

**2025/TDC(CBCS)/EVEN/SEM/
CHMHCC-403/245**

TDC (CBCS) Even Semester Exam., 2025

CHEMISTRY

(4th Semester)

Course No. : CHMHCC-403

(Physical Chemistry—IV)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

1. Answer any two of the following questions :

2×2=4

(a) What is Kohlrausch law of independent migration of ions?

(b) Define molar conductivity. Discuss its variation with concentration.

- (c) With the help of graph, explain why it is not possible to determine the molar conductivity at infinite dilution for a weak electrolyte by extrapolating the concentration-molar concentration curve.

2. Answer any one of the following questions : 6

- (a) (i) Explain Arrhenius theory of electrolytic dissociation. 1½

- (ii) Derive the relation between equivalent conductivity and specific conductivity of an electrolyte solution. 2

- (iii) The molar conductivities at infinite dilution for barium hydroxide, barium chloride and ammonium chloride are $457.6 \text{ ohm cm}^2 \text{ mol}^{-1}$, $240.6 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ and $129.8 \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ respectively. Calculate the molar conductivity at infinite dilution for ammonium hydroxide. 2½

- (b) Give an account of Debye-Hückel theory of strong electrolyte. Explain clearly asymmetric effect and electrophoretic effect. 3+3=6

UNIT—II

3. Answer any *two* of the following questions : 2×2=4

- (a) What is ionic mobility?
- (b) What is the solubility product constant expression for MgF_2 and Ag_2CrO_4 ?
- (c) Discuss the factors affecting transport number.

4. Answer any *one* of the following questions : 6

(a) Define the transport number of an ion. How is it determined using boundary method? 2+4=6

(b) (i) What is the principle of conductometric titration? What are the advantages of conductometric titration? 2+2=4

(ii) Discuss the conductometric titration curve obtained in the titration of a mixture of HCl and CH_3COOH with NaOH. 2

UNIT—III

5. Answer any *two* of the following questions :

2×2=4

(a) Explain the formation of products of electrolysis of aqueous CuSO_4 solution using platinum electrodes showing primary and secondary changes.

(b) State Faraday's law of electrolysis.

(c) Explain the role of salt bridge in a galvanic cell.

6. Answer any *one* of the following questions :

6

(a) (i) Derive Nernst equation and mention its application.

3

(ii) How do you determine the electrode potentials of zinc?

3

(b) (i) Explain the electrolytic extraction of aluminium from alumina by Hall-Heroult process with a suitable diagram.

3

(ii) A current of 4 ampere was passed for 1.5 hours through a solution of CuSO_4 , when 3.2 g of copper was deposited. Calculate the current efficiency.

3

UNIT—IV

7. Answer any *two* of the following questions :

2×2=4

- (a) Write a brief note on concentration cell.
- (b) Explain the principle of potentiometric titration with reference to redox reaction.
- (c) Write the relation and explain the terms for entropy change with e.m.f.

8. Answer any *one* of the following questions : 6

(a) Derive the expression for the e.m.f. of concentration cells (i) with transference and (ii) without transference. 3+3=6

(b) (i) What is potentiometric titration? Give an account on potentiometric redox titration. 1+3=4

(ii) Determine the pH of a solution using the hydrogen electrode. 2

(6)

UNIT—V

9. Answer any *two* of the following questions : 2×2=4

- (a) What is dielectric electrostatics?
- (b) Define paramagnetism with example.
- (c) Explain diamagnetism.

10. Answer any *one* of the following questions : 6

- (a) (i) Deduce Clausius-Mosotti equation. 3
- (ii) Explain the following : 3
 - (1) Induced polarization
 - (2) Orientation polarization
- (b) (i) What is meant by polarizability of a molecule? 2
- (ii) Derive Lorentz-Lorenz molecule. 2
- (iii) What is magnetic susceptibility and how can it be measured? 2

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