

**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. Which one is temperature independent.  
a) molarity                      b) molality    c) mole fraction              d) normality
2. Standard hydrogen electrode potential is assumed to be taken as  
a) 1                                  b) 2                                  c) 3                                  d) Zero
3. The electrolyte used in lead storage battery is  
a) 38% Sulphuric acid    b) 20% sulphuric acid    c) PbSO<sub>4</sub>              d) PbO<sub>2</sub>
4. The unit of rate constant for zero order reaction is  
a) molL<sup>-1</sup>s<sup>-1</sup>    b) s<sup>-1</sup>                                  c) mol<sup>-1</sup>L<sup>-1</sup>s<sup>-1</sup>              d) molL<sup>-1</sup>
5. Mischmetals is used in Mg-based alloy to produce  
a) bullets                          b) shell                                  c) lighter flint              d) all of these
6. The oxidation number of Ni in [Ni(CN<sub>4</sub>)]<sup>2-</sup>  
a) +1                                  b) +2                                  c) +4                                  d) +3
7. The boiling points of isomeric haloalkanes \_\_\_\_\_ with increase in branching  
a) increase              b) decrease    c) remains same              d) none of these
8. Phenol is known as \_\_\_\_\_  
a) Carboic acid    b) Benzyl alcohol    c) salicylic acid    d) Carboxylic acid
9. Which of the following alcohols react most readily with Lucas reagen ?  
a) Primary              b) secondary              c) tertiary              d) all of these
10. Aldehydes which answer Cannizzaro reaction does not contain \_\_\_\_\_  
a) α-Hydrogen    b) β-Hydrogen    c) γ-Hydrogen    d) δ-Hydrogen
11. Ammonical silver nitrate solution is called \_\_\_\_\_  
a) Fehling's reagent    b) Schiff's reagent    c) Benedict's reagent    d) Tollen's reagent
12. Nitrogen atom of amino group is \_\_\_\_\_ hybridised.  
a) sp                                  b) sp<sup>2</sup>                                  c) sp<sup>3</sup>                                  d) sp<sup>3</sup>d
13. The general formula of quaternary ammonium compound is  
a) R-NH<sub>2</sub>    b) R<sub>3</sub>N                                  c) R<sub>4</sub>N<sup>+</sup>X<sup>-</sup>              d) R<sub>2</sub>NH
14. Which is a fat soluble vitamin?  
a) Vitamin A              b) Vitamin B                                  c) Vitamin C                                  d) Vitamin B<sub>2</sub>
15. Carbohydrates are stored in the body as  
a) sugars                          b) starch                                  c) glucose                                  d) glycogen

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

**brackets:**

**5 × 1 = 5**

(equal, , elementary,  $C_6H_5SO_2Cl$ , 2-bromo-2-methylpropane, zinc, Tertiary, non-ideal)

16. Ethyl alcohol and water is an example for \_\_\_\_\_ solution.
17. Molecularity is applicable only for \_\_\_\_\_ reactions
18. Zr and Hf have almost \_\_\_\_\_ atomic and ionic radii.
19. The IUPAC name of t-butyl bromide \_\_\_\_\_.
20. \_\_\_\_\_ is known as Hinsberg's reagent.

**PART - B**

**III. Answer any three of the following. Each question carries two marks.**

**3 × 2 = 6**

21. State Henry's law. Write its mathematical form.
22. Show that the half-life period of a first order reaction is independent of initial concentration of reacting species.
23. What is ionization isomerism? Give an example.
24. Explain Friedel Craft's reaction with equation by taking chlorobenzene as example.
25. Explain Cannizzaro's reaction with an example.
26. What are fibrous proteins? Give an example.

**PART - C**

**IV. Answer any three of the following. Each question carries three marks.**

**3 × 3 = 9**

27. Calculate the spin only magnetic moment of  $Fe^{2+}$ . [Atomic number of Fe=26].
28. Explain the preparation of potassium permanganate from  $MnO_2$  with equation.
29. a) What are interstitial Compounds? Give an example.  
b) Name one 3d series element that do not show variable oxidation state.
30. Using Valence Bond Theory [VBT], explain geometry, hybridisation and magnetic property of  $[Ni(CN)_4]^{-2}$  ion. [Atomic number of Nickel is 28].
31. Mention any three postulates of Werner's theory of coordination compounds.
32. a) What are Homoleptic complexes? Give an example.  
b) Give an example for ambidentate ligand.

