D 122471 (Pages : 2) Name..

Reg. No....................................

SECOND SEMESTER M.Sc. DEGREE REGULAR/SUPPLEMENTARY EXAMINATION, APRIL 2025

(CBCSS)

Chemistry

CHE2C08—ELECTRO CHEMISTRY, SOLID STATE CHEMISTRY AND STATISTICAL THERMODYNAMICS

(2019 Admission onwards)

Time : Three Hours   Maximum : 30 Weightage

Section A

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

1. Write electrode reactions for lead acid battery during charging.

2. Write electrode reactions in methanol fuel cell.

3. What is Stern model of electrical double layer ?

4. Explain the term 'electrode polarization'.

5. Write Herrmann Mauguin symbol for :

    (a) C_2v ; (b) D_3d.

6. A plane cuts the x, y and z axis at $2a$, $3b$ and $6c$. Write the Miller indices.

7. Explain the term 'Fermi level'.

8. Distinguish between thermodynamic probability and mathematical probability.

9. Write symmetry number for :

    (a) BCl_3 ; (b) benzene.

10. State and explain Dulong Petit's law.

                                                        $(8 \times 1 = 8$ weightage)

Turn over

Section B

Answer any **six** *questions.*
Each question carries a weightage of 2.

11. Calculate the thickness of ion atmosphere around Ca^{2+} in 0.01 molal $CaCl_2$ in water at 25ºC. Dielectric constant of water is 78.5.

12. Calculate EMF of the cell at 25ºC $Zn \left| Z_n^{2+} \right._{(a=0.0001)} \left\| Cd^{2+} \right._{(a=0.01)} \left| Cd \right.$. The standard electrode potentials of $Z_n^{2+} | Zn$ and $Cd^{2+} | Cd$ are $– 0.763$ and $– 0.403Y$ respectively. Write the cell reaction and calculate the equilibrium constant of the reactions at 25ºC.

13. Briefly discuss one of the theories of hydrogen over voltage.

14. Mg forms hexagonal close packed structure with a = 320.9 pm. Calculate the density of Mg.

15. Briefly discuss Cooper theory of super conductivity.

16. Calculate residual entropy of CO if 50% of the units are in CO orientation and 50% of the unit are in OC orientation.

17. Calculate translational partition function for He at 0ºC and 1 atm pressure.

18. Derive Bose – Einstein distribution law.

(6 × 2 = 12 weightage)

Section C

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

19. What are the assumption in Debye Hückel theory ? Following the theory derive Debye Hückel limiting law.

20. Derive Butler – Volmer equation. Discuss.

21. Briefly discuss band theory of solids.

22. Apply Fermi Dirac statistics for electrons in metals. Discuss.

(2 × 5 = 10 weightage)