UE-5238

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M. Sc. (Sem. II) Examination, June - 2025

Chemistry

Paper - 2.3

CHEM-523-T

Physical Chemistry

Time Allowed : **Three Hours**

Max. Marks : **70**

Min. Marks : **28**

This question paper contains two sections as under :

SECTION - A

1 (i) Define chemical potential and give its significance.

(ii) What is fugacity? Explain.

(iii) Write about chemical equilibria.

(iv) Write the expression for canonical ensemble and give its relevance.

(v) What is entropy production in non-equilibrium systems?

(vi) State thermodynamic criteria for non-equilibrium states.

(vii) What is Debye-Huckel Onsager equation?

(viii) Define overpotential and its role in electrochemical reaction.

(ix) Write the use of Mott-Schottky plot.

(x) Expain the term corrosion.

10×2=20

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SECTION - B

UNIT - I

2 (a) Explain partial molar free energy and partial molar volume.

(b) Discuss their determination and thermodynamic importance.

2×5=10

OR

(a) Write the methods of determination of fugacity.

(b) Explain the method of determination of activity and activity coefficients and how is ionic strength calculated?

2×5=10

UNIT - II

3 Derive the expression for most probable distribution using Lagrange's method of undetermined multipliers.

10

OR

(a) Define Partition function and explain its types.

(b) How are thermodynamic properties calculated from the Partition function?

2×5=10

UNIT - III

4 (a) Discuss entropy flow and entropy balance in irreversible procceses.

(b) Explain non-equilibrium stationary state.

6+4=10

OR

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Write a detailed note on Onsager's reciprocity relations and microscopic reversibility.

2×5=10

UNIT - IV

5 (a) Derive Debye-Huckel Onsager equation for strong electrolyte.

(b) Discuss the limitations and extension of this theory.

2×5=10

OR

Derive the Lipmann equation and describe the methods of determinations of surface excess qualities.

10

UNIT - V

6 (a) Discuss thermodynamics of electrical doubls layer of metal/electrolyte inerface.

(b) Explain electrocapillarity and excess charge capacitance.

2×5=10

OR

(a) Derive Ilkovic equation for polarography.

(b) Write methods of corrosion monitoring and prevention.

2×5=10

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