

MODEL PAPER – 3

Time : 3 Hours + 15 Minutes]

[Total Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

- Candidates are required to give their answers in their own words as far as practicable.
- Figure in the right hand margin indicate full marks.
- While answering the questions, candidate should adhere to the word limit as far as practicable.
- 15 Minutes of extra time has been allotted for the candidates to read the questions carefully.
- This question paper is divided into two sections—SECTION – A and SECTION – B.
- In SECTION – A there are 70 Objective Type Question, out of which only 35 objective questions be answered. Darken the circle with blue/black ball pen against the correct option on OMR Sheet provided to you. Do not use Whitener/Liquid/Blade/ Nail on OMR paper, otherwise the result will be invalid.
- In SECTION – B, there are 20 Short Answer Type Question (each carrying 2 marks), out of which any 10 questions are be answered.
Apart from this, there are 6 Long Answer Type Question (Each Carrying 5 marks), out of which 3 questions are to be answered.
- Use of any electronic device is prohibited.

SECTION – A : Objective Type Questions

Directions : There are 70 Objective Type Questions, out of which only 35 objectives questions to be answered. For each question, mark the correct option on the OMR answer sheet.
35 × 1 = 35

- Which of the following is not an ideal solution ?
(A) Benzene + Toluenes
(B) Methyl alcohol + Ethyl alcohol
(C) Chloroform + Acetone
(D) Carbon tetrachloride + Silicone tetrachloride
- By which of the following processes colloidal sols are purified ?
(A) Peptisation
(B) Coagulation
(C) Dialysis
(D) Flocculation
- The process of reduction of a metal oxide by carbon or carbon monoxide to the metal is called :
(A) Smelting
(B) Roasting
(C) Calcination
(D) Leaching
- In which of the following oxidation state of oxygen is + 2 ?
(A) F₂O
(B) Cl₂O
(C) Na₂O₂
(D) Na₂O
- The oxidation number of Pt in [Pt(C₂H₄)Cl₃]⁻ is :
(A) +1
(B) +2
(C) +3
(D) +4
- Alkyl halides are used for the preparation of which of the following ?
(A) Alkane
(B) Alkene
(C) Alcohol
(D) All of these
- Which of the following is ether ?
(A) $\begin{matrix} R \\ | \\ H-C=O \end{matrix}$
(B) $\begin{matrix} R \\ | \\ R-C=O \end{matrix}$
(C) $\begin{matrix} R \\ | \\ R-O \end{matrix}$
(D) $\begin{matrix} R \\ | \\ HO-C=O \end{matrix}$
- The IUPAC name of $\begin{matrix} OH \\ | \\ CH_3-CH-COOH \end{matrix}$ is :
(A) Lactic acid
(B) 2-Hydroxy propanoic acid
(C) Propanoic acid
(D) None of these
- The IUPAC name of $\begin{matrix} CH_3-CH-CH_3 \\ | \\ NH_2 \end{matrix}$ is :
(A) Propyl amine
(B) Isopropyl amine
(C) Propan-2-amine
(D) Propan-1-amine
- Which of the following diseases is caused due to the deficiency of Vitamin E ?
(A) Beri-beri
(B) Scurvy
(C) Anti-fertility
(D) None of these
- Which of the following oxides shows ferro-magnetism ?
(A) CrO₂
(B) MnO₂
(C) Fe₃O₃
(D) V₂O₅
- In which of the following pairs of structure are tetrahedral as well as octahedral voids respectively ?
(A) bcc and fcc
(B) hcp and simple cubic
(C) hcp and ccp
(D) bcc and hcp
- Which of the following is an amorphous solid ?
(A) Graphite (C)
(B) Quartz glass (SiO₂)
(C) Chrome alum
(D) Silicon carbide (SiC)
- Which of the following equations represents osmotic pressure ?
(A) $P = CRT$
(B) $P = \frac{CT}{R}$
(C) $P = \frac{RC}{T}$
(D) $P = \frac{RT}{C}$

