CHEMISTRY

MODEL PAPER – 1

Time : 3 Hours + 15 Minutes] [Total Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. Candidates are required to give their answers in their own words as far as practicable.
2. Figure in the right hand margin indicate full marks.
3. While answering the questions, candidate should adhere to the word limit as far as practicable.
4. 15 Minutes of extra time has been allotted for the candidates to read the questions carefully.
5. This question paper is divided into two sections—**SECTION – A** and **SECTION – B**.
6. 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.
7. 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.
8. 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

1. Which of the following is a covalent solid ?
   (A) Iron (B) Diamond
   (C) Sodium chloride (D) Copper
2. Which of the following is deposited at cathod on electrolysis of aqueous NaCl solution ?
   (A) Chlorine (B) Sodium
   (C) Sodium amalgam (D) Hydrogen
3. Cyanide process is used for the extraction of which of the following metals ?
   (A) Cr (B) Ag
   (C) Cu (D) Zn
4. By which of the following nobel gases the maximum number of compounds have been formed ?
   (A) He (B) Ne
   (C) Ar (D) Xe
5. The electronic configuration of Cu^{2+} (Z = 29) is :
   (A) $[_{18}Ar]\ 3d^8\ 4s^1$ (B) $[_{18}Ar]\ 3d^7\ 4s^2$
   (C) $[_{18}Ar]\ 3d^9$ (D) $[_{18}Ar]\ 3d^6\ 4s^2\ 4p^1$
6. Which of the following is an example of double salt ?
   (A) Bleaching powder (B) $K_4[Fe(CN)_6]$
   (C) Hypo (D) Potash alum
7. Which of the following is soluble in water ?
   (A) CH_3OH (B) $CHCl_3$
   (C) CCl_4 (D) CS_2
8. Which of the following is Tollen's reagent ?
   (A) $[Ag(NH_3)_2]^+$ ion (B) $Cu(OH)_2$
   (C) Ag_2O (D) CuO
9. Primary amine on reaction with Grignard reagent gives which of the following ?
   (A) An alkane (B) A higher amine
   (C) A secondary amine (D) None of these
10. Which of the following contains ester linkages ?
    (A) Terylene (B) Nylon
    (C) Teflon (D) Bakelite
11. Which of the following carbohydrates is the most abundant in nature ?
    (A) Glucose (B) Fructose
    (C) Starch (D) Cellulose
12. Which of the following is antioxidant ?
    (A) Lacithin (B) Citric acid
    (C) Vitamin E (D) All of these
13. Cystals are :
    (A) Four types (B) Three types
    (C) Seven types (D) All of these
14. The coordination number of a metal crystallizing in hexagonal close packed (hcp) structure is :
    (A) 12 (B) 8
    (C) 4 (D) 6

15. When an electron occupies the empty space of negatively charged ions, then the defect in crystal is :
(A) Schottky defect (B) Frenkel defect
(C) F-centre (D) None of these

16. In fcc cubic cell, an atom at the face centre is shared by :
(A) 6 unit cell (B) 1 unit cell
(C) 2 unit cells (D) 4 unit cell.

17. Which of the following is a colligative property of solution ?
(A) Osmotic Pressure (B) Surface tension
(C) Conductivity (D) Half-life period

18. Tyndall effects is observed in :
(A) Solution (B) Precipitate
(C) Sol (D) Vapours

19. The pH of human blood is approximately :
(A) 6.5 (B) 7.0
(C) 7.4 (D) 8.2

20. A zeotropic mixture of HCl and H_2O has :
(A) 48% HCl (B) 22.21 HCl
(C) 36% HCl (D) 20.2% HCl

21. In galvanic cell, anode is :
(A) Negative electrode (B) Positive electrode
(C) Neutral electrode (D) None of these

22. In an aqueous solution hydrogen (H_2) will not reduce :
(A) Fe^{3+} (B) Cu^{2+}
(C) Au^{2+} (D) Ag^{+}

23. The electromotive force (EMF) of the cell for the cell reaction at equilibrium state is :
(A) positive (B) zero
(C) negative (D) none of these

24. A dilute aqueous solution of sodium fluoride is electrolysed, the products at the anode and cathode are :
(A) F_2, Na (B) F_2, H_2
(C) O_2, Na (D) O_2, H_2

