

Instructions:

1. Question paper has FIVE parts. All parts are compulsory.
2. a. Part-A carries 20 marks. Each question carries 1 mark.
b. Part-B carries 06 marks. Each question carries 2 marks.
c. Part-C carries 15 marks. Each question carries 3 marks.
d. Part-D carries 20 marks. Each question carries 5 marks.
e. Part-E carries 09 marks. Each question carries 3 marks.
3. In Part- A questions, first attempted answer will be considered for awarding marks.
4. Write balanced chemical equations and draw neat labelled diagrams and graphs wherever necessary.
5. Direct answers to the numerical problems without detailed steps and specific unit for final answer will not carry any marks.
6. Use log tables and simple calculator if necessary (use of scientific calculator is not allowed).

PART-A**I. Select the correct option from the given choices.****1 × 15 = 15**

1. Higher the value of Henry's constant
 - a) Higher the solubility.
 - b) Lower the solubility.
 - c) No change in solubility
 - d) both (b) and (c).
 2. Potential value of SHE is
 - a) 0.0 v
 - b) 0.1 v
 - c) 1.1 v
 - d) 1.0 v
 3. During electrolysis of aqueous solution of NaCl, the reaction preferred at anode is
 - a) $2\text{H}_2\text{O}(\text{l}) \rightarrow \text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^-$
 - b) $\text{H}_2\text{O}(\text{l}) + \text{e}^- \rightarrow \frac{1}{2} \text{H}_2(\text{g}) + \text{OH}^-$
 - c) $\text{Cl}^-(\text{aq}) \rightarrow \frac{1}{2} \text{Cl}_2(\text{g}) + \text{e}^-$
 - d) $\frac{1}{2} \text{Cl}_2(\text{g}) + \text{e}^- \rightarrow \text{Cl}^-(\text{aq})$
 4. Decomposition of ammonia in the presence of Pt is an example for
 - a) Zero order reaction
 - b) First order reaction
 - c) second order reaction
 - d) thermo-chemical
- equation 5. Transition element shows maximum oxidation state is
- a) Mn
 - b) Cr
 - c) Fe
 - d) Zn
6. The oxidation state of Fe in $[\text{Fe}(\text{CN})_6]^{-4}$ is
 - a) + 2
 - b) 0
 - c) + 3
 - d) + 5
 7. The composition of Lucas reagent is
 - a) Anhy. $\text{ZnCl}_2 + \text{Conc. HCl}$
 - b) H_2 and HCl
 - c) SO_2 and HCl
 - d) NO_2 and H_2

8. Phenol molecule is less stable than phenoxide ion because
- phenol resonance structures have charge separation but not in phenoxide ion.
 - phenoxide ion resonance structures have charge separation but not in phenol.
 - both Phenoxide ion and phenol resonance structures have charge separation
 - both Phenoxide ion and phenol resonance structures do not have charge separation
9. Cresol is an example for
- dihydric alcohol
 - monohydric phenol
 - trihydric phenol
 - trihydric alcohol
10. Tollen's reagent is a
- silver nitrate solution
 - ammonical silver nitrate solution
 - ammonium nitrate solution
 - silver chloride solution
11. Carboxylic acids exist in dimeric form even in vapour phase due to
- Hydrogen bond
 - peptide bond
 - ionic bond
 - metallic bond
12. The chemical name of Hinsberg reagent is;
- Benzene sulphur chloride
 - Sulphonyl chloride
 - Benzene sulphonyl chloride
 - Benzene chloride
13. Benzene diazonium chloride reacts with phenol to form p-hydroxy azobenzene in
- acidic medium
 - neutral medium
 - basic medium
 - both acidic and neutral medium
14. Thiamine is a chemical name of;
- Vitamin A
 - Vitamin B₁
 - Vitamin C
 - Vitamin K
15. The nitrogenous base adenine forms hydrogen bonding with
- Thymine
 - Cytosine
 - Guanine
 - None of the above

II. Fill in the blanks by choosing the appropriate word from those given in the brackets:

(B.M, Hydrogen, molecularity, Vicinal, Isotonic, pseudo-first order) **5 × 1 = 05**

16. Two solutions having same osmotic pressure are called _____.
17. Inversion of cane sugar is an example for _____.
18. The unit of magnetic moment is _____.
19. 1,2-Dichloroethane is an example for _____ halide.
20. Solubility of ethylamine in water is due to formation of _____ bonding with water.

PART - B

III. Answer any three of the following. Each question carries two marks. 3 × 2 = 06

- Mention any factors affect solubility of gas in liquid.
- Define pseudo-first order reaction. Give an example.
- What are ligands? Give an example for bidentate ligand.
- Write the general equation for Wurtz reaction. Give an example.
- Explain Gatterman-Koch synthesis of benzaldehyde. Give equation.
- Name two hormones which regulate the glucose level in the blood.

PART – C

IV. Answer any three of the following. Each question carries three marks. 3 × 3 = 09

27. Calculate the spin only magnetic moment of Fe^{3+} ion. ($Z = 26$)
28. Explain the manufacture of potassium dichromate from chromite ore.
29. What is Lanthanoid contraction? Mention any two consequences.
30. Write the IUPAC names and the type of isomerism for the following complexes
(a) $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ and (b) $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$.
31. Using Valence Bond Theory [VBT], explain geometry, hybridisation and magnetic property of $[\text{Co}(\text{NH}_3)_6]^{3+}$ ion. [Atomic number of Cobalt is 27].
32. Draw the energy level diagram for the crystal field splitting in octahedral complexes. Give an example for linkage isomerism.

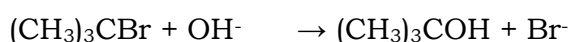
V. Answer any two of the following. Each question carries three marks. 2 × 3 = 06

33. Explain reverse osmosis. Give an example for hypertonic solutions.
34. State Faraday's law. Mention one method of prevention of corrosion.
35. Explain the working of hydrogen-oxygen fuel cell.
36. Derive integrated rate equation for first order reaction.

PART – D

VI. Answer any four of the following. Each question carries five marks. 4 × 5 = 20

37. a. Write the mechanism involved in the following reaction:



Identify the reactant on which rate of reaction depends.

- b. Explain nitration of chlorobenzene with equation. (3+2)
38. a. Explain the mechanism of dehydration of ethanol to ethane.
- b. Explain esterification reaction with equation. (3+2)
39. a. Explain cumene process of manufacture of phenol.
- b. Explain Williamson's ether synthesis with an example.
- c. Give an example for unsymmetrical ether. (2+2+1)
40. a. Explain aldol condensation reaction with an example.
- b. Explain Rosenmund reduction with an example.
- c. Give an example for aldehyde do not containing alpha (α)-hydrogen atom. (2+2+1)
41. Explain Hell-Volhard-Zelinsky (HVZ) reaction with an example.
- b. Between methanoic acid and ethanoic acid, which is more acidic? Give reason.
- c. Name the product formed when acetic acid undergo decarboxylation with soda lime. (2+2+1)
42. a. Explain Hoffman's bromamide synthesis of primary amine with an example. t-amines do not react with Hinsberg's reagent. Give reason.
- b. Explain Carbylamine reaction with an example. (3+2)
43. a. Explain the Haworth structure of sucrose.
- b. What is Zwitter ion of an amino acid? Which vitamin deficiency causes night blindness?

c. Give an example for globular proteins.

(2+2+1)

PART – E (PROBLEMS)

VII. Answer **any three** of the following. Each question carries **three** marks. **3 × 3 = 9**

44. 5.8 g of a solute dissolved in 100 g of carbon disulphide. The vapour pressure of the solution was found to be 190 mm of Hg. Calculate the molar mass of the solute. Given vapour pressure of pure carbon disulphide is 195 mm of Hg and molar mass of carbondisulphide is 76 g/mol.
45. The boiling point of benzene is 353.23K. When 1.8g of non-volatile solute was dissolved in 90g of benzene, the boiling point is raised to 354.11K. Calculate the molar mass of the solute. (Given K_b for benzene is 2.53Kkgmol^{-1}).
46. Calculate EMF of the cell represented below.
 $\text{Zn} / \text{Zn}^{+2} (0.1\text{M}) \parallel \text{Cu}^{+2} (1\text{M}) \mid \text{Cu}$ at 25°C . Given: $E_{\text{Cu}}^0 = +0.34\text{ v}$ and $E_{\text{Zn}}^0 = 0.76\text{ v}$
47. Calculate standard free energy change for the reaction.
 $\text{Zn}_{(s)} + 2\text{Ag}^+_{(aq)} \rightarrow \text{Zn}^{+2}_{(aq)} + 2\text{Ag}_{(s)}$; $E^0_{\text{cell}} = 1.56\text{V}$; $1\text{F} = 96500\text{Cmol}^{-1}$
48. For a first order reaction, the half-life period is 60 min. Calculate the time required to complete 70% of the reaction.
49. The rate constants of a reaction are $2 \times 10^{-2}\text{s}^{-1}$ at 320K and $8 \times 10^{-2}\text{ s}^{-1}$ at 340 K. Calculate the energy of activation of the reaction. (Given: $R = 8.314\text{JK}^{-1}\text{mol}^{-1}$).