**V. Answer any two of the following. Each question carries three marks.**

**2 × 3 = 6**

33. What are azeotropes? Give an example for binary solutions showing minimum and maximum boiling azeotrope.
34. Draw a neat labeled diagram of  $H_2-O_2$  fuel cell and write overall cell reaction.
35. State the Faraday's second law of electrolysis. How many faraday of electricity is required for the reduction of 1 mole of  $Al^{3+}$  ions ?
36. Derive an integrated rate equation for the rate constant of a zero order reaction.

**PART - D**

**VI. Answer any four of the following. Each question carries five marks.**

**4 × 5 = 20**

37. a) Explain  $S_N2$  mechanism by taking chloromethane as an example.

- b) i) Chloroform is stored in closed dark coloured bottles. Why?  
 ii) Write the structure of DDT.
38. a) Explain Kolbe's reaction with equation.  
 b) What is Lucas reagent?  
 c) Explain the Friedel-Crafts alkylation of anisole.
39. a) What happens when vapours of 1° alcohols passed over heated Cu at 573K? Give equation.  
 b) Explain Reimer-Tieman reaction.  
 c) What is the effect of electron donating group on acidity of alcohols?
40. a) Explain Clemmensen reduction reaction with an example.  
 b) Aldehydes are generally more reactive than ketones towards nucleophilic addition reactions. Give any two reasons.  
 c) Write the IUPAC name of  $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CH}_3$ . an example.
41. a) How does carboxylic acids react with  $\text{SOCl}_2$ ? Explain with an example.  
 b) Explain Etard's reaction with an example.  
 c) What is Tollen's reagent?
42. a) Explain Gabriel phthalimide synthesis by taking methanamine as an example.  
 b) Between  $\text{CH}_3\text{NH}_2$  and  $\text{C}_6\text{H}_5\text{NH}_2$  which is more basic? Give reason.  
 c) Write the general formula of diazonium salt. (2+2+1)
43. a) Write the Haworth's structure of Lactose.  
 b) Name the sugar moiety present in DNA.  
 c) What are essential amino acids? Name naturally occurring  $\alpha$ -amino acid which is not optically active. (2+1+2)

### PART - E (PROBLEMS)

#### VII. Answer any three of the following. Each question carries three marks. $3 \times 3 = 9$

44. 1.0 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.40K. The freezing point depression constant of benzene is  $5.12 \text{ K Kg mol}^{-1}$ . Find the molar mass of the solute.
45.  $200 \text{ cm}^3$  of an aqueous solution of a protein contains 1.26 g of the protein. The osmotic pressure of the protein. The osmotic pressure of such a solution at 300 K is found to be  $2.57 \times 10^3 \text{ bar}$ . Calculate the molar mass of the protein.
46. Calculate the emf of the cell for the reaction:  
 $\text{Mg}_{(s)} + 2\text{Ag}^+(0.0001\text{M}) \longrightarrow \text{Mg}^{2+}(0.130\text{M}) + 2\text{Ag}_{(s)}$  If  $E^0_{(\text{cell})} = 3.17 \text{ V}$
47. The molar conductivity of  $0.025 \text{ mol L}^{-1}$  methanoic acid is  $46.1 \text{ S cm}^2 \text{ mol}^{-1}$ . Calculate its degree of dissociation and dissociation constant. Given  $\lambda^0(\text{H}^+) = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$  and  $\lambda^0(\text{HCOO}^-) = 54.6 \text{ S cm}^2 \text{ mol}^{-1}$ .
48. A first order reaction takes 69.3 minutes for 50% completion. How much time will be needed for 80% completion?
49. The specific reaction rate of a reaction doubled when temperature changes from  $30^\circ\text{C}$  to  $50^\circ\text{C}$ . Calculate the energy of activation of the reaction. (Given:  $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ).