MODEL PAPER – 4

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

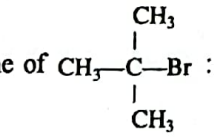
INSTRUCTIONS TO THE CANDIDATES :

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. The half life of a first order reaction :
   (A) does not depend upon rate constant
   (B) does not depend upon initial concentration
   (C) depends upon initial concentration
   (D) all of these
2. Which of the following compounds has zero dipole moment ?
   (A) CH_3Cl (B) $CHCl_3$ (C) CCl_4 (D) CH_2Cl_2
3. Which of the following is a member of first transition series ?
   (A) Ni (B) Ac (C) Cd (D) Au
4. Which of the following is a bidentate ligand ?
   (A) E.D.T.A (B) Ethylene diamine
   (C) Acetate ion (D) Pyridine
5. If 18 g of glucose is dissolved in 1000 g of solvent, then the solution is said to be :
   (A) 1 molar (B) 0.1 molal
   (C) 0.1 molar (D) 0.5 molal
6. The IUPAC name of  :
   (A) Tertiary butyl chloride
   (B) Secondary butyl chloride
   (C) 2-bromo-2-methyl propane
   (D) 2, 2-dimethyl-1–bromoethane
7. Which of the following is obtained when formic acid is heated with conc. H_2SO_4 ?
   (A) CO_2 (B) CH_3HSO_4
   (C) Oxalic acid (D) CO
8. Which of the following is formed when acetamide reacts with Br_2/KOH ?
   (A) Acetone (B) Methyl amine
   (C) Acetaldehyde (D) Ammonia
9. Which of the following is a polyamide ?
   (A) Teflon (B) Nylon 6, 6
   (C) Terylene (D) Bakelite
10. From which of the following is insulin secreted ?
    (A) Thyroid (B) Pancreas
    (C) Adrenal body (D) None of these
11. The number of basic crystal system is :
    (A) 4 (B) 6 (C) 7 (D) 8
12. Which one of the following is non-crystalline or amorphous ?
    (A) Diamond (B) Graphite
    (C) Glass (D) Common Salt
13. Which of the following oxides shows electrical properties like metals ?
    (A) SiO_2 (B) MgO (C) $SO_2(s)$ (D) CrO_2
14. An example of amorphous solid is :
    (A) Diamond (B) Graphite
    (C) Salt (D) Rubber
15. The boiling point of water decreases at high mountains because
    (A) atmospheric pressure is low
    (B) temperature is low
    (C) pressure is high
    (D) more air
16. Atomic mass is equal to :
    (A) number of electrons of an atom
    (B) sum of the numbers of electrons and protons of an atom
    (C) sum of the numbers of neutrons and protons of an atom
    (D) none of these
17. If n is number of moles of solute and N is number of moles of solvent then mole fraction strength of solute is :
    (A) $n + N$ (B) $\frac{n}{N+n}$ (C) $\frac{N}{N+n}$ (D) $\frac{n}{N}$

18. Fused NaCl on electrolysis gives ..... on cathode.
(A) Chlorine (B) Sodium
(C) Sodium amalgam (D) Hydrogen

19. Which has the maximum standard oxidation potential ?
(A) Zn (B) Cu
(C) Ag (D) Mg

20. The electrode through which electrons enter into electrolytic solution is :
(A) Cathode (B) Anode
(C) May be anode cathode (D) None

21. In chemical equation $H_2(g) + I_2(g) \rightleftharpoons 2HI\ (g)$ the equilibrium constant K_p depends on :
(A) total pressure (B) catalyst used
(C) amount of H_2 and I_2 (D) temperature

22. The rate at which a substance reacts, depends upon its
(A) Atomic Mass (B) Equivalent Mass
(C) Molecular Mass (D) Active Mass

23. Which one of the following is a lyophilic colloid ?
(A) Milk (B) Gum
(C) Fog (D) Blood

24. Which of the following gives yellow or brown precipitate with alkaline Nessler's reagent ?
(A) CO_2 (B) NH_3
(C) NaCl (D) KI