15. If 2 gm of NaOH is present in 200 ml of its solution, its molarity will be :
 (A) 0.25 (B) 0.5
 (C) 5 (D) 10
16. pH of pure water is :
 (A) 1 (B) 4
 (C) 3 (D) 7
17. Osmotic pressure can be increased by :
 (A) Increasing temperature (B) decreasing temperature
 (C) increasing volume (D) none
18. The cell which involves the conversion of chemical energy into electrical energy is called :
 (A) Electrolytic cell (B) Galvanic cell
 (C) Conductivity cell (D) All of these
19. Faraday's second law of electrolysis is related to :
 (A) Atomic number of cation
 (B) Speed of cation
 (C) Speed of anion
 (D) Equivalent weight of electrolyte
20. One Faraday electricity equal to how much Coulombs ?
 (A) 96550 (B) 96500
 (C) 96000 (D) 95500
21. Tyndall effect is not found is :
 (A) sugar solution
 (B) colloidal solution of gold
 (C) suspension
 (D) emulsion
22. In physical adsorption the approximate heat energy evolved in kJ/mol is :
 (A) 20-40 (B) 40-60
 (C) 60-80 (D) 40-400
23. Which of the following is an example of solid-solid system ?
 (A) Smoke (B) Cake
 (C) Synthetic gems (D) Pumice stone
24. Which one of the following is not an ore of zinc ?
 (A) Zinc blende (B) Calamine
 (C) Zincite (D) Bauxite
25. When a metal oxide is heated with carbon, then metal is formed, $M_xO_y + yC \rightarrow xM + yCO$, here carbon acts as :
 (A) oxidising agent (B) Reducing agent
 (C) Stabilizer (D) None of these
26. Ore of aluminium is :
 (A) bauxite (B) hematite
 (C) dolomite (D) None of these
27. The process of smelting involves reduction of metal oxide with :
 (A) Al (B) C
 (C) Mg (D) CO
28. The formula of blue vitriol is :
 (A) $CuSO_4$ (B) $CuSO_4 \cdot 5H_2O$
 (C) $CaSO_4 \cdot 2H_2O$ (D) None
29. The largest bond angle is found in which of the following ?
 (A) H_2O (B) PH_3
 (C) H_2S (D) NH_3
30. Element found from sea water is :
 (A) Magnesium (B) Sodium
 (C) Iodine (D) none of these
31. Which one of the following element is liquid at normal temperature ?
 (A) zinc (B) mercury
 (C) bromine (D) water
32. Which of the following is the strongest oxidising agent?
 (A) F_2 (B) Cl_2
 (C) I_2 (D) Br_2
33. Which of the following is a tetrabasic acid ?
 (A) Hypophosphorous acid (H_3PO_2)
 (B) Metaphosphoric acid (HPO_3)_n
 (C) Pyrophosphoric acid ($H_4P_2O_7$)
 (D) Orthophosphoric acid (H_3PO_4)
34. Chlorine reacts with excess of ammonia to form :
 (A) NH_4Cl (B) $N_2 + HCl$
 (C) $N_2 + NH_4Cl$ (D) $N_2 + NCl_3$
35. The formula of Nitric acid is :
 (A) HNO_3 (B) $H_2N_2O_2$
 (C) HNO_2 (D) HNO_4
36. Group I element of Periodic Table are known as :
 (A) Alkali metals (B) Alkaline earth metals
 (C) Inert gases (D) None
37. The strongest acid is :
 (A) $HClO_4$ (B) $HClO_3$
 (C) $HClO_2$ (D) $HClO$
38. What is the oxidation state of sulphur in SF_6 ?
 (A) +6 (B) -6
 (C) +4 (D) -4
39. Number of σ and π bonds in C_2 molecule is/are :
 (A) 1σ and 1π (B) 1σ and 2π
 (C) 2π only (D) 1σ and 3π
40. Copper is a member of :
 (A) First transition series (B) Second transition series
 (C) Third transition series (D) Fourth transition series
41. Which one of the following is called green vitriol ?
 (A) $FeSO_4 \cdot 7H_2O$ (B) $CuSO_4 \cdot 5H_2O$
 (C) $CaSO_4 \cdot 2H_2O$ (D) None of these
42. When Iron powder is added in $CuSO_4$ solution, the blue colour of solution turns :
 (A) Black (B) Green
 (C) Brown (D) Colourless