25. For a zero order reaction :
(A) $t^{1/2} \propto a$ (B) $t^{1/2} \propto \frac{1}{a}$
(C) $t^{1/2} \propto a^2$ (D) $t^{1/2} \propto \frac{1}{a^2}$

26. Milk is an example of :
(A) emulsion (B) suspension
(C) sol (D) none of these

27. Copper sulphate solution on treatment with excess of KI gives whitish precipitate. The precipitate is :
(A) Cu I_2 (B) Cu_2I_2
(C) Cu_2SO_2 (D) I_2

28. Which of the following oxides is reduced in blast furnace ?
(A) Oxide of iron (B) Oxide of copper
(C) Sodium oxide (D) Zinc oxide

29. Formula of copper pyrite is :
(A) Cu_2S (B) CuFeS
(C) $CuFeS_2$ (D) $Cu_2Fe_2S_2$

30. Galena is an ore of :
(A) Sn (B) Pb
(C) Si (D) Ag

31. NaOH is known as :
(A) Caustic soda (B) Washing soda
(C) Caustic Potash (D) All

32. Formula of common salt is :
(A) NaCl (B) KCl
(C) NaOH (D) $KClO_3$

33. Which one of the following is an electrophilic reagent ?
(A) BF_3 (B) NH_3
(C) H_2O (D) None of these

34. Main source of helium is :
(A) Air (B) Radium
(C) Monazite (D) Water

35. Which one of the following elements is found in free state in nature?
(A) Sodium (B) Iron
(C) Zinc (D) Gold

36. The elements of group 16 are known as :
(A) Halogens (B) Chalcogens
(C) Transition elements (D) Noble gases

37. Second period of periodic table contains elements :
(A) 2 (B) 8
(C) 8 (D) 32

38. The substance which exhibits paramagnetism is :
(A) H_2O (B) O_2
(C) NaCl (D) C_6H_6

39. H_2SO_2 is a/an—
(A) Acid (B) Base
(C) Alkali (D) All

40. Which among the following is strongest acid ?
(A) HF (B) HCl
(C) HBr (D) HI

41. Formula of oleum is :
(A) $H_2S_2O_7$ (B) H_2SO_4
(C) H_2SO_3 (D) H_2SO_5

42. Outermost configuration $3d^5 4s^2$ is of :
(A) Ca (B) Zn
(C) Mg (D) Fe

43. Which of the following is not an element of first transition series ?
(A) Iron (B) Chromium
(C) Magnesium (D) Nickel

44. Which of the following elements is liquid at room temperature:
(A) Zn (B) Hg
(C) Cu (D) Au

45. K_2 [$Fe(CN)_6$] is a/an :
(A) double salt (B) complex salt
(C) acid (D) base

46. Which complex has dsp^2 -hybridization of the central metal atom ?
(A) $[Fe(CO)_5]$ (B) $[Ni(CO)_4]$
(C) $[Ni(CN)_4]^{2-}$ (D) $[Cr(H_2O)_6]^{3+}$

47. In co-ordination compound $K_4[Ni(CN)_4]$, the oxidation state of nickel is :
(A) O (B) +1
(C) +2 (D) –1

48. The hybridisation of Fe in $K_4[Fe(CN)_6]$:
(A) dSp^2 (B) Sp^2
(C) d^2Sp^3 (D) Sp^3d^2

49. The molecular formula of benzene is :
(A) C_6H_5 (B) C_6H_6
(C) C_6H_{12} (D) None of these

50. General formula of Alkene is :
(A) C_nH_{2n} (B) C_nH_{2n+2}
(C) C_nH_{2n-2} (D) None of these

51. Which is the most stable carbocation ?
(A) $(CH_3)_2\overset{\oplus}{C}H$ (B) $C_6H_5-\overset{\oplus}{C}H_2$
(C) $(CH_3)_3\overset{\oplus}{C}$ (D) $CH_2=CH\overset{\oplus}{C}H_2$

52. Which one of the following compounds is soluble in water :
(A) $CHCl_3$ (B) $C_2H_5 - O - C_2H_5$
(C) CCl_4 (D) CH_3CH_2OH

53. Alcohol is formed when one of the hydrogen of Alkane is replaced by :
(A) Hydroxyl group (B) Aldehyde group
(C) Carboxylic group (D) Chloro group

