LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FOURTH SEMESTER – **NOVEMBER 2013**

CH 4502 – ELECTRO CHEMISTRY

Date : 05/11/2013 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

PART – A

Answer ALL questions: **(10 × 2 = 20)**

1. Define the term electrode potential and how would you represent Standard Hydrogen electrode.
2. For the cell Zn $|Zn^{2+}\|Cu^{2+}|$ Cu
   i) Write down the electrochemical reaction.
   ii) Calculate the emf of the cell at 298K.
   The standard reduction potential at 298K are
   $Zn^{2+}|$ Zn : -0.763 V
   $Cu^{2+}|$ Cu : +0.337 V
3. Write the electrode reaction and the potential of calomel electrode.
4. What is meant by concentration cell and mention its types.
5. Define ionic strength of solutions.
6. What is meant by the term Van't Hoff factor?
7. Define the term decomposition potential.
8. Write Debye – Huckel Onsager equation.
9. Define Hydrogen overvoltage.
10. Write down Ilkovic equation and explain the terms involved in it.

PART – B

Answer EIGHT questions: **(8 × 5 = 40)**

11. What is meant by electrochemical series? Mention any two applications.
12. Discuss on the following:
    i) Metal – metal ion electrode
    ii) Metal insoluble salt electrode.
13. Write a short note on reference electrodes.
14. A zinc rod is placed in 0.1 M solution of zinc sulphate at 25^0C.Assuming that the salt is dissociated to the extent of 95% at this dilution. Calculate the potential of the electrode at this temperature. E^0 Zn^{2+}, Zn = -0.76 V.
15. How would you determine the p^H of the given solution using quinhydrone electrode. Mention its demerits.
16. Calculate the equilibrium constant of the cell reaction
    $2\ Ag^+ + Zn$ ⊔ $2\ Ag + Zn^{2+}$ occurring in the Zinc-silver cell at 25^0C when $[Zn^{2+}] = 0.10$ M and $[Ag^+] = 10$ M. The EMF of the cell is found to be 1.62 V.
17. How does specific and equivalent conductance vary with dilution?
18. Discuss on Arrhenius theory of electrolytic dissociation and mention its limitations.
19. Mention the principle of conductometric titrations. Discuss the titration curve obtained in the titration of a strong acid with a weak base.

20. Give an account of the Debye-Huckel theory of strong electrolytes.
21. Calculate the EMF of the concentration cell consisting of Zinc electrodes, one immersed in a solution of 0.01 molality and other in a solution of 0.1 molality at 25^0 C.The two solutions are separated by a salt bridge. The mean activity coefficient of the electrolyte may be assumed to be unity.
22. Discuss the electrochemical theory of corrosion.

PART – C

Answer any FOUR questions: **(4 × 10 = 40)**

23. Define electromotive force. How is it measured using potentiometer?
24. Discuss in detail the construction and working of Weston saturated and unsaturated cell.
25. a)The cell $Cd \mid CdCl_{2\ 1m} \mid AgCl_{(s)} \mid Ag$ has an emf of 0.675 volt at 25^0C and the temperature coefficient of emf is -0.00065 volt deg^{-1}. Calculate ΔH and ΔS for the cell reaction.

    b) How would you calculate the valency of ions in doubtful cases using EMF method?
26. Discuss the principle underlying potentiometric titrations and how would you carry out acid-base and redox titrations potentiometrically?
27. Define transport number. How is it determined using moving boundary method?
28. a) Illustrate how the solubility of a sparingly soluble salt can be determined with the help of conductance measurement.

    b) Derive an expression for the EMF of concentration cell with transference.

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