

25P213

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Name:

Reg.No:

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2026

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19PCHE2C08 - ELECTROCHEMISTRY, SOLID STATE CHEMISTRY, AND STATISTICAL THERMODYNAMICS

(Chemistry)

(2019 Admission onwards)

Time : 3 Hours

Maximum : 30 Weightage

Section A

Answer any *eight* questions. Each question carries 1 weightage.

1. Calculate the activity coefficient of Ca^{2+} and Cl^- in 0.01 molal CaCl_2 in water. The 'A' value in Debye-Huckel equation is 0.509.
2. Discuss about hydrogen overvoltage.
3. Explain secondary salt effect and its applications.
4. Distinguish between crystallographic point groups and space groups.
5. What is meant by line defect?
6. How does band theory distinguish semiconductors from insulators and conductors?
7. Differentiate between μ -space and Υ -space.
8. Derive the relation between enthalpy and partition function.
9. What are the drawbacks of Debye's theory of heat capacity of solids?
10. What are the assumptions of Fermi-Dirac statistics?
11. State and explain debye-falkenhagen effect.
12. Draw a Tafel plot. Explain the significance of the slope and intercept of the Tafel plot.

(8 × 1 = 8 Weightage)

Section B

Answer any *four* questions. Each question carries 3 weightage.

13. Write a note on different types of reference electrodes.
14. Briefly explain the electrode reactions, and working principle of polymer electrolyte fuel cell and alkaline fuel cell.

15. Explain hydrogen overpotential using the double-layer theory.
16. Define space lattice and unit cells.
17. What is Hall effect? Discuss its applications.
18. Discuss cooper theory of superconductivity.
19. What is rotational partition function?

(4 × 3 = 12 Weightage)

Section C

Answer any **two** questions. Each question carries 5 weightage.

20. Give an account of the Debye-Huckel theory of strong electrolytes. explain clearly what is meant by assymetry effect and electrophoretic effect.
21. Explain. 1) Electrical double layer. 2) Draw Tafel plot and give its significance.
22. Write a brief account of the magnetic properties of solids.
23. Derive the relations between partition function and (i) enthalpy, (ii) internal energy, (iii) entropy, (iv) Gibbs' energy, (v) Helmholtz energy, (vi) pressure and (vii) C_v .

(2 × 5 = 10 Weightage)