54. R—OH + CH_2N_2 → Leaving group in this reaction is
(A) CH_3 (B) R
(C) N_2 (D) CH_2

55. The structure of Propan — 2 — ol is :
(A) $CH_3—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3$ (B) $CH_3—CH_3—CH_2OH$
(C) $CH_2—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_2OH$ (D) $HOCH_2-CH_2-CH_2OH$

56. Aldehydes without α-hydrogen atom undergoes :
(A) Cannizzaro Reaction (B) Aldol Condensation
(C) Perkin Reaction (D) None of these

57. Which organic acid gives silver mirror test ?
(A) CH_3COOH (B) HCOOH
(C) $CH_3 - CH_2 - COOH$ (D) CH_3–CH (OH) – COOH

58. Which compound does not decompose on heating ?
(A) Na_2CO_3 (B) $ZnCO_3$
(C) $Al_2(CO_3)_3$ (D) $CaCO_3$

59. Carbon atom in the carobnyl group is :
(A) *sp*-hybridised (B) sp^2 hydridised
(C) sp^3 hydridised (D) dsp^2 hydridised

60. Glycerol is :
(A) Monohydric alcohol (B) dihydric alcohol
(C) Trihydric alcohol (D) Primary alcohol

61. Which of the following is the strongest base ?
(A) NH_3 (B) $CH_3 - NH_2$
(C) $(CH_3)_2 - NH$ (D) $(CH_3)_3 - N$

62. Which one is capable of forming zweitterion?
(A) CH_3NO_2 (B) CH_3COOH
(C) $CH_3CH_2NH_2$ (D) H_2NCH_2COOH

63. Natural rubber is a polymer of :
(A) Isoprene (B) Chloroprene
(C) Butadiene (D) Styrene

64. Number of isomers formed by C_3H_9N is :
(A) 2 (B) 3
(C) 4 (D) 6

65. Carbohydrate which yield three to ten mono saccharide units on hydrolysis is called :
(A) Monosaccharide (B) Disaccharide
(C) Oligosaccharide (D) Polysaccharide

66. Enzymes are made up of :
(A) edible proteins
(B) proteins with specific structure
(C) nitrogen containing carbohydrates
(D) carbohydrates

67. Glucose is :
(A) Triose (B) Tetrose
(C) Fentose (D) Hexose

68. Drug used to reduce Fever is called :
(A) Antipyretic (B) Analgesic
(C) Antacid (D) None

69. The formula of Phenol is :
(A) C_6H_5OH (B) C_2H_5OH
(C) C_3H_4OH (D) C_6H_6

70. Slaked lime is :
(A) CaO (B) $CaCO_3$
(C) Ca $(OH)_2$ (D) $CaCl_2$

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 × 2 = 20

1. What is molal elevation constant ? How is it related to molarity of a solution ?
2. Define the term polymerization.
3. Describe the following with examples :
   (i) Antipyretics (ii) Analgesics
4. Boiling point of NH_3 is higher than PH_3, Why ?
5. Alkyl Amines are stronger base than Ammonia, Why ?
6. Discuss Depression in freezing point.
7. Define Coordination Number.
8. Why does vapour pressure of a liquid decrease with addition of a non-volatile solid solute ?
9. Which type of ores are concentrated by froth floation process ? Give examples.
10. Noble gases have comparatively large atomic radius. Why ?
11. Why are solids rigid ?
12. Why does the conductivity of a solution decrease with dilution ?
13. Define 'energy of activation' of a reaction. How does it vary with a rise in temperature ?
14. Write any two characteristics of chemisorption.
15. Differentiate between 'Minerals' and 'Ores'.
16. Why does NH_3 form hydrogen bond but PH_3 does not ?
17. What do you mean by acid rain ? explain.
18. Describe method of nitration of benzene.
19. Why is aniline a weaker base than methylamine ?
20. What is the biological effect of denaturation of proteins ?