25. Mineral from which metal is extracted, is called :
(A) Ore (B) Gangue
(C) Slag (D) none of these

26. Malachite is an ore of :
(A) iron (B) copper
(C) zinc (D) silver

27. Copper metal is purified by which of the following method :
(A) Electrolytic refining (B) Zone refining
(C) Chromatography (D) None

28. Name important ore of aluminium—
(A) Bauxite (B) Cryolite
(C) Croundum (D) None

29. The electronic configuration of carbon is :
(A) $1s^2, 2s^2, 2p^2$ (B) $1s^2, 2s^2, 2p^1$
(C) $1s^2, 2s^2, 2p^3$ (D) $1s^2, 2s^2, 2p^4$

30. Catenation property is maximum in :
(A) phosphorus (B) carbon
(C) sulphur (D) zinc

31. Which one of the following does not form hydrogen bonding ?
(A) NH_3 (B) H_2O
(C) HCl (D) HF

32. Modern periodic table is given by :
(A) Dobereiner (B) Mendeleef
(C) Mendel (D) None of these

33. Which of the following has $p\pi - d\pi$ bond?
(A) NO_3^- (B) CO_3^{2-}
(C) BO_3^{2-} (D) SO_3^{2-}

34. Which has the largest bond angle in the following ?
(A) NH_3 (B) H_2S
(C) BF_3 (D) CH_4

35. Nitric acid is prepared by :
(A) Contact process (B) Ostwald's method
(C) Photosynthesis (D) Haber's process

36. Which of the following gas is mono-atomic ?
(A) Chlorine (B) Helium
(C) Nitrogen (D) Oxygen

37. Which of the following bonds is the strongest ?
(A) F – F (B) Cl – Cl
(C) I – I (D) Br – Br

38. Which is not a *p*-block elements ?
(A) Sn (B) Al
(C) Mg (D) Pb

39. Which of the following is not a *p*-block elements ?
(A) Sn (B) P
(C) S (D) Ba

40. Most stable oxidation state of bismuth is :
(A) + 3 (B) +5
(C) +3 and + 5 both (D) None

41. Electronic configuration of alkaline earth element is :
(A) ns^2 (B) ns^1
(C) np^6 (D) ns^0

42. Which one of the following is diamagnetic ion ?
(A) Co^{2+} (B) Ni^{2+}
(C) Cu^{2+} (D) Zn^{2+}

43. The best way to protect iron from rusting is :
(A) making iron cathode (B) putting it in saline water
(C) both 'A' and 'B' (D) none of these

44. Transition elements are
(A) Metals (B) None metals
(C) *d*-block elements (D) Gas

45. Ligands are capable of donating atleast :
(A) one pair of electrons (B) one electron
(C) three electron (D) all of these

46. The co-ordination number of Cr in $K_3[Cr(C_2O_4)_3]$ is :
(A) 3 (B) 4
(C) 5 (D) 6

47. Spelter is:
(A) Pure zinc (B) Impure zinc
(C) Impure aluminium (D) Impure merecury

48. IUPAC name of H_2 $[PtCl_6]$ is :
(A) Dihexa Chloroplatinic (IV) acid
(B) Hydrogen hexachloro plantinate (II)
(C) Hydrogen hexa chloride Pt (IV)
(D) Hydrogen hexa chlorido Pt (II)

49. The hybridisation of carbon in diamond is :
(A) sp^3 (B) sp^2
(C) sp (D) dsp^2

50. Criteria for purity of organic solid is :
(A) boiling point (B) melting point
(C) specific gravity (D) none of these

51. The antiseptic action of CHI_3 is :
(A) due to idoform
(B) due to liberation of free iodine
(C) partially due to iodine and partially due to CHI_3
(D) None of these

52. S_N2 mechanism proceeds via formation of :
(A) Carbocation (B) Transition state
(C) Free radical (D) Carbonion

53. Ethyl acetate reacts with CH_3MgBr to from :
(A) Secondry alcohol (B) Tertiary Alcohol
(C) Primary Alcohol and Acid
(D) Carboxylic Acid

