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TM244829R

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, MARCH 2024

2022 ADMISSIONS REGULAR

SEMESTER IV - CHEMISTRY

CH4E03TM20 - Advanced Physical Chemistry

Time : 3 Hours **Maximum Weight : 30**

Part A

I. Answer any Eight questions. Each question carries 1 weight **(8x1=8)**

1. Describe Laue patterns and its use in crystallography.
2. Explain the symmetry element Mirror plane.
3. Indicate the Herman Manguin symbol for the following point groups: a) C_{2v} b) C_{3v} c) C_{4v}.
4. Explain the term "Nebulation".
5. Briefly explain Novel fluorophores.
6. Explain liquid junction potential? How can it be eliminated?
7. Calculate the EMF of the following Concentration cell at 298 K.
   $Cu(s)/Cu^{2+}$ $(m=0.02, \gamma=0.32)$ $//Cu^{2+}(m=0.2, \gamma=0.11)/Cu(s)$.
8. Distinguish between voltammetry and polarography.
9. Elaborate the thermodynamics of glycolysis.
10. Elucidate the relation between standard free energy change $\Delta G^{o'}$ and equilibrium constant k'_{eq}.

Part B

II. Answer any Six questions. Each question carries 2 weight **(6x2=12)**

11. Discuss the photoconductivity of liquid crystals.
12. Explain the working of a Hollow cathode lamp.
13. Discuss the Lippmann equation for the change in interfacial tension of a metal-solution interface.
14. Derive the equation for membrane potential for two electrolyte solutions of different concentration separated by a membrane.
15. a) The standard electrode potential for a cell in which the following reaction: $2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(s)$ occurs at 0.236 V at 298 K. Calculate (a) the standard Gibbs energy change (standard free energy change) and (b) the equilibrium constant for the cell reaction.
    b) Calculate the EMF of the following cell at 298 K: $Mg(s)/Mg^{2+}(0.001M)//Cu^{2+}(0.0001M)/Cu(s)$. Given: $E^{\circ}_{Mg^{2+}/Mg}$ = -2.37 V; $E^{\circ}_{Cu/Cu^{2+}}$ = +0.34 V.
16. What are the advantages of "dropping mercury electrode" in Polarography? Explain.
17. Derive the polarographic wave equation.
18. Comment on the entropy production and entropy flow in open systems.

Part C

III. Answer any Two questions. Each question carries 5 weight **(2x5=10)**

19. a) Compute the expression for structure factor, F(hkl) for (a) primitive cubic unit cell (b) FCC lattice (c) BCC lattice. b) Comment on strong and weak reflections.
20. Give an account of the principle and instrumentation of Atomic Absorption Spectroscopy. Discuss the important applications and limitations of this technique.

21. Explain corrosion in terms of Pourbaix diagram for a) water and b) Iron.
22. Discuss briefly the polarographic method of chemical analysis.