43. The element showing highest oxidation state among first transition series is :
- (A) Ni (B) Cr
(C) Fe (D) Mn
44. Which of the following is known as red lead ?
- (A) Pb_3O_4 (B) Pb_2O_3
(C) PbO (D) PbO_2
45. Which metal nitrate gives colorless gas on thermal decomposition
- (A) $NaNO_3$ (B) $Cu(NO_3)_2$
(C) $Ba(NO_3)_2$ (D) $Hg(NO_3)_2$
46. Which of the following compounds has tetrahedral geometry ?
- (A) $[Ni(CN)_4]^{2-}$ (B) $[Pd(CN)_4]^{2-}$
(C) $[PdCl_4]^{2-}$ (D) $[NiCl_4]^{2-}$
47. The oxidation number of Fe in $K_4[Fe(CN)_6]$ is :
- (A) +2 (B) +3
(C) -2 (D) -3
48. The correct formula of hexamine platinum (IV) chloride is :
- (A) $[Pt(NH_3)_6]Cl_4$ (B) $[Pt(NH_3)_6]Cl_2$
(C) $[Pt(NH_3)_2]_2Cl_3$ (D) $[Pt(NH_3)_6]Cl_6$
49. NaOH is:
- (A) Acid (B) Base
(C) Salt (D) All
50. Alkene gives which of the following reactions ?
- (A) Addition reaction (B) Substitution reaction
(C) Both 'A' and 'B' (D) None of these
51. Hybridisation of carbon in ethane is :
- (A) sp^3 (B) sp^2
(C) sp (D) sp^3d^2
52. Which is the strongest nucleophile ?
- (A) $\overset{\ominus}{C}H_3$ (B) $CH_3 - \overset{\ominus}{C}H_2$
(C) $\overset{\ominus}{N}H_2$ (D) $CH_3 - \overset{\ominus}{O}$
53. The reaction between alkyl halide and sodium metal is called :
- (A) Wurtz reaction (B) Kolbe's reaction
(C) Clemmensen's reaction (D) None of these
54. Bakelite is obtained from phenol by reacting it with :
- (A) Acetaldehyde (B) Acetal
(C) Formaldehyde (D) Chlorobenzene
55. The I.U.P.A.C. name of $CH_3OC_2H_5$ is :
- (A) Methoxy methane (B) Ethoxy ethane
(C) Ethoxy methane (D) None
56. Which of the following is a formula of methoxy methane?
- (A) CH_3OCH_3 (B) CH_3COCH_3
(C) $C_2H_5OCH_3$ (D) $C_2H_5COCH_3$
57. Ethanol when heated with excess of conc. H_2SO_4 at $170^\circ C$ gives :
- (A) Ethane (B) Ethene
(C) Dimethyl ether (D) Ethyl hydrogen Sulphate
58. The general formula of alkanal is :
- (A) $C_nH_{(2n+1)}O$ (B) $C_nH_{2n}O$
(C) $C_nH_{(2n-2)}$ (D) $C_nH_{2n}O_2$
59. The name of acetone in IUPAC system is :
- (A) Methanal (B) Ethanal
(C) Propanone (D) Ethanone
60. The reaction is called
- $$RCOCl + H_2 \xrightarrow{Pd/BaSO_4} RCHO + HCl$$
- (A) Cannizzaro Reaction (B) Rosenmund's Reaction
(C) Haloform Reaction (D) Clemmensen's Reaction
61. The cannizzaro's reaction is not given by :
- (A) Formaldehyde (B) Acetaldehyde
(C) Benzaldehyde (D) Furfural
62. Number of pi (π) bonds in aniline is :
- (A) 0 (B) 1
(C) 2 (D) 3
63. CH_3CN on reduction gives.:
- (A) CH_4 (B) CH_3COOH
(C) $C_2H_5NH_2$ (D) C_2H_5COOH
64. Aniline reacts with Acetaldehyde to form :
- (A) Carbylamines (B) Nitrobenzene
(C) Imine (D) Schiffs base
65. In X is ?
- (A) $Sn + NaOH$ (B) Sn/HCl
(C) NH_3 (D) All of these
66. Which one of the following is natural polymer ?
- (A) Protein (B) Nylon-6
(C) Buna-S (D) Terrylene
67. Vitamin A is known as :
- (A) Ascorbic acid (B) Retinol
(C) Calciferol (D) Tocopherol
68. Ascorbic acid is a :
- (A) Vitamin (B) Enzyme
(C) Protein (D) Amino acid
69. Which vitamin deficiency causes night blindness?
- (A) Vitamin A (B) Vitamin B
(C) Vitamin C (D) Vitamin D
70. A substance which lowers the body temperature is known as :
- (A) Antipyretic (B) Analgesic
(C) Antibiotic (D) None of these

SECTION - B : Non-Objective Type Questions

SHORT ANSWER TYPE QUESTIONS

Directions : Questions Nos. 1 to 20 are of short answer type.

Each question carries 2 marks. Answer any ten question on your copy.
 $10 \times 2 = 20$

1. Explain the difference between a double salt and a complex salt.
2. Define the following terms :
(i) Mole fraction (ii) Molality
(iii) Molarity (iv) Mass percentage
3. What is salt bridge ? What are its uses ?
4. Define the zero order reaction. Give its unit.
5. Give two methods for the preparation of colloids.
6. What is demulsification ? Name two demulsifiers.
7. (a) Write the names of two ores of copper.
(b) Which method is commonly used to extract copper.
8. Define Electrometallurgy.
9. How is cast iron differ from pig iron ?
10. Why is red phosphorous less reactive than white phosphorous ?
11. Explain why H_2S is a gas while H_2O is a liquid at room temperature.
12. What are monosaccharides ?
13. What are biodegradable polymers? Give two examples.
14. Explain the following terms giving one example of each type :
(i) Antacids, (ii) Disinfectants
15. HF is weaker than HI in acetic strength.
16. Define physical adsorption.
17. Lower members of aldehyde are more soluble in water. Why ?
18. Discuss Faraday Second Law.
19. Who are the members of halogen family ?
20. Bond angle of NH_3 is greater than in PH_3 . Why ?

LONG ANSWER TYPE QUESTIONS

Directions : Questions Nos. 21 to 26 are Long Answer Type

Questions. Answer any 3 questions out of them. $3 \times 5 = 15$

21. Write the following name reactions :
(i) Kolbe's Schmidt Reaction or Kolbe Reaction
(ii) Reimer-Tiemann Reaction
22. Explain the main points in the extraction of zinc from zinc blende.
23. What happens when :
(i) Acetone reacts with iodine and base.
(ii) Acetylene is passed through red hot Cu-tube.
24. Differentiate between DNA and RNA.
25. Calculate the mass percentage of benzene and carbon tetrachloride if 22 g of benzene is dissolved in 122 g of carbon tetrachloride.
26. Write the comparison between Physisorption and Chemisorption.

ANSWER WITH EXPLANATION

SECTION - A

OMR ANSWER-SHEET

- | | |
|---------------------|---------------------|
| 1. (A) (B) (C) (D) | 36. (A) (B) (C) (D) |
| 2. (A) (B) (C) (D) | 37. (A) (B) (C) (D) |
| 3. (A) (B) (C) (D) | 38. (A) (B) (C) (D) |
| 4. (A) (B) (C) (D) | 39. (A) (B) (C) (D) |
| 5. (A) (B) (C) (D) | 40. (A) (B) (C) (D) |
| 6. (A) (B) (C) (D) | 41. (A) (B) (C) (D) |
| 7. (A) (B) (C) (D) | 42. (A) (B) (C) (D) |
| 8. (A) (B) (C) (D) | 43. (A) (B) (C) (D) |
| 9. (A) (B) (C) (D) | 44. (A) (B) (C) (D) |
| 10. (A) (B) (C) (D) | 45. (A) (B) (C) (D) |
| 11. (A) (B) (C) (D) | 46. (A) (B) (C) (D) |
| 12. (A) (B) (C) (D) | 47. (A) (B) (C) (D) |
| 13. (A) (B) (C) (D) | 48. (A) (B) (C) (D) |
| 14. (A) (B) (C) (D) | 49. (A) (B) (C) (D) |
| 15. (A) (B) (C) (D) | 50. (A) (B) (C) (D) |
| 16. (A) (B) (C) (D) | 51. (A) (B) (C) (D) |
| 17. (A) (B) (C) (D) | 52. (A) (B) (C) (D) |
| 18. (A) (B) (C) (D) | 53. (A) (B) (C) (D) |
| 19. (A) (B) (C) (D) | 54. (A) (B) (C) (D) |
| 20. (A) (B) (C) (D) | 55. (A) (B) (C) (D) |
| 21. (A) (B) (C) (D) | 56. (A) (B) (C) (D) |
| 22. (A) (B) (C) (D) | 57. (A) (B) (C) (D) |
| 23. (A) (B) (C) (D) | 58. (A) (B) (C) (D) |
| 24. (A) (B) (C) (D) | 59. (A) (B) (C) (D) |
| 25. (A) (B) (C) (D) | 60. (A) (B) (C) (D) |
| 26. (A) (B) (C) (D) | 61. (A) (B) (C) (D) |
| 27. (A) (B) (C) (D) | 62. (A) (B) (C) (D) |
| 28. (A) (B) (C) (D) | 63. (A) (B) (C) (D) |
| 29. (A) (B) (C) (D) | 64. (A) (B) (C) (D) |
| 30. (A) (B) (C) (D) | 65. (A) (B) (C) (D) |
| 31. (A) (B) (C) (D) | 66. (A) (B) (C) (D) |
| 32. (A) (B) (C) (D) | 67. (A) (B) (C) (D) |
| 33. (A) (B) (C) (D) | 68. (A) (B) (C) (D) |
| 34. (A) (B) (C) (D) | 69. (A) (B) (C) (D) |
| 35. (A) (B) (C) (D) | 70. (A) (B) (C) (D) |

ANSWER

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. (C) | 2. (C) | 3. (A) | 4. (A) | 5. (B) |
| 6. (D) | 7. (C) | 8. (B) | 9. (C) | 10. (C) |
| 11. (A) | 12. (C) | 13. (B) | 14. (A) | 15. (A) |
| 16. (D) | 17. (A) | 18. (B) | 19. (D) | 20. (B) |
| 21. (A) | 22. (A) | 23. (C) | 24. (D) | 25. (B) |
| 26. (A) | 27. (B) | 28. (B) | 29. (D) | 30. (C) |
| 31. (B) | 32. (A) | 33. (C) | 34. (C) | 35. (A) |
| 36. (A) | 37. (A) | 38. (A) | 39. (C) | 40. (A) |
| 41. (A) | 42. (B) | 43. (D) | 44. (A) | 45. (D) |
| 46. (D) | 47. (A) | 48. (A) | 49. (B) | 50. (C) |
| 51. (A) | 52. (D) | 53. (A) | 54. (C) | 55. (D) |
| 56. (A) | 57. (B) | 58. (B) | 59. (C) | 60. (B) |
| 61. (B) | 62. (D) | 63. (C) | 64. (D) | 65. (B) |
| 66. (A) | 67. (B) | 68. (A) | 69. (A) | 70. (A) |

SECTION – B

1. Difference between a double salt and a complex salt :

Double salt	Complex salt
1. A double salt is a combination of two salt compounds.	1. A complex salt is a molecular structure that is composed of one or more complex ions.
2. Double salts can give simple ions when added to water.	2. Complex salts do not give simple ions when added to water.
3. Mohr's salt $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ is a double salt.	3. $\text{K}_4[\text{Fe}(\text{CN})_6]$ is a complex salt.

2. (i) **Mole fraction**—Mole fraction may be defined as the ratio of the number of moles of one component (solute or solvent) to the total number of all the components present in the solution.

