

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

(Regular/Improvement/Supplementary)

CHEMISTRY

GCHE6B11T: PHYSICAL CHEMISTRY-III

Time: 2 Hours

Maximum Marks: 60

SECTION A: Answer the following questions. Each carries *two* marks.

(Ceiling 20 Marks)

1. Define 'molar conductivity'. How is it related to conductivity?
2. The cell constant of a conductivity cell is 88 m^{-1} . A 0.01 M solution of an electrolyte offers a resistance of 210 ohms when taken in the cell. Calculate the specific conductance of the solution.
3. Sketch the general shapes of the conductometric titration curves for the following: (i) Strong acid vs strong base; (ii) Weak acid vs weak base.
4. For the cell $\text{Zn(s)}|\text{Zn}^{2+}(\text{aq})||\text{Cd}^{2+}(\text{aq})|\text{Cd(s)}$, calculate the equilibrium constant at 25°C and also the standard Gibb's energy change of the cell reaction.
Given: $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$; $E^\circ_{\text{Cd}^{2+}/\text{Cd}} = -0.40 \text{ V}$.
5. Give the Nernst equation for electrode potential and explain the terms involved.
6. What are colligative properties? Give two examples.
7. State and explain Boyle-van't Hoff law for solutions.
8. Give the conjugate acids of the following: (i) OH^- ; (ii) SO_4^{2-}
9. Will an aqueous solution of KCN be acidic, alkaline or neutral? Explain.
10. State the law of rationality of indices.
11. Define point defect. Mention the names of common point defects observed in crystals.
12. Distinguish between the terms valence band and conduction band as per the band theory of solids.

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 Marks)

13. How does Kohlrausch's law help us to determine the limiting molar conductivity for a weak electrolyte?
14. Explain Debye-Falkenhagen effect.
15. A solution prepared by dissolving 0.25 g of a non-volatile solute in 50 mL of an organic solvent (molecular mass = 154; density = 1.58 g/mL) at 303 K is found to have a vapour pressure of 141.9 mm of Hg. If the vapour pressure of the pure solvent at 303 K is 143 mm of Hg, calculate the molar mass of the solute.

(PTO)

16. Explain the term viscosity with regard to liquids. Explain the determination of molecular mass from viscosity measurements.
17. Define solubility product. The solubility of AgCl at 293 K is 0.0016 gdm^{-3} . Calculate its solubility product at 293 K (Ag = 108; Cl = 35.5).
18. Derive Bragg's diffraction condition.
19. What are intrinsic semiconductors? Explain intrinsic conduction on the basis of the band theory of solids.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. (a) What is meant by the term standard electrode potential? Outline a method for its determination.
(b) Explain the utility of the values of standard electrode potentials.
21. Explain the hexagonal and cubic closest-packing of uniform spheres and also the packing of such spheres in a body-centered cubic environment.

(1 x 10 = 10 Marks)