D3ACH2101 **(2 Pages)** **Name.....**
Reg.No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2022
(Regular/Improvement/Supplementary)

CHEMISTRY

FCHE3C09 - ELECTROCHEMISTRY, SOLID STATE CHEMISTRY AND STATISTICAL THERMODYNAMICS

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

Section A: Short answer questions. Answer any *eight* questions. Each carries *one* weightage.

1. Write Debye-Hückel equation and explain the terms.
2. What is the purpose of adding KCl in polarographic measurements?
3. Prove that molar entropy at 0K of CO would be R ln 2.
4. What is the effect of temperature on conductivity of metals, semiconductors and insulators?
5. Explain line defects in crystals.
6. Why does band theory fail in the case of metal oxides?
7. Which class of materials show piezoelectric properties?
8. What is Meissner effect?
9. What are ensembles? Discuss the types of ensembles.
10. State and explain Stirling approximation.
11. Calculate the possible number of ways of distribution of 2 particles among 4 energy states, when particles are Bosons.
12. What are Miller indices? How are they determined?

(8×1 = 8 weightage)

Section B: Short essay questions. Answer any *four* questions. Each carries *three* weightage.

13. Give a brief discussion on secondary cells with an example.
14. Briefly explain about electrode reactions and cell voltages of phosphoric acid fuel cell.
15. How is corrosion explained by modern electrochemical theory?
16. The parameters of an orthorhombic unit cell are a=50pm, b=100pm, c=150pm. Determine the spacing between the (123) planes.

(P.T.O.)

17. Explain each of the following with an example: paramagnetism, ferromagnetism, ferrimagnetism and antiferromagnetism.

18. Define Overvoltage. What are the factors affecting Overvoltage?

19. Derive an equation for the molecular rotational partition function of an ideal diatomic gas.

(4×3 = 12 weightage)

Section C: Essay questions. Answer any *two* questions. Each carries *five* weightage.

20. Explain optical property of the solids.

21. Compare the important features of Maxwell-Boltzmann, Bose Einstein and Fermi Dirac statistics.

22. Discuss the salient features of the Einstein theory of the heat capacity of monoatomic crystals. How did Debye modify it? Show the result of the Einstein and Debye theories on a plot and comment briefly.

23. (a) Discuss the basis of the polarographic method of analysis. What is the significance of limiting diffusion current and half-wave potential?

    (b) What is dropping mercury electrode? What are the advantages of using DME in polarography? What is its limitation?

(2 × 5 = 10 weightage)