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C 42746 (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)

Turn over

30

Section B

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

11. Explain the working of a polymer electrolyte fuel cell.

12. Device an electrochemical cell in which the following reaction takes place

$$Fe^{2+} + Ag^{+} \rightarrow Fe^{3+} + Ag$$

Find the equilibrium constant of the reaction. The standard electrole potentials of $Fe^{2+}, Fe^{3+} \mid Pt$ and $Ag^{+} \mid Ag$ 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. Tungston crystallises in bcc. Density is 19.3g 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 Å. Temperature : 25

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)

Section C

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

19. (a) Derive an equation to show the effect of conic strength of the medium on the reactions in solution.

    (b) Discuss industrial application of nonstrihiometric compounds.

20. Derive Buttler–Volmer equation. Discuss.

21. Briefly discuss Bose–Einstein condensation.

22. Discuss Debye's theory of heat capacity of solids.

(2 × 5 =