QP Code: P25B028

Reg. No : .....

Name : .....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

II SEMESTER (CBCSS-PG) DEGREE EXAMINATION, MARCH 2025

CHE2C08 : ELECTROCHEMISTRY SOLID STATE CHEMISTRY AND STATISTICAL THERMODYNAMICS

2024 Admission Onwards

(Credits: 3)

Time: 3 Hours **Maximum Weightage: 30**

Section A

Answer **any eight** questions. Weightage **1** for each question. **(8x1 = 8 Weightage)**

1. Define Catilytic Theory. [BTL1]
2. Explain the concept of polarisation in Fuel cell and discuss its effects on cell performance. [BTL4]
3. Write down tafel equation and explain its significance. [BTL1]
4. Explain luminescence. [BTL2]
5. Show that 5-fold axis of symmetry is absent in Solids. [BTL4]
6. Why paramagnets never achieve saturation magnetization experimentally? [BTL3]
7. Develop an expression for $E_{1/2}$ for Hg Polarography. What is its significance? [BTL3]
8. Give the relation between thermodynamic probability and mathematical probability. [BTL1]
9. Compare and contrast the stastical weight factor of a solid with that of a ideal gas. Analyse the factors that contribute to difference in SWF between the 2 systems. [BTL4]
10. Compare the classical theory of heat capacity of gases with quantum theory. [BTL2]

Section B

Answer **any six** questions. Weightage **2** for each question. **(6x2 = 12 Weightage)**

11. Write a note on primary cells and secondary cells and give examples. [BTL2]
12. Compare electrolytic polarisation with concentration polarisation. [BTL4]
13. Explain electrochemical theory with respect to Hydrogen overvoltage and give its applications. [BTL3]
14. Explain the properties of Crystallographic point groups. [BTL2]

Turn Over

15. Analyze various optical properties of Solids. [BTL4]

16. Define Hall Effect. Explain how Hall effect can be used to determine the conductivity of semiconductors. [BTL4]

17. Derive the expression for translational partition function in three dimensions and its relation to translational entropy. [BTL4]

18. Explain the drawbacks of classical Maxwell-Boltzmann statistics and the need for quantum approach. Derive Bose-Einstein distribution law. [BTL4]

Section C

Answer **any two** questions. Weightage **5** for each question. **(2x5 = 10 Weightage)**

19. Using the data given in the series explain why [BTL5]
(i) Cu(I) sulphate does not exist in solution.
(ii) Neither Cu^{+} nor Co^{3+} is stable in aqueous solution.
(iii) Zinc reacts with H_2SO_4 to give H_2 but silver does not. Explain the significance of electro chemical series in this context.

20. Account for Debye-Huckel theory of strong electrolytes. Explain clearly what is meant by asymmetry effect and electrophoretic effect. [BTL3]

21. Interpret the electronic structure of solid in terms of following: [BTL5]
i) Energy bands and band gap.
ii) Density of states and Fermi level.
iii) Brillouin zones and reciprocal lattices.

22. Compare the classical theory of heat capacity of solids with Einstein's theory. Discuss the merits and drawbacks of Einstein's theory. [BTL4]

****