LONG ANSWER TYPE QUESTIONS

Directions : *Questions Nos. 21 to 26 are Long Answer Type Questions. Answer any 3 questions out of them.* 3 × 5 = 15

21. What is electrochemical cell ? Explain the Structure of an electrochemical cell.
22. Define the term osmotic pressure. Describe how the molecular mass of a substance can be determined by a method based on measurement of osmotic pressure ?
23. Write the Raoult's law for Depression in freezing point and also calculate the molal mass of salute by Depression in freezing point.
24. State Raoult's law for solution containing non-volatile solutes.
25. What is the difference between osmosis and diffusion ?
26. Write the important ore of aluminium and discuss the principle of extraction of aluminium.

ANSWER WITH EXPLANATION

SECTION – A

OMR ANSWER-SHEET

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

ANSWER

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

SECTION – B

1. Molal Elevation constant or Ebullioscopic constant (k_b) is the elevation of boiling point produced when one mole of non-volatile solute is dissolved in 1 kg of solvent.
   $\therefore \Delta T_b = K_b\, m$.
2. **Polymerization** is a process of formation of a high molecular mass polymer from one or more monomers by linking together of repeating structural units with covalent bonds.
3. (i) The compounds which are used for the purpose of lowering the body temperature to normal during high fever are called **antipyretics.**
   Examples : Aspirin (Acetyl salicylic acid), Phenacetin.
   (ii) The compounds which relieve all sorts of body pains without the loss of consciousness are called **analgesics.** Analgesics are commonly called pain killers.
   Examples : Ibuprofen, Paracetamol, Novalgin.
4. This is because there is intramolecular hydrogen bonding present in NH_3 (Due to small size and high electronegativity of N) and not in PH_3 (due to large size and less electronegativity of P).
5. Alkyl amines are stronger base than ammonia because they have an alkyl group attached to them. It donates more electrons to the atom (+I effect). So that it can give more to act as a base.
6. **Depression in freezing point**—The fall in the freezing point of a liquid due to the dissolution of any nonvolatile solute is called the depression in freezing point (ΔT_f)

$$\Delta T_f = K_f\, m = \frac{K_f n_2}{w_1} = \frac{K_f \times w_2}{w_1 \times M_2}$$

$$M_2 = \frac{K_f \times w_2}{w_1 \times \Delta T_f}$$

   where, m is the molality of the solute in solution, and K_f is the molal depression constant, (or molal freezing point depression constant), K_f has the unit of K kg mol^{-1}.
   If the mass of the solvent w_1 is expressed in grams, then the molar mass of the solute can be obtained by using the following relationship.

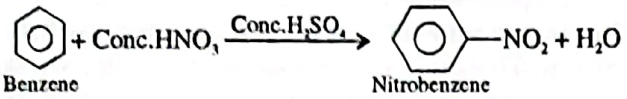
$$M_2 = \frac{K_f \times w_2}{(w_1 \times 1000) \times \Delta T_f} = \frac{1000\, K_f \times w_2}{w_1 \times \Delta T_f}$$

7. **Coordination number**—The number of nearest neighbours of any constituent particle is called its *coordination number.*
   In ionic crystals, the coordination number of any ion is governed by the radius ratio.
8. The pressure of a non-volatile solute in a solution reduces the escaping tendency of the solvent molecules into the vapour phase and thus lowers the vapour pressure of the solvent.
9. Sulphide ores are concentrated by froth floatation process eg. Copper Pyrite—$CuFeS_2$, Zinc Blande—ZnS.
10. The atomic radius of a noble gas is comparatively large in its period because the atomic radius of inert gas is vander waals radius where as those of other elements of the same period are either covalent radius or metallic radius.
11. In solid state the constituent particles are not free to move. They can only oscillate about their mean positions due to strong attraction forces between the particles. That is why solids have a closely packed arrangement and rigid structure.
12. The conductivity of a solution is related with the number of ions present per unit volume of the solution. When the solution is diluted, the number of ions decreases. Hence, conductivity or specific conductance of the solution also decreases.
13. **Energy of activation**—The minimum energy over average energy which must be gained by the molecules before they could react to form products is called the energy of activation. It is denoted by E_a
14. (i) **High specificity**—Chemisorption is highly specific and it will only occur when absorbent and adsorbate molecules can chemically react with each other. e.g., oxygen is adsorbed on metals by oxide formation.
    (ii) **Surface area**—Chemisorption increases with increase in surface area of the absorbent.
15. **Difference between Mineral and Ore :**

