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(Pages : 2)

Name.....

Reg. No.....

**SECOND SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)  
EXAMINATION, APRIL 2021**

(CBCSS)

Chemistry

**CHE 2C 08—ELECTRO CHEMISTRY, SOLID STATE CHEMISTRY  
AND STATISTICAL THERMODYNAMICS**

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

1. *In cases where choices are provided, students can attend **all** questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
3. *There will be an overall ceiling for each Section / Part that is equivalent to the maximum weightage of the Section / Part.*

**Section A**

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

1. Write electrode reactions for  $H_2 - O_2$  fuel cell under alkaline conditions.
2. Find electrode potential for a calomel electrode with 0.1 M  $KCl$ . The standard electrode potential is 0.268 V,  $T = 298 K$ .
3. What is Stern model of electrical double layer ?
4. What is half wave potential ? Explain its significance.
5. Write Schoenflies symbol for (a) 222 ; (b) mmm.
6. Account for the semiconductivity of nonstoichiometric  $ZnO$ .
7. Explain ferrimagnetism. Write one example.
8. Explain thermodynamic probability. How is it related to entropy ?
9. Find symmetry number for (a)  $C_6H_6$  ; (b)  $CH_4$ .
10. Calculate the heat capacity for diamond at 1.86 K characteristic temperature is 1860 K.

(8 × 1 = 8 weightage)

**Turn over**

**Section B**

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

11. Calculate the concentration of  $\text{Ag}^+$  at equilibrium, when excess of finely divided metallic Ag is added to 0.05 molal ferric nitrate. The standard electrode potentials of  $\text{Ag}^+/\text{Ag}$  and  $\text{Fe}^{2+}, \text{Fe}^{3+} | \text{Pt}$  are 0.799 and 0.771 V respectively.  $T = 298 \text{ K}$ .
12. Calculate the thickness of ion atmosphere around  $\text{K}^+$  in 0.01 KCl at  $25^\circ\text{C}$  in water. The dielectric constant = 78.5.
13. Discuss one of the theories of hydrogen over voltage.
14. List the seven crystal systems and corresponding Bravais lattices. Discuss.
15. What is Piezoelectricity? Discuss its applications.
16. Define partition function. Derive equation to show its relationship with internal energy.
17. Calculate absolute entry of He at  $0^\circ\text{C}$  and 1 atmosphere pressure.
18. Show that all particles obey Maxwell-Boltzman statistics under dilute system conditions.

(6 × 2 = 12 weightage)

**Section C**

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

19. What are the assumptions of Debye Huckel theory? Using the theory derive Debye Huckel limiting law.
20. Derive Butler-Volmer equation.
21. Briefly discuss free electron theory of metals.
22. Discuss Debye's theory of heat capacity of solids.

(2 × 5 = 10 weightage)