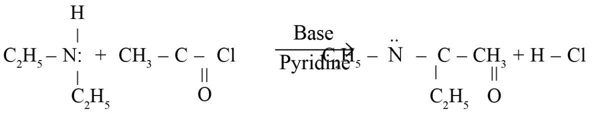
- *"Aliphatic and aromatic primary and secondary amines react with acid chlorides, anhybrides and esters by nucleophilic substitution reaction. This reaction is known as acylation."*
- This reaction is the replacement of hydrogen atom of $-NH_2$ and $>N-H$ of group by the acyl group.
- The reaction is carried out in the presence of a base stronger than the amine like pyridine, which removes the formed HCl and shifts the equilibrium to the right hand side.



$$\underset{H}{C_2H_5-\ddot{N}-H}\quad \overset{CH_3}{\underset{\overset{\parallel}{O}}{C}}-Cl \xrightarrow[\text{Pyridine}]{\text{Base}} C_2H_5-\overset{H}{\underset{H}{\overset{+}{N}}}-\overset{CH_3}{\underset{O^-}{C}}-Cl \rightarrow C_2H_5-\underset{H}{N}-\underset{\overset{\parallel}{O}}{C}-CH_3+H-Cl$$

Ethanamine

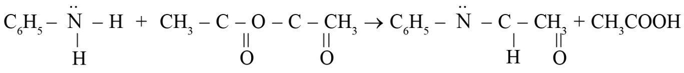
N-Ethylethanamide



$$C_2H_5-\overset{H}{\underset{C_2H_5}{N:}} + CH_3-\underset{\overset{\parallel}{O}}{C}-Cl \xrightarrow[\text{Pyridine}]{\text{Base}} C_2H_5-\underset{C_2H_5}{\ddot{N}}-\underset{\overset{\parallel}{O}}{C}-CH_3+H-Cl$$

N-Ethylethanamine

N-Ethylethanamide



$$C_6H_5-\underset{H}{\ddot{N}}-H + CH_3-\underset{\overset{\parallel}{O}}{C}-O-\underset{\overset{\parallel}{O}}{C}-CH_3 \rightarrow C_6H_5-\underset{H}{\ddot{N}}-\underset{\overset{\parallel}{O}}{C}-CH_3+CH_3COOH$$

Benzenamine Ethanoic anhydride N-Methyl benzamide

- Amines also react with benzoyl chloride (C_6H_5COCl) this reaction is known as benzoylation.

$$CH_3NH_2 + C_6H_5COCl \rightarrow CH_3NHCOC_6H_5 + HCl$$

Methanamine Benzoyl chloride N-methylbenzamide

Section C

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

22.

➥ $W_2 = 19.5$ g $W_1 = 500$ g

$M_2 = 78\ \text{g.Mol}^{-1}$ $\Delta T_f = 1.0°$ C

$K_f = 1.86\ \text{K.kg.Mol}^{-1}$

$i = (?)$ Ka = (?)

$$\Delta T_f = i \,.\, K_f \,.\, \frac{W_2 \times 1000}{M_2 \times W_1}$$

$$\therefore\ i = \frac{\Delta T_f \times M_2 \times W_1}{K_f \times W_2 \times 1000}$$

$$= \frac{1 \times 78 \times 500}{1.86 \times 19.5 \times 1000}$$

$$\therefore\ i = 1.07526$$

$$\propto = \frac{i-1}{n-1}$$

$$\therefore\ \propto = \frac{1.07526-1}{2-1}$$

$$\therefore\ \propto = 0.07526$$

$$\text{C (Molality)} = \frac{W_2 \times 1000}{M_2 \times W_1}$$

$$= \frac{19.5 \times 1000}{76 \times 500}$$

$$= 0.5131$$

$$\text{Ka} = \frac{\alpha^2 \cdot C}{1-\alpha}$$

$$= \frac{(0.07526)^2 \cdot (0.5131)}{1-0.07526}$$

$$= \frac{0.00290}{0.9247}$$

$$= 0.00313$$

$$\text{Ka} = 3.1 \times 10^{-3}$$

23.