Sl. No.	Mineral	Ore
1.	Naturally occurring substances of metals present in the earth's crust are called minerals.	Minerals which can be used to obtain the metal profitably are called ores.
2.	All minerals are not ores.	All ores are essentially minerals too.
3.	e.g., bauxite ($Al_2O_3 \cdot xH_2O$) and clay ($Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$)	e.g. bauxite ($Al_2O_3 \cdot xH_2O$)

16. N in ammonia forms hydrogen bond, but there are no hydrogen bonds present in PH_3 due to :
    (i) N is small sized as compared to P
    (ii) N has higher value of electronegativity than that of P.
17. **Acid rain**—It is a rain or any other form of precipitation that usually acidic, meaning that it possesses elevated levels of hydrogen ions (low pH)., It can have harmful effects on plants. aquatic animals and infrastructure. Acid rain is caused by emissions of sulpher dioxide and nitrogen oxide, which react with water molecules in the atmosphere to produce acids. In chemical in acid rain can cause point to peel, corrosion of steel structures such as bridges and erosion and stone statues.

18. Nitration of benzene is usually carried out by treating benzene with a mixture of concentrated nitric acid (HNO_3) and conc. sulphuric acid (H_2SO_4).



19. The aromatic ring in aniline is electron-withdrawing. This reduces the electron density on the N-atom of the $-NH_2$ group, and therefore, makes it less basic.
On the other hand, the methyl group in methylamine is electro-releasing. This increases the electron density on nitrogen, and therefore, makes it more basic.

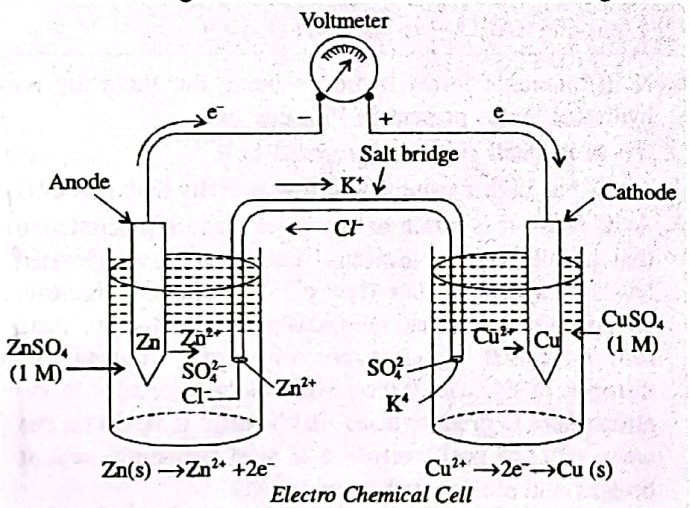
20. When a protein in its native form is subjected to change in temperature or change in pH, the hydrogen bonds are disrupted. As a result, the globules unfold, the helix get uncoiled and the protein loses its biological activity.

21. A voltaic/Galvanic/Elecrochemical cell is a device used to convert chemical energy into electical energy.
The underlying principle is that ($-\Delta_r G^\theta$) the decrease in the Gibbs free energy is a measure of electrical energy produced.

$-\Delta_r G^\theta = W_{electrical}$
$= nFE^\circ$

E° = E.M.F. of the cell
n = number of electrons transformed during the reaction
F = Faraday
= 96500 coulombs

One such cell is Daniel's Cell described below.
It is simple form, a *zinc strip* is dipped in the $ZnSO_4$ solution and a copper strip is dipped in the $CuSO_4$ solution taken in separated beakers. The two metallic strips which act as electrodes are connected by the conducting wires through a voltmeter. The two solution are joined by an inverted U-tube known as salt bridge. The U-tube is filled with the solution of some electrolyte such as KCl, KNO_3 or NH_4Cl to which gelatin or agar-agar has been added to convert it into semi-solid paste. A schematic diagram of this cell has been shown in Figure.



Electro Chemical Cell

The deflection in voltmeter indicates that there is a potential difference between the two electrodes. It has been found that the conventional current flows through the outer circuit from copper to zinc strip. It implies that the electrons flow occures from zinc to copper strip.