Mole fraction of a component

$$= \frac{\text{Number of moles of component}}{\text{The number of moles of all the components}}$$

For example, in a binary mixture, if the number of moles of A and B are n_A and n_B respectively, the mole fraction of A and B will be x_A and x_B . [Mole fraction is a ratio, so it has not unit.]

$$x_A = \frac{n_A}{n_A + n_B}; x_B = \frac{n_B}{n_A + n_B}$$

- (ii) **Molality**—The number of moles of the solute (n) per kilogram (kg) of the solvent is known as molality (m).

$$\text{Molality } (m) = \frac{\text{Moles of solute}}{\text{Mass of solvent in kg}}$$

Unit of molality is mol kg^{-1} or m (molal)

- (iii) **Molarity**—Molarity (M) is defined as the number of moles of solute dissolved in one litre (or one cubic decimetre) of solution.

$$\text{Molarity } (M) = \frac{\text{Moles of solute}}{\text{Volume of solution in litre}}$$

Unit of molarity is mol L^{-1} or M (Molar)

- (iv) **Mass percentage**—It may be defined as mass of solute per 100 g of solution.

$$\text{Mass \% of solute} = \frac{\text{Moles of solute}}{\text{Mass of solution}} \times 100$$

3. **Salt bridge**—In electro chemistry it is a laboratory device used to connect the oxidation and reduction half-cells of a galvanic cell (voltaic cell), a type of electrochemical cell. Salt bridge usually come into two types : glass tube and filter paper.

Uses—It is used in voltaic cell. Purpose of salt bridge is only to move electrons from electrotype solution to the other.

4. The reactions in which the rate of reaction is independent of the concentration of the reactants is called zero order reaction.

$$\text{Rate} = k [A]^0 = k$$

where k is rate constant of the reaction.

The unit of a zero order reaction is $\text{mol L}^{-1} \text{s}^{-1}$.

5. Two methods for the preparation of colloids are :
(i) Condensation method (ii) Dispersion method
6. The process of separating of an emulsion into its constituent liquids is called **demulsification**. The various techniques applied for demulsification are boiling and centrifugation which destroy the emulsifying agents.
7. (a) Main ores of copper are :
(i) Copper pyrites— CuFeS_2
(ii) Copper glance— Cu_2S
(iii) Malachite— $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$
- (b) Copper is extracted mostly from sulphide ores. The sulphide ore is concentrated by Froth Flotation process. The concentrated ore is roasted to convert it to Cu_2O . The oxide thus formed is reduced by carbon in a smelter. The left-over copper (I) sulphide is partly oxidised to Cu_2O during Bessemerisation. Here, Cu_2O and Cu_2S react to produce metallic copper and SO_2 .
 $\text{Cu}_2\text{S} + 2\text{Cu}_2\text{O} \rightarrow 6\text{Cu} + \text{SO}_2$. The copper metal so obtained is refined by electrolytic method.
8. The process of extraction of metals by electrolysis of their fused salts is called electrometallurgy. Electrons serve as the reducing agent.
9. The iron obtained from blast furnace is pig iron. Pig iron contains about 4% of carbon and many impurities in smaller amount (e.g. S, P, Si, etc.) Cast iron is obtained by melting pig iron with scrap iron and coke using hot air blast. It contains slightly lower carbon content (about 3%) and is extremely hard and brittle.
10. White phosphorous is more reactive than red phosphorous due to angular strain in tetrahedral P_4 molecule. The red phosphorous has a polymeric structure consisting of a chain of P_4 tetrahedra.
11. Since H–O bond is more polar than H–S because of greater electronegativity difference in the bond participating atoms. Due to this, H_2O molecules are involved in the bending associates to be liquid at room temperature. Where as, the intermolecular hydrogen bonding is negligible in the molecules of H_2S and does not associates and it maintains the gaseous state at room temperature.
12. A carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone is called a monosaccharide. Common examples are glucose, fructose, ribose etc.

13. The polymers which can be broken down into smaller and harmless molecules by enzyme-catalysed reactions are called biodegradable polymers.

Examples : Following are the biodegradable polymers

- ☐ Polyhydroxybutyrate-co-β-hydroxyvalerate (PHBV)
- ☐ Polyglycolic acid
- ☐ Polylactic acid

14. (i) **Antacid**—The substances which neutralise the excess acid in stomach and raise pH to the optimum level are called antacids.

Examples : Magnesium oxide, Aluminium hydroxide, Sodium hydrogencarbonate.

(ii) **Disinfectants :** The substances which are capable of destroying the microorganisms and are harmful to the living tissues are called disinfectants. The 1% solutions of phenol in water acts as a disinfectant.

15. Hydrogen iodide (HI) is more stronger acid than hydrogen fluoride because iodine (I) is more electronegative than Fluorine (F) and hence it can donate H⁺ more easily than Fluorine (F).

16. **Physical adsorption**—If the adsorbate is held on a surface by the weak forces such as, van der Waals' type, then the adsorption is called *van der Waals' adsorption*, or *physical adsorption*.

Adsorption of gases on animal charcoal is a physical adsorption.

Adsorption of water vapour on silica gel is a physical adsorption.

17. Because, lower member of aldehyde have capability of forming, H-bond with water molecule.

18. **Faraday Second Law**—If an electric current is passed through various electrolytes grouped in series then the amount of the substances deposited are directly proportional to their respective chemical equivalents.

If x, y, z, \dots are the deposited amounts of the substance and E_1, E_2, E_3, \dots are their respective chemical equivalents then

$$\frac{x}{E_1} = \frac{y}{E_2} \quad \text{and} \quad \frac{x}{E_1} = \frac{z}{E_3}$$

also, from first law,

$$x = Z_1 It, \quad y = Z_2 It, \quad z = Z_3 It$$

where, Z_1, Z_2 and Z_3 are electro chemical equivalents of the deposited substances.

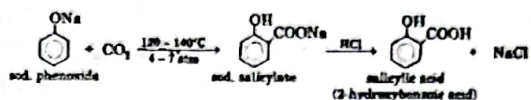
$$\Rightarrow \frac{x}{y} = \frac{Z_1}{Z_2} = \frac{E_1}{E_2} \quad \text{and} \quad \frac{y}{z} = \frac{Z_2}{Z_3} = \frac{E_2}{E_3} \Rightarrow Z \propto E$$

This concludes that the electro chemical equivalent of a substance is directly proportional to the chemical equivalent of the substance.

19. Fluorine (F), Chlorine (Cl), Bromine (Br), Iodine (I) and Astatine (At) are members of halogen family.

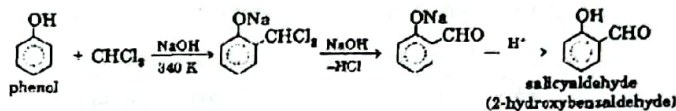
20. The bond angle in NH₃ is greater than PH₃ because electro-negativity of nitrogen is greater than phosphorus.

21. (i) **Kolbe's Schmidt Reaction**—This reaction gives a method for the fixation of carbon dioxide in a benzene ring. Sodium phenoxide on heating at 120-140°C under pressure (4-7 atm) with CO₂ gives sodium salicylate, which on reacting with dil. HCl gives salicylic acid, (2-hydroxybenzoic acid)



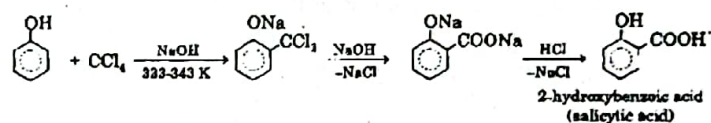
A small quantity of 4-hydroxybenzoic acid (*p*-hydroxybenzoic acid) is also formed. The two isomers can be readily separated by steam distillation, when 2-hydroxybenzoic acid being more volatile distils over first.

(ii) **Reimer-Tiemann Reaction**—The reaction of phenol with chloroform in the presence of aqueous alkali at 340 K followed by hydrolysis of the resulting product gives *o*-hydroxybenzaldehyde, (salicylaldehyde). This reaction is called **Reimer-Tiemann reaction**.



However, if carbon tetrachloride is used in place of chloroform, hydroxy acids are obtained.

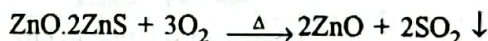
For example,



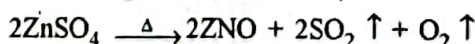
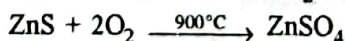
22. **Extraction of zinc :** Reduction process involves the steps.

(i) **Concentration of the ore :** The ore is crushed and made to powder. The crushed ore is concentrated by Froth floatation process. The concentrated ore goes to the surface along with the froth. This is removed and dried.

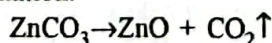
(ii) **Roasting :** The concentrated ore is roasted in a furnace at high temp. (900°C) in presence of excess of air. In this process zinc blends is converted into



There is chance of formation of ZnSO₄ if the reaction temperature remains low. The ZnSO₄ thus formed is decomposed to give ZnO, SO₂ and O₂.



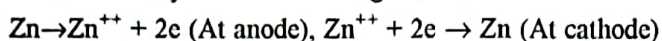
If calamine ore (ZnCO₃) is used then it is converted to ZnO by calcination.



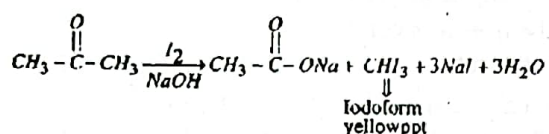
(iii) **Reduction:** ZnO thus formed as a result of roasting or calcination is reduced by carbon. As a result at reduction Zn metal in molten state is formed.



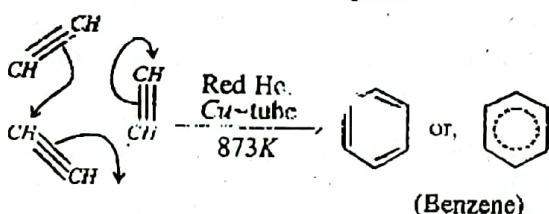
(iv) **Purification** : Impure Zn is purified by the process of electrolysis for this impure zinc rod is made anode and a rod of pure zinc is made cathode. These rods are dipped in an electrolytic cell containing $ZnSO_4$ solution. Zn is deposited at cathode on electrolysis. The following cell reactions occur



23. (i) When acetone reacts with iodine and base, it liberates iodoform yellow ppt.



- (ii) When Acetylene is passed through red hot Cu-tube, formation of benzene takes place



24. Due to electronegativity, nitrogen pulls the electron pairs towards itself decreasing the bond length than the bond length of PH_3 . As, electron comes closer they repel in the same space provided in NH_3 increasing its bond angle.

Difference between DNA and RNA :

DNA	RNA
1. DNA is double stranded helix in which two strands are coiled spirally in opposite directions.	1. It is single stranded structure.
2. The sugar molecule is 2-dehydrobase.	2. The sugar molecules is ribose.
3. Nitrogenous base uracil is not present.	3. Nitrogenous base thymine is not present.
4. DNA molecule are very large their molecules weights may vary from 6 million to 16.	4. RNA molecules are much smaller with molecular weight ranging from 20000 to 40000.
5. DNA has unique property of replication.	5. RNA usually doesn't replicate

25. Total mass of solution = $22 + 122 = 144 \text{ g}$

$$\text{Mass per cent benzene} = \frac{22}{144} \times 100 = 15.28\%$$

$$\text{Mass per cent } CCl_4 = \frac{122}{144} \times 100 = 84.72\% \text{; Soln.}$$

26. Difference between Physisorption and Chemisorption :

Physisorption	Chemisorption
1. Enthalpy of adsorption, usually is of the order of $20-40 \text{ kJ mol}^{-1}$.	1. Enthalpy of adsorption, is of the order $40-400 \text{ kJ mol}^{-1}$.
2. Molecules of adsorbate and adsorbent are held by vander Waals interactions.	2. Molecules of adsorbate and adsorbent are held by chemical bonds.
3. It usually takes place at low temperature and decreases with increasing temperature.	3. It takes place at relatively high temperatures.
4. It is not very specific i.e., all gases are absorbed on all solids to some extent.	4. It is highly specific and takes place when there is some possibility of compound formation between the adsorbate and the adsorbent molecules.
5. Multi-molecular layers may be formed on the adsorbent.	5. Usually mono-molecular layer is formed on the adsorbent.
6. It does not require any activation energy.	6. It requires activation energy.
7. The amount of gas adsorbed is related to the ease of liquefaction of the gas.	7. There is no such correlation.
8. It is reversible in nature.	8. It is irreversible in nature.

□ □ □