

[Time allowed: 3 hours]

[Maximum marks: 70]

General Instructions:

(i) All questions are compulsory.

(ii) Question nos. 1 to 8 are very short answer questions and carry 1 mark each.

(iii) Question nos. 9 to 18 are short answer questions and carry 2 marks each.

(iv) Question nos. 19 to 27 are also short answer questions and carry 3 marks each.

(v) Question nos. 28 to 30 are long answer questions and carry 5 marks each.

(vi) Use log tables if necessary, use of calculators is not allowed

1. Define the 12-16 compound.

2. Define Zeta potential.

3. Why do halogens show different colour.

4. Why does formaldehyde is more reactive than benzaldehyde ?

5. Why does 3° amines can not prepare from Gabrielphthalimide reaction?

6. Define mutarotation? Give an example.

7. Define biodegradable polymer with example.

8. What is understood by 'Agonist'?

9. Define osmotic pressure. How is it that measurement of osmotic pressures is more widely used for determining molar masses of macromolecules than the rise in boiling point or fall in freezing point of their solutions?

OR

Derive an equation to express that relative lowering of vapour pressure for a solution is equal to the mole fraction of the solute in it when the solvent alone is volatile.

10. The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1} . Calculate its molar conductivity in this solution.

11. Assign reasons for the following :

(i) In liquid state, hydrogen chloride is a stronger acid than hydrogen fluoride.

(ii) Phosphorus (P_4) is much more reactive than nitrogen (N_2).

12. Discuss the relative stability in aqueous solutions of +2 oxidation state among the elements : Cr, Mn, Fe and Co. How would you justify this situation?

(At. Nos. Cr = 24, Mn = 25, Fe = 26, Co = 27)

13. What happens when HBr reacts with $\text{CH}_3\text{CH}=\text{CH}_2$? How would you justify this reaction?

14. Write the IUPAC names of the following compounds :

(i) $(\text{CH}_3)_3\text{CCH}_2\text{Br}$

(ii) CH_2Cl_2

15. Alcohols react both as nucleophiles as well as electrophiles. Write one reaction of each type and describe its mechanism.

16. How would you carry out the following conversions?

(i) Ethyl magnesium chloride to propan-1-ol

(ii) Benzyl chloride to benzyl alcohol

17. Write the structures of the monomers of the following polymers :

(i) PVC

(ii) Polypropene

18. What are biodegradable and non-biodegradable detergents? Give one example of each type.

19. Explain what is observed when

(i) a beam of light is passed through a colloidal solution.

(ii) an electrolyte NaCl, is added to hydrated ferric oxide sol.

(iii) an electric current is passed through a colloidal sol.

20. Write the chemical reactions which take place in the following operations :

(i) Hydro metallurgy .

(ii) Isolation of zinc from zinc blende.

(iii) Mond's process for refining nickel.

21. Compare actinoids and lanthanoids with reference to their :

(i) electronic configurations of atoms

(ii) oxidation states of elements

(iii) general chemical reactivity of elements.

22. Niobium (Nb) crystallises in a body-centred cubic (bcc) structure. If its density is 8.55 g cm^{-3} , calculate the atomic radius of niobium.

(Atomic mass of Nb = 93 u; $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

OR

Explain with suitable examples the following :

(a) *n*-type and *p*-type semiconductors

(b) F-centres

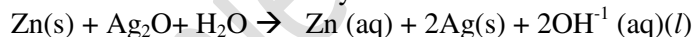
(c) Ferromagnetism

23. Srisha wanted to keep ice creams without melting. So he had to keep it on ice taken in a container. His grandmother advised him to pour salt on the ice.

a. Why?

b. What is the value in this?

24. In the button cells widely used in watches and other devices the following reaction takes place :



Determine $\Delta_r G^\circ$ for the reaction.

(Given : $E^\circ = \text{Zn}^{2+} / \text{Zn} = -0.76 \text{ V}$ and $E^\circ = \text{Ag}^+ / \text{Ag} = 0.34 \text{ V}$)

25. Write the IUPAC name and describe the magnetic behaviour (diamagnetic or paramagnetic) isomerism of the following coordination entities:

(i) $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^{-1}$

(ii) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$

(iii) $[\text{NiCl}_2(\text{H}_2\text{O})_2]$

(At. Nos. : Cr = 24, Co = 27, Ni = 28)

26. Account for the following :

(i) *pK_b* of methylamine is less than that of aniline.

- (ii) Aniline does not undergo Friedel–Crafts reaction.
(iii) Ethylamine is freely soluble in water whereas aniline is only slightly soluble.

27. Define the following in relation to proteins :

- (i) Primary structure
(ii) Denaturation
(iii) Peptide linkage

28. (a) A reaction is of first order in A and of second order in B. Write the differential rate equation for this reaction. How will its initial rate be affected if the concentration of both A and B are together doubled?

(b) The rate constant k of a reaction increases four fold when the temperature changes from 300 K to 320 K. Calculate the activation energy for the reaction. ($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

OR

- (a) List the factor which affect the rate of a chemical reaction.
(b) The half-life for radioactive ^{14}C is 5730 years. The wooden part of an archaeological artifact has only 80% of the ^{14}C activity found in fresh wood. Calculate the age of the artefact.

29. (a) Assign reasons for the following :

- (i) Bi (V) is a stronger oxidising agent than Sb (V).
(ii) Of the noble gases only xenon is known to form established chemical compounds.
(b) Draw the structures of the following molecules :

(i) $\text{H}_2\text{S}_2\text{O}_7$ (ii) BrF_3 (iii) XeF_2

OR

(a) Complete the following chemical reaction equations :

(i) $\text{Ca}_3\text{P}_2 + \text{H}_2\text{O} \rightarrow$

(ii) $\text{XeF}_4 + \text{H}_2\text{O} \rightarrow$

(b) How would you account for the following observations :

- (i) NH_3 is a stronger base than PH_3 .
(ii) Sulphur in vapour state exhibits paramagnetism.
(iii) Hydrogen fluoride has a higher boiling point than hydrogen chloride.

30. (a) Illustrate the following reactions giving one example for each :

(i) Cannizzaro reaction

(ii) Decarboxylation

(b) Complete the following reaction equations by giving the indicated missing substances :

(i) $\text{CH}_3\text{CHO} + \text{H}_2\text{NCONHNH}_2 \rightarrow$

OR

(a) State tests to distinguish between the following pairs of compounds :

(i) Propanol and ethanol

(ii) Phenol and benzoic acid

(b) How will you bring about the following conversions :

(i) Propanone to propene

(ii) Benzaldehyde to benzophenone

(iii) Ethanol to 3-hydroxybutanal