LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FOURTH SEMESTER – APRIL 2010

CH 4502 - ELECTROCHEMISTRY

Date & Time: 21/04/2010 / 9:00 - 12:00   Dept. No. | Max. : 100 Marks

PART –A

Answer ALL the questions   (10 x 2 = 20 Marks)

1. What do you mean by a reversible cell.

2. If a solution of Cu^{2+} and Ag^+ ions is electrolysed, which will be deposited first? Why?

3. State the Faraday's laws of electrolysis.

4. Explain the variation of conductance with concentration for a strong electrolyte.

5. How you would predict the feasibility of the reaction from EMF measurements.

6. The standard reduction electrode potential of Zn^{2+}/Zn is -0.76volt. What information do you observe from this?

7. What is meant by equivalent conductance at infinite dilution?

8. State the reactions that are taking place in the lead storage cell.

9. In the determination of Hittorf's number by moving boundary method, if the principle electrolyte is HCl, what would you choose as the indicator electrolyte?

10. Write down the Ilkovic equation and mention the terms involved in it.

PART –B

Answer ANY **EIGHT** questions   (8 x5 = 40 Marks)

11. What is meant by single electrode potential? How could you measure the single electrode potential?

12. Find the pH of the electrolyte used with hydrogen electrode in the following cell

    Pt │ H$_2$(1atm) │ H+(a = x)‖Normal calomel electrode(NCE)

    E_{cell} at 25°C = 0.830volt

    E_{NCE} at 25°C = 0.280volt

    (reduction)

13. What is meant by liquid junction potential? How does it affect EMF measurements? How can it be controlled?

14. Derive Nernst equation for electrode potentials.

15. Describe the EMF method for the determination of solubility product of a sparingly soluble salt.

16. Explain how precipitation titration can be carried out potentiometrically.   **(P.T.O.)**

17. In the electrolysis of a solution of potassium chloride, 0.0137g of chloride was lost from the anode compartment and 0.0857g of Ag was deposited in a silver coulometer connected in series with the cell. Calculate the transport number of K^+ and Cl^- ions.

18. How the pH of a solution can be determined using quinhydrone electrode?

19. In a conductivity cell, 0.01N KCl solution gave a resistance of 225.0 ohms while a 0.01N solution of HCl gave a resistance of 77.1 ohms. Conductivity of KCl solution is 0.00141 mhocm^{-1}. Calculate the conductance, equivalent conductance and molar conductance of HCl solution.

20. Discuss the Debye-Huckel theory of strong electrolytes.

21. Give an account of hydrogen overvoltage.

22. Explain the principle of polarography.

PART –C

Answer any **FOUR** the questions   (4 x 10 = 40 Marks)

23. (a) Explain the electrochemical theory of corrosion.

    (b) Derive the equation for the EMF of the following

         i. Oxidation-reduction electrodes

         ii. Amalgam electrodes

24. How are ΔH, ΔS, ΔG and K determined from EMF data?

25. (a) Derive an equation relating the standard EMF of a cell and the equilibrium constant of the cell reaction.

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

26. Write notes on any two of the following

         i.   Concentration polarization

         ii.   Vant Hoff factor

         iii.   Glass electrodes.   (5+5)

27. (a) Describe one method for the determination of transport number of an ion.   (5)

    (b) What are concentration cells? Give examples.   (5)

28. (a) Explain the principle of codutometric acid-base tirations   (5)

    (b) State and explain Kohlrausch's law.

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