➥ $2Cr(s) + 3Cd^{2+}(aq) \rightarrow 2Cr^{3+}(aq) + 3Cd$

$E^0_{Cr+3\,|\,Cr} = -0.74V$, $E^0_{Cd+2\,|\,Cd} = -0.40$ V

➠ Calculate standard potential

$E^0_{cell} = E^0_{Cd+2\,|\,Cd} - E^0_{Cr+3\,|\,Cr}$

$= -0.40 - (-0.74)$

$= 0.34$ V

➠ Calculate Gibbs energy

$\Delta_r G^6 = -nF\, E^0_{cell}$

$= -6 \times 96500 \times 0.34$

$= -196860$ C.V.

$= -196860$ J

$= -196.86$ kJ

- Calculate Equilibrium constant

$\Delta_r G^6 = -2.303\ RT \log K_C$

$\therefore \log K_C = \dfrac{-196.86}{-2.303 \times 8.314 \times 298}$

$\therefore \log K_C = 34.501$

$\therefore K_C = \text{Antilog of } (34.501)$

$\therefore K_C = 3.17 \times 10^{34}$

24.

- Decomposition reaction of SO_2Cl_2,

	$SO_2Cl_2(g)$	$\rightarrow$	$SO_2(g)$	+	$Cl_2(g)$
Pressure at time t = 0 s	p_i atm		0 atm		0 atm
Pressure at time t	$p_i - x$ atm		x atm		x atm

- p_i is initial pressure at time t = 0 s

$\therefore$ Total pressure at time t,

$p_t = p_i - x + x + x = p_i + x$

$\therefore x = p_t - p_i$

$\therefore p_{(SO2Cl2)} = p_i - x = p_i - (p_t - p_i) = 2p_i - p_t$ atm.

For experiment - 1

- At time t = 0 s, Initial pressure $p_i = 0.5$atm

At time t = 100 s, $p_{(SO2Cl2)} = 2p_i - p_t$

$= 2 \times 0.5 - 0.6$

$= 0.4$ atm

- For first order reaction,

$\therefore k = \dfrac{2.303}{t} \log \dfrac{p_i}{p_{SO_2Cl_2}}$

$= \dfrac{2.303}{100} \log \dfrac{0.5}{0.4}$

$= \dfrac{2.303}{100} \times 0.0969$

$\therefore k = 2.2318 \times 10^{-3}\ \text{sec}^{-1}$

For experiment-2

- At time t = 0 s, Initial pressure $p_i = 0.5$ atm

$p_{SO2Cl2} = 2p_i - p_t = 2 \times 0.5 - 0.65 = 0.35$ atm

$\therefore \text{rate} = k \cdot p_{SO2Cl2}$

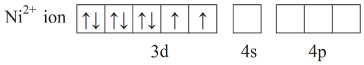
$= 2.2318 \times 0.35 \times 10^{-3}\ \text{sec}^{-1}$

$= 0.78113 \times 10^{-3}$

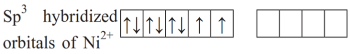
$= 7.8113 \times 10^{-4}\ \text{atm. sec}^{-1}$

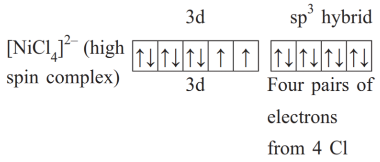
25.

- In $[NiCl_4]^{2-}$ nickel is in +2 oxidation state and has the electronic configuration

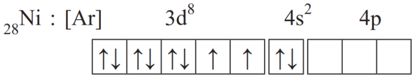


- Cl^- is weak ligand so electron does not get paired.
- In tetrahedral complexes one s and three p orbitals are hybridized to form four equivalent orbitals oriented tetrahedrally.

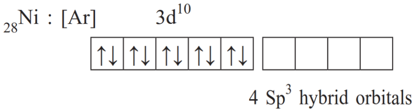




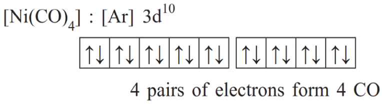
- Each Cl^- ion donates a pair of electrons. The compounds paramagnetic since, it contains two unpaired electrons, and tetrahedral complex.
- In $[Ni(CO)_4]$ Ni is in the zero oxidation state. It's Electronic configuration is



- But CO is a strong field ligand. Therefore, it causes the pairing of unpaired 3d electrons. Also, it causes the 4s electrons to shift to the 3d orbital, thereby giving rise to sp^3 hybridization.



- Each CO donate electron pair to Sp^3 hybrid orbital.



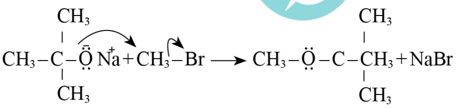
- Since no unpaired electrons are present in this case, $[Ni(CO)_4]$ is diamagnetic.

26.

- It is an important laboratory method for the preparation of symmetrical and unsymmetrical ethers. In this method, an alkyl halide is allowed to react with sodium alkoxide.

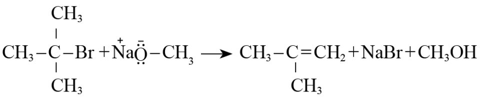
$$R - X + R' - \ddot{O} - Na \rightarrow R - \ddot{O} - R' + Na\ X$$

- Ethers containing substituted alkyl groups (secondary or tertiary) may also be prepared by this method. The reaction involves S_N2 attack of an alkoxide ion on primary alkyl halide.



$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-\ddot{O}\overset{+}{Na}+CH_3-Br \longrightarrow CH_3-\ddot{O}-\underset{CH_3}{\overset{CH_3}{C}}-CH_3+NaBr$$

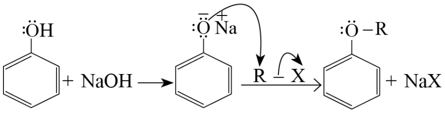
- Better results are obtained if the alkyl halide is primary. In case of secondary and tertiary alkyl halides, elimination competes over substitution. If a tertiary alkyl halide is used, an alkene is the only reaction product and no ether is formed. For example, the reaction of CH_3ONa with $(CH_3)_3C–Br$ gives exclusively 2-methylpropene.



$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Br+\overset{+}{Na}\ddot{O}-CH_3 \longrightarrow CH_3-\underset{CH_3}{C}=CH_2+NaBr+CH_3OH$$

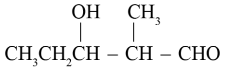
2–Methylpropene

- It is because alkoxides are not only nucleophiles but strong bases as well. They react with alkyl halides leading to elimination reactions.
- Phenols are also converted to ethers by this method. In this, phenol is used as the phenoxide moiety.



27.

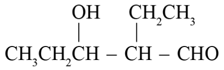
➥ (a) Propanal acts as both nucleophile as well as electrophile.



$$\mathrm{CH_3CH_2CHO + CH_3CH_2CHO \longrightarrow CH_3CH_2\overset{\overset{OH}{|}}{CH}-\overset{\overset{CH_3}{|}}{CH}-CHO}$$

3-Hydroxy-2-methylpentanal

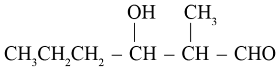
(b) Propanal as electrophile and butanal as nucleopile.



$$\mathrm{CH_3CH_2CHO + CH_3CH_2CH_2CHO \longrightarrow CH_3CH_2\overset{\overset{OH}{|}}{CH}-\overset{\overset{CH_2CH_3}{|}}{CH}-CHO}$$

2-Ethyl-3-hydroxypentanal

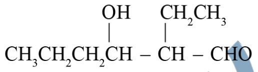
(c) Butanal as electrophile and propanal as nucleophile.



$$\mathrm{CH_3CH_2CH_2CHO + CH_3CH_2CHO \longrightarrow CH_3CH_2CH_2-\overset{\overset{OH}{|}}{CH}-\overset{\overset{CH_3}{|}}{CH}-CHO}$$

3-Hydroxy-2-methylhexanal

(d) Butanal acts as both nucleophile as well as an electrophile.



$$\mathrm{CH_3CH_2CH_2CHO + CH_3CH_2CH_2CHO \longrightarrow CH_3CH_2CH_2\overset{\overset{OH}{|}}{CH}-\overset{\overset{CH_2CH_3}{|}}{CH}-CHO}$$

2-Ethyl-3-hydroxy hexanal