54. The functional group of alcohol is :
(A) –COOH (B) –CHO
(C) $-\overset{|}{\underset{|}{C}}=O$ (D) –OH

55. By which of the following reactions Phenol is converted into salicyl aldehyde ?
(A) Etard reaction (B) Kolbe's reaction
(C) Reimer-Tiemann reaction (D) Cannizzaro's reaction

56. Which of the following is most acidic ?
(A) Benzyl alcohol (B) Cyclohexanol
(C) Phenol (D) m-Chlorophenol

57. Dry distillation of calcium formate gives :
(A) HCHO (B) HCOOH
(C) CH_3COOH (D) CH_3CHO

58. IUPAC name of CH_3COOH is :
(A) Methanoic acid (B) Ethanoic acid
(C) Propanoic acid (D) Methanol

59. The product formed by heating calcium formate is :
(A) Formaldehyde (B) Acetaldehyde
(C) Acetone (D) Formic acid

60. Which is the most basic ?
(A) $C_6H_5NH_2$ (B) $(C_6H_5)_2NH$
(C) CH_3NH_2 (D) $(CH_3)_2NH$

61. Ammonia changes the moist red litmus paper into :
(A) Blue (B) Green
(C) Black (D) White

62. CH_3 CH_2NH_2 is known as :
(A) Ethyl amine (B) Propyl amine
(C) Methyl amine (D) Ammonia

63. A compound on hydrolysis give 1°–amine. The compound is :
(A) Anilide (B) amide
(C) cyanide (D) None

64. Bakelite is an example of :
(A) elastomer (B) fibre
(C) thermoplastic (D) thermosetting

65. Polythene is a polymer of :
(A) Ethane (B) Ethene
(C) Propene (D) Etheyne

66. Formula of sucrose is :
(A) $C_{12}H_{22}O_{12}$ (B) $C_{12}H_{22}O_{11}$
(C) $C_{12}H_{24}O_{11}$ (D) $C_{12}H_{22}O_{10}$

67. The human body does not produce :
(A) Enzyme (B) DNA
(C) Vitamin (D) Hormones

68. Sweetest of all sugars is :
(A) Glucose (B) Lactose
(C) Sucrose (D) Fructose

69. Over production of acid in stomach can be controlled by :
(A) Antacid (B) Anaglesic
(C) Antipyretic (D) Antibiotic

70. Washing soda is :
(A) $Na_2CO_310H_2O$ (B) $Na_2CO_3.5H_2O$
(C) Na_2CO_3 (D) NaOH

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. **Why does table salt NaCl sometimes appear yellow in colour ?**
2. **What is semipermeable membrane ?**
3. **Define electrode and electrode potential.**
4. **Define rate law. Give example.**
5. **What is activation energy ? Establish the relation between rate ,constant of a reaction and activation energy.**
6. **What are emulsion ? What are their different types ? Give example of each type.**
7. **Define standard electrode potential.**
8. **Giving examples, differentiate between 'Roasting' and 'Calcination'.**
9. **Differentiate between Flux and Slag.**
10. **Fluorine does not exhibit any positive oxidation state. Why ?**
11. **Which one is stronger acid HF or HCl, why ?**
12. **What are essential and non-essential amino acids ? Give two examples of each type ?**
13. **What are artificial sweetening agents ? Give two examples.**
14. **Cyclohexamine is more basic than Aniline.**
15. **Discuss the definitions of Elevation of boiling point.**
16. **Define Electrochemical equivalent.**
17. **PCl_5 is known but NCl_5 is not known. Why ?**
18. **What is a primary cell ? Give an example.**
19. **Transition elements exhibit variable oxidation state. Why ?**
20. **What is 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.* $3 \times 5 = 15$

