Answer any 4 questions from 1 to 5. Each carries 1 score. **(4 × 1 = 4)**

1 Dissolution of a gas in liquid is a process

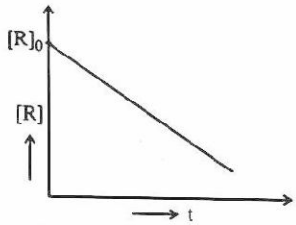
(a) with increase in enthalpy

(b) with no change in enthalpy

(c) with decrease in enthalpy

(d) for which enthalpy change cannot be predicted

2. For a reaction, a plot between concentration of reactant, [R] and time, t is as shown below :



The order of the reaction is _____ .

3. The transition element present in 'bronze' is _____ .

4. Identify the product formed by the catalytic reduction of propanal.

5. The zwitter ion of the amino acid, $H_2N - CH_2 - COOH$ is _____ .

Answer any 8 questions from 6 to 15. Each carries 2 scores. **(8 × 2 = 16)**

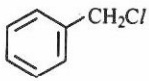
6. Find the relative lowering of vapour pressure of the solution containing 0.5 mol glucose dissolved in 55.5 mol of water.

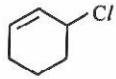
7. Write the cell representation for the determination of standard electrode potential of Cu^{2+}/Cu electrode using 'SHE'.

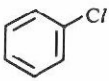
8. Derive an expression for half-life of a first order reaction from its integrated rate equation.

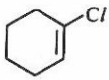
9. Define collision frequency and effective collisions on the basis of collision theory.

10. Classify the following compounds into allylic, benzylic, vinylic and aryl halides :

(A) 

(B) 

(C) 

(D) 

11. Write the IUPAC names of the major products in the reactions given below :

(i) Acid catalysed hydration of propene. (1)

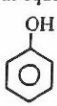
(ii) Addition of CH_3MgBr on HCHO followed by hydrolysis. (1)

12. Reaction of phenol with NaOH indicates the acidic nature of phenol.

(i) Write the chemical equation representing the reaction of phenol with NaOH. (1)

(ii) Give reason for the acidic nature of phenol. (1)

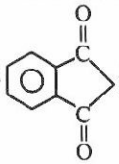
13. Write the chemical equations for :

(i) reaction of 

with bromine water. (1)

(ii) reaction of $(CH_3)_3C - O - CH_3$ with HI. (1)

14. How is an alkanenitrile, converted into a ketone ?

15. Write the chemical reaction representing the preparation of $CH_3CH_2NH_2$, starting from  N^-K^+ (potassium phthalimide).

Answer any 8 questions from 16 to 26. Each carries 3 scores. **(8 × 3 = 24)**

16. (i) A solution of ethanol and water shows positive deviation. Why ? **(1)**

(ii) Represent graphically, the positive and negative deviations shown by non-ideal solutions. **(2)**

17. Calculate the electrode potential of hydrogen electrode in contact with 0.01 molar H^+ ion solution.

($[H_2] = 1$, $E^{\ominus}_{H^+/H_2} = 0$ V)

18. For the reaction, $2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$, experiments show that the rate, $r \propto [NO]^2$ and $r \propto [O_2]$. If so,

(i) Formulate rate equation for it. **(1)**

(ii) Give its order and molecularity. **(1)**

(iii) If [NO] is increased three times the initial value, what happens to its rate ? **(1)**

19. Account for the following :

(i) Scandium (Z = 21) is a transition element but zinc (Z = 30) is not. **(1)**

(ii) Transition elements exhibit high enthalpies of atomisation. **(1)**

(iii) Mn^{3+} shows oxidising property. **(1)**

20. Briefly explain lanthanoid contraction, its cause and consequences.

21. A compound with molecular formula, $PtCl_2 \cdot 2NH_3$ gives no precipitate, when treated with excess $AgNO_3$. If so,

(i) Write the primary and secondary valences of Pt in the compound. (1)

(ii) Give the IUPAC name of the coordination compound corresponding to the above formula. (1)

(iii) Represent the configurations of geometrical isomers of the above co-ordination compound. (1)

22. Write any three limitations of Valence Bond Theory to explain the bonding in co-ordination compounds.

23. Observe the given chemical reactions and answer the questions followed :

I. $A + SOCl_2 \longrightarrow CH_3CH_2Cl + SO_2 + HCl$

II. $CH_3CH_2Cl \xrightarrow[\text{acetone}]{B} CH_3CH_2I$

III. $CH_3CH_2Cl \xrightarrow{\text{alc.KOH}} C$

(i) Identify A, B and C (1)

(ii) Write the name of the reaction II. (1)

(iii) In reaction III, if we use aqueous KOH, instead of alcoholic KOH, what will be the product ? (1)

24. (i) Explain, why aldehydes are generally more reactive than ketones in nucleophilic addition reactions. (2)

(ii) Write the chemical equation representing the addition of HCN on CH_3CHO. (1)

25. (i) Aniline is less basic than ammonia. Why ? (1)

(ii) How, aniline is converted into 4-bromo aniline ? (2)

26. Briefly explain the classification of carbohydrates, on the basis of their behaviour on hydrolysis, with suitable examples.

Answer any 4 questions from 27 to 31. Each carries 4 scores. $(4 \times 4 = 16)$

27. (i) Define Van't Hoff factor. (1)

(ii) A solution is prepared by dissolving 25 mg of K_2SO_4 in water to get 2 litre of solution at 25 °C. If the solute completely dissociates in solution, calculate its osmotic pressure.

(molecular mass of K_2SO_4 = 174 u; R = 0.0821 L atm K^{-1} mol^{-1}) (3)

28. (i) The conductivity of an electrolytic solution decreases as dilution increases. Why ? (1)

(ii) Explain the variation of molar conductivity with dilution in the case of strong and weak electrolytes. (2)

(iii) State Kohlrausch's law. (1)

29. Consider the complex species, Hexa-aqua-titanium (III) ion and answer the following :

(i) Identify the geometry of the species. (½)

(ii) Give its structural formula. (½)

(iii) Sketch the energy level diagram representing the crystal field splitting of d-orbitals of Ti^{3+} in this species. (2)

(iv) Give reason for the blue green colour of this ion in solution. (1)

30. Given, two haloalkanes A and B :

A : $CH_3 - CH_2 - CH_2 - Br$ B : $CH_3 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$

(i) How A and B are prepared from propene? (2)

(ii) Which among A and B follows S_N1 reaction more easily ? Justify the answer. (2)

31. Explain with suitable examples :

(i) Aldol condensation (2)

(ii) Hell – Volhard – Zelinsky reaction. (2)