22. The minimum pressure which should be applied on the solution, so as to prevent the movement of the solvent molecules into the solution from solvent side through a semipermeable membrane is called osmotic pressure.
Molecular mass by osmotic pressure method. The osmotic pressure (π) of a solution is given by

$$\pi V = nRT$$

where, V is the volume of the solution
n is the number of moles of the solute
R is the universal gas constant
T is the temperature on the Kelvin scale

If w is the mass of the solute of molar mass M then,

$$n = \frac{w}{M}$$

Therefore, $$\pi V = \frac{w}{M}RT$$

or $$M = \frac{wRT}{\pi V}$$

Thus, knowing w, R, T π and V one can obtain M, the molar mass of the solute.

23. Depression in freezing point is directly proportional to the concentration (molality) of salute

$$\Delta T_f \propto C_m$$
$$\Rightarrow \quad \Delta T_f = K_f C_m \qquad ...(1)$$

where, ΔTf = Depression in freezing point
K_f = molal Depression constant
C_m = concentration of salute

Calculation of molal mass of salute :
Let a gram of salute is be dissolve in b gram of solvent.
molal mass of salute = m

no. of moles of salute = $\frac{a}{m}$

$\because$ $\frac{a}{m}$ moles dissolve in b gram of solvent

$$\therefore \text{ Molality } = \frac{\frac{a}{m}}{b} \times 1000$$

$$\therefore C_m = \frac{a \times 1000}{b \times m}$$

Hence According to equation (1)

$$\Delta T_f = K_f \times C_m$$
$$\Rightarrow \quad \Delta T_f = K_f \times \frac{a \times 1000}{b \times m}$$
$$\Rightarrow \quad \Delta T_f \times m = \frac{K_f \times a \times 1000}{b}$$
$$\therefore \quad m = \frac{K_f \times a \times 1000}{b \times \Delta T_f}$$

m is the molal mass of salute.

24. Raoult's law for solution containing non-volatile solutes : It states that partial vapour pressure of a solvent over a solution of a non-volatile solute, $P_{solution}$ is directly proportional to the mole-fraction of the solvent ($X_{solvent}$) in the solution.

Mathematically,

$$P_{solution} = P^{o}_{solvent}\, X_{solvent}$$

where $P^{o}_{solvent}$ is the vapour pressure of the pure solvent at the given temperature.

$$\therefore \quad \frac{P_{solution}}{P^{o}_{solvent}} = X_{solvent}$$

$$\therefore \quad X_{solute} = 1 - X_{solvent}$$

$$\therefore \quad X_{solute} = 1 - \frac{P_{solution}}{P^{o}_{solvent}}$$

$$X_{solute} = \frac{P^{o}_{solvent} - P_{solution}}{P^{o}_{solvent}}$$

$$X_{solute} = \frac{P^{o} - P}{P^{o}}$$

where $\frac{P^{o} - P}{P^{o}}$ is called the relative lowering of vapour pressure which is a colligative property.

25. Difference between osmosis and diffusion :

(i) In osmosis the presence of a semi permeable membrane is must while in diffusion in there is no need of a semipermeable membrane.

(ii) In osmosis the direction of movement of particles takes place only in one direction that is the particles of only solvent moves while in diffusion the particles of both the solute and solvent move in opposite directions.

(iii) In osmosis the movement of solvent particles takes place from a dilute solution into a concentrated solution while in diffusion the movement of particles is from higher concentration to lower concentration.

26. Important ores of aluminium are bauxite ($Al_2O_3.2H_2O$) and cryollite-Na_3AlF_6.

Principle of extraction of aluminium from Bauxite :

The natural Bauxite contains silica, ferric oxide etc impurities. These impurities are separated by Bayer's process. Hall's or Serpek process.

$$Al_2O_3 + 2NaOH + 3H_2O \rightarrow 2Na\,[Al\,(OH)_4]\,(aq)$$

$$2NaOH + SiO_2 \rightarrow Na_2SiO_3 + H_2O$$

$$Na\,[Al\,(OH)_4] \rightarrow Al\,(OH)_3 + NaOH$$

The obtained $Al\,(OH)_3$ is filtered and washed. Now it is calcinated. As a result this almunia is obtained. Now cryollite is added in aluminia and electricity is carried out in carbon electrode containing cell. After electrolysis aluminium is obtained at cathode and oxygen is obtained at anode.

❑❑❑