

21/08/2023

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(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, APRIL 2023**

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 reaction in lead acid battery during charging.
2. Write Nernst equation for oxygen electrode.
3. Compare Gouy Chapmann and Helmholtz model of electrical double layer.
4. Write Ilkovic equation. Explain the terms.
5. Write Hermann–Maugin symbol for :
(a) C_{2v} . (b) C_{2h} .
6. Explain with example 'space group'.
7. What is Hall effect ? Explain.
8. Define symmetry number. Find symmetry number for CH_4 .
9. Arrange translational, rotational, vibrational and electronic partition function in the increasing order of magnitude. Justify your answer.
10. Electrons never follow Maxwell–Boltzman statistics. Why ?

(8 × 1= 8 weightage)

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Section B

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

11. Explain the working of a polymer electrolyte fuel cell.
12. Devise an electrochemical cell in which the following reaction takes place
$$\text{Fe}^{2+} + \text{Ag}^+ \rightarrow \text{Fe}^{3+} + \text{Ag}$$

Find the equilibrium constant of the reaction. The standard electrode potentials of $\text{Fe}^{2+}, \text{Fe}^{3+} | \text{Pt}$ and $\text{Ag}^+ | \text{Ag}$ are +0.771 and +0.799 V respectively. Temperature is 25°C.
13. Draw a typical Tafel plot. Explain the significance of slope and intercept of the Tafel plot.
14. Tungsten crystallises in bcc. Density is 19.3 g cm^{-3} . Find the length of the side of the unit cell. What is the interplanar spacing of 200 planes ?
15. Discuss the working of a two stage laser.
16. Evaluate rotational partition function for H_2 . Bond length is 0.74 \AA . Temperature : 25°C.
17. Derive an equation for the vibrational contribution towards heat capacity of a gas.
18. How would you evaluate equilibrium constant of a reaction theoretically ? Discuss.

(6 × 2 = 12 weightage)

Section C

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

19. (a) Derive an equation to show the effect of ionic strength of the medium on the rate of ionic reactions in solution.
(b) Discuss industrial application of nonstoichiometric compounds.
20. Derive Butler–Volmer equation. Discuss.
21. Briefly discuss Bose–Einstein condensation.
22. Discuss Debye's theory of heat capacity of solids.

(2 × 5 = 10 weightage)