C 4758 (Pages : 2) Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2016

(CUCSS)

Chemistry

CH 2C 08—ELECTROCHEMISTRY, SOLID-STATE CHEMISTRY AND STATISTICAL THERMODYNAMICS

(2015 Admissions)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer **all** *questions.*

Each question carries a weightage of 1.

1. Write electrode reactions in the dry cell (Zn, MnO_2).
2. Write equation for the activity of the following electrolytes in terms of molal concentration and mean ionic activity coefficient :

   (a) MX_2 ; (b) M_2X_3.
3. Define exchange current density. Explain its significance.
4. Explain the significance of slope and intercept of a Tafol plot.
5. Write Hermann-Mauguin symbol for the following (a) D_{3d} ; (b) C_{4v}.
6. Explain the term "glide plane".
7. Define Fermi level. Explain its significance.
8. What is birefringence ? Explain.
9. How many ways you can distribute two particles among three degenerate levels assuming (a) Bose Einstein statistics ; (b) Fermi Dirac statistics ?
10. Rationalise third law of thermodynamics using statistical concepts.
11. Calculate the heat capacity of solid (with characteristic temperature of 1000 K) at 10 K.
12. What do you mean by dilute system ?

(12 × 1 = 12

Part B

Answer any **eight** *questions.*

Each question carries a weightage of 2.

13. Calculate the mean ionic activity coefficient of 0.01 molal $LaCl_3$ in water at 25° C. A = 0.509.
14. Explain the working of a lead acid battery.

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15. Write a brief account of the various models of electrical double layer.
16. Briefly explain one of the theories of hydrogen over voltage.
17. Draw stereographic projection for (222) system.
18. Write briefly on the application of non-stoichiometric compounds.
19. Briefly explain Meisner effect.
20. Explain the working of a laser.
21. Calculate the residual entropy of H_2O.
22. Evaluate translational partition function of CO_2 at 0°C. and 1 atm. pressure.
23. Derive an equation for the vibrational contribution towards heat capacity of gases.
24. Briefly explain Bose-Einstein condensation.

(8 × 2 = 16)

Part C

Answer any **two** *questions.*
Each question carries a weightage of 4.

25. What are the assumptions in Debye-Hückel theory ? Following the theory, derive Debye Hückel limiting law.
26. Derive Butler-Volmer equation.
27. Derive Maxwell Boltzman statistics. Discuss.
28. Apply Fermi Dirac statistics for electrons in metals. Discuss.

(2 × 4 = 8)