21. **Write the following name reactions :**
    (i) Rosenmund's Reduction
    (ii) Sandmeyer's Reaction
22. **What are the main sources of Iodine ? How is iodine extracted from sea weeds ?**
23. **What happens when :**
    (i) Nitrobenzene is treated with Sn/HCl.
    (ii) What happens, when SO_2 (gas) passes through acidic $KMnO_4$?
24. **Explain the cleansing action of soaps and detergents.**
25. **A first order reaction takes 69.3 minutes for 50% completion. Set up an equation for determining the time needed for 80% completion of this reaction. (Calculation of result is not required).**
26. **Drive Rate Constant for first order Reaction.**

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

SECTION – B

1. Yellow colour in NaCl is due to metal excess defect due to which unpaired electrons occupy anionic sites, known as F-centres. These electrons absorb energy from the visible region for the excitation which makes crystal appear yellow.
2. Continuous sheets or films (natural or synthetic) which contain a network of submicroscopic holes or pores through which small solvent molecules (water etc.) can pass, but solute molecules of bigger size cannot pass are called semipermeable membrane.
3. **Electrode**—Solid electric conductor through which an electric current enters or leaves on electrolytic cell or the medium is called Electrode.
   Electrode Potential—The electrical potential difference set up between the metal and its ions in the solution is called electrode potential.
4. The mathematical expression describing the concentration-dependence of the rate of reaction is called rate law or rate equation. For example, for a reaction two reactants A and B, the rate law is
   $$\text{Reaction rate} = k.\ [A]^n\ [B]^m$$
   A — concentration of reactant A
   n — order of reaction with respect to A
   B — concentration of reactant B
   m — order of reaction with respect B
5. **Activation Energy**—The minimum Rate constant amount of energy absorbed by the reactant molecules so that their energy becomes equal to threshold value is called activation energy.
   Activation energy (E_a) = Threshold energy (E_T) – Average energy of the reactant (E_R) i.e. $E_a = E_t - E_R$
   Relation between rate constant of a reaction and its activation energy :
   According to Arhenius equation, $K = A.e^{-E_a/RT}$
   or, $\ln K = \ln A - \frac{E_a}{RT}$
   Converting natural logarithm to the base 10,
   $$2.303 \log K = 2.303 \log A - \frac{E_a}{RT}$$
   $$\Rightarrow \log K = \log A - \frac{E_a}{2.303RT}$$
   As the value of E_a increases, the value of K decreases and therefore reaction rate decreases.
6. Liquid-liquid colloidal systems in which finely divided droplets of a liquid are dispersed into other liquid are called emulsions. These are formed by shaking the two immiscible liquids with each other.
   Type of Emulsions :
   (a) Oil dispersed in water (O/W type) e.g., milk, vanishing cream, etc.
   (b) Water dispersed in oil (W/O type) e.g., butter, cold cream, etc.

7. **Standard Electrode Potential**—It is the measure of individual potential of a reversible electrode at standard state which is with solutes at an effective concentration of 1 mol dm^{-3} and gases at a pressure of 1 atm.

8. **Difference between Raosting and Calcination :**

Sl. No.	Roasting	Calcination
1.	Ore is heated in the presence of excess of air or oxygen.	Ore is heated in the absence or limited supply of air or O_2.
2.	This method is employed for sulphide ores.	This method is employed for carbonate ores.
3.	Sulphur dioxide is produced along with metal oxide.	Carbon dioxide is produced along with metal oxide.
4.	e.g., $2ZnS+3O_2 \xrightarrow{\Delta} 2ZnO+2SO_2\uparrow$	e.g., $ZnCO_3 \xrightarrow{\Delta} ZnO+CO_2\uparrow$

9. **Difference between Flux and Slag :**

Flux	Slag
1. It is chemical cleaning agent, which remove impurities from metal.	1. Slag is partially viterious by product of the process of smelting ores, which separates the desired metal fraction from the unwanted fraction. It is mixture of metal oxide.
2. Example : $CaO + SiO_2 \rightarrow CaSiO_3$	2. Example : $CaO + SiO_2 \rightarrow CaSiO_3$

10. Fluorine is the most electronegative element. Its ionisation enthalpy is very high. Therefore it cannot lose electrons easily and does not exhibit any positive oxidation state.

11. Hydrogen iodide (HI) is more stronger acid than hydrogen floride because iodine (I) is less electronegative than Florine (F) and hence it can donate H^+ more easily than florine (F).

12. Out of the 20 amino acids required for protein synthesis human body can synthesize only 10. These 10 amino acids which, the body can synthesize are called **non-essential or dispensable amino acids** while the remaining ten which the human body cannot synthesize are called essential or indispensable amino acids. These essential amino acids are required for the growth of the body and they must be supplied in the human diet.

    Two examples of essential amino acids are valine and phenylalamine. Two examples of non-essential amino acids are glycine and cysteine.

13. Sucrose, glucose etc. are natural sugars. They add to calorie intake. To cut down on the intake of calories many people use artifical sweeterners such as saccharine (ortho-Sulpho-benzimide) which is 550 times as sweet as sugar (mass to mass) with negligible calories. It is excreted from the body in urine unchanged. It is entirely inert and harmless when taken. It is of great value of diabetic persons and people who need to control intake to calories. Other example of artificial sweeteners are aspartame, sucrolose, alitame.

14. In cyclohexamine, the electron donating group is attached to SP^3 hybridized cyclohexane ring while in case of aniline it is attached with SP^2 hybridized carbon containing benzene ring. Due to more S-character in benzene ring, here becomes the de localization of π-electrons in the ring and further the NH_2-group donates more electron to the ring so that it reduces the +ve charge centers and stablizes the ring and moves it less acidic means basicity increases while in case of cyclohexamine, the lone pair of electron donating NH_2-group is not de localised over cyclohexane ring and is available for donation, which makes the compound more basic than aniline.

15. **Elevation of boiling point**—The rise in the boiling point of a liquid due to the dissolution of any nonvolatile solute is called elevation of boiling point (ΔT_b).

$$\Delta T_b = K_b \ \ m = K_b \frac{n_2}{w_1} = \frac{K_b . w_2}{w_1 \times M_2}$$

$$M_2 = \frac{K_b . w_2}{w_1 . \Delta T_b}$$

where, w_2 is the mass of solute (in grams), and M_2 is the molar mass of the solute (in g/mol); w_1 is the mass of the solvent in kg units.

If the mass of the solvent w_1 is expressed in grams, then the molar mass of the solute can be obtained from the following relationship,

$$M_2 = \frac{K_b \times w_2}{(w_1/1000) \times \Delta T_b} = \frac{1000\ K_b w_2}{w_1 \times \Delta T_b}$$

16. **Electrochemical equivalent (Z) :** If I = 1 ampere and t = 1 second, then

$$w = Z$$

Thus, the electrochemical equivalence may be defined as the amount of the substance deposited by passing one ampere of current for one second or by passing one coulomb of charge through the electrolyte.

17. Nitrogen can't extend its valence from 3 to 5 due to absence of d-orbital while phosphorous shown penta valences as d-orbital present in its valence cell.

18. The cell which produces electrical energy by virtue of chemical reaction within the cell is called a primary cell. The primary cells cannot be charged for repeated use.
Example : Dry cell, Daniell cell, Mercury cell.

19. The variable oxidation states of transition elements are due to participation of $(n-1)d^n$ electron in bond formation along with *ns* electron.

20. Proteins are complex molecules made of amino acids. They are present in all organisms and play a vital role in cellular functions and processes. Denaturation of proteins occure when the secondary and tertiary structure of a protein is altered and the protein is no longer capable of performing its functions. This is similar to stretching a rubber band so far that the rubber band either breaks or is no longer able to snap back to its original shape and size. Once denatured, some proteins are able to return back to their original shape. Other are not.

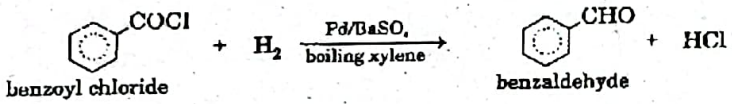
21. **(i) Rosenmund's Reduction**—Reduction of acid chlorides (RCOCl) to the corresponding aldehydes with hydrogen using palladium as catalyst spread on barium sulphate is known as **Rosenmund's reaction.** The presence of $BaSO_4$ does not allow reduction of aldehyde to alcohol. Both aromatic and aliphatic acid chlorides can be reduced to the corresponding aldehydes by this method.

$$\underset{\text{acid chloride}}{R-\overset{O}{\overset{\|}{C}}-Cl} + H_2 \xrightarrow[\text{boiling xylene}]{Pd/BaSO_4} \underset{\text{aldehyde}}{R-CHO} + HCl$$

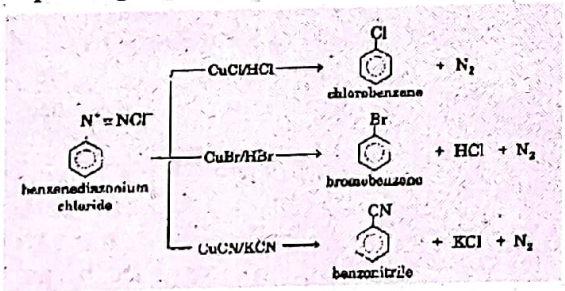
For example,

$$\underset{\text{acetyl chloride}}{CH_3COCl} + H_2 \xrightarrow[\text{boiling xylene}]{Pd/BaSO_4} \underset{\text{acetaldehyde}}{CH_3CHO} + HCl$$

$BaSO_4$ prevents the reduction of acetaldehyde to ethanol.



(ii) Sandmeyer's Reaction—A diazonium salt can be converted into the halogen or cyano derivative of the parent aromatic hydrocarbon by treating it with a mixture containing the corresponding cuprous salt and the acid. For example



In this reaction, the group attached to copper (Cu) gets transferred to the benzene ring.

22. **Natural sources of Iodine :** Due to its reactivity Ioidine is not found in nature in free state. Its main sources are (i) sea weeds (ii) chile salt peter (iii) Natural brine.

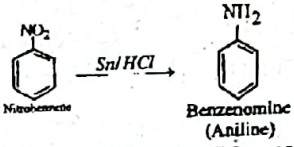
Extraction of Iodine from sea weeds—Sea weeds lamineria contains iodine, Sea weed is well dried and burnt in deep pit carefully so that idoine do not get destroyed. The obtained ash is called kelp which contains 0.4 to 1.3% Iodine kelp is dissolved in water and solution is partially crystallised when less. Soluble KI and NaI remain in the mother liquor, conc H_2SO_4 is added when basic sulphides despositet the bottom, when is filtered and removed. Now the filtrate is mixed with MnO_2 and H_2SO_4 and heated iron vessel. Iodine vapourises due to the reaction and is collected Aludel. Iodine is new collected as solid after condensation.

$$2NaI + MnO_2 + 3H_2SO_4 \rightarrow 2NaHSO_4 + MnSO_4 + 2H_2O + I_2\downarrow$$

Iodine obtained by this method contains Cl_2 and Br_2 as impurifies. It is treated with KI to obtained pure Iodine

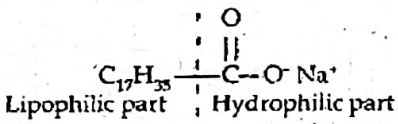
$$2KI + Cl_2 \xrightarrow{\Delta} 2KCl + I_2,\ Br_2 + 2KI \xrightarrow{\Delta} 2KBr + I_2$$

23. **(i)** When nitrobenzene is treated with Sn/HCl then Anelyne is formed.

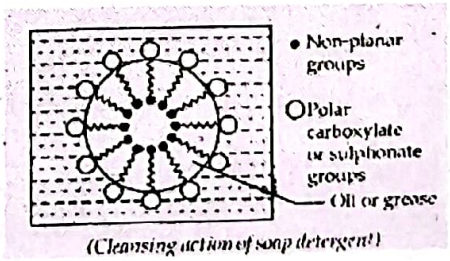


(ii) $2KMnO_4 + 5SO_2 + 2H_2O \rightarrow K_2SO_4 + 2MnSO_4 + 2H_2SO_4$

24. All the soaps and detergents contain two characteristic groups, i.e., a water-soluble (hydrophilic) group and oil-soluble (Lyophilic or lipophilic group). As a result one end of the molecule of a soap or detergent tends to go into oil phase and the other end tends to go into water phase with the net result that the material (soap or detergent) concentrates at the surface of the solution or interace.



The dirt is generally held to a dirty surface by a thin film of an oil or grease. When it is treated with soap solution, the non-polar hydrocarbon chain of soap or detergent dissolves in oil or grease and the carboxylate part of the soap or the sulphonate group of the detergent is held by surrounding water (in fig. below). This lowers the surface tension between water and grease. As a result a stable emulsion of oil in water is formed. When the surface or the cloth is mechanically scrubbed the loosened dirt particles are absorbed by colloidal soap particles and ultimately washed away by water.



(Cleansing action of soap detergent)

25. Here $t_{1/2}$ = 69.3 minutes

For first order reaction

$$k = \frac{0.693}{t_{1/2}} = \frac{0.693}{69.3} \text{ min}^{-1} = 0.01 \text{ min}^{-1}$$

$$t_{80\%} = \frac{2.303}{k}\log\frac{100}{20} = \frac{2.303}{0.01}\log 5$$

= 160.97 minutes.

26. For a first order reaction,

$$A \rightarrow \text{Products}$$

Let the initial conc. of [A] be a ML^{-1}.

Let x change into products so that equilibrium concentration after time t is :

$\frac{dx}{dt} \cdot \alpha[A]$ — k = constt. called

$\alpha(a-x)$ — Rate constant

$= k(a-x)$ — reaction rate or specific

$$\frac{dx}{(a-x)} = kt$$

Integrating both sides $\int \frac{1}{a-x} = k\int dt + I_0$

I_0 = constant of integration

$$-\text{In}(a-x) = kt + I_0 \quad \ldots (1)$$

when time $t = 0$; $x = 0$

$\therefore \quad -\text{In } a = I_0$

Put in equation (1)

$$-\text{In}(a-x) = kt - \text{ln at}$$

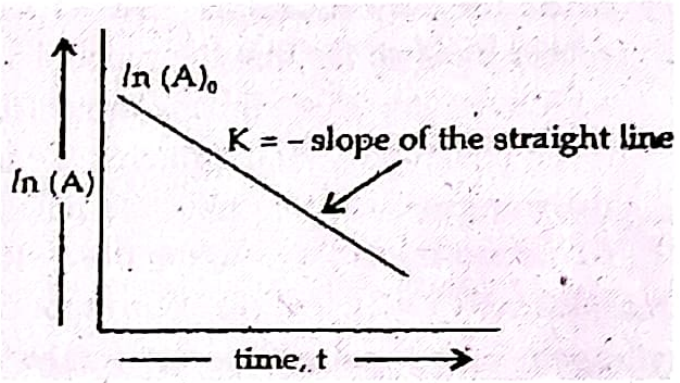
$$\text{In } a - \log(a-x) = kt \quad \text{or} \quad k = \frac{1}{t}\text{ ln } \frac{a}{a-x}$$

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

If the initial concentration is 'a' moles per litre, x moles of A change in time t and k is the rate constant, then integrated rate equation is

$$k_1 = \frac{2.303}{t}\log\frac{a}{a-x} \quad \text{or} \quad k_2 = \frac{2.303}{t}\log\frac{[A]_0}{[A]}$$

where $[A]_0$ is the initial concentration and [A] is the concentration at time t. The value of k can be calculated by substituting the values of a, t and x.



❑❑❑