

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – CHEMISTRY

FOURTH SEMESTER – APRIL 2018

16UCH4MC01– ELECTROCHEMISTRY

Date: 20-04-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

PART – A

Answer ALL questions.

(10 x 2 = 20 marks)

1. Define the term electrode potential and how would you represent Standard Hydrogen electrode?
2. What is a reversible cell?
3. What is liquid junction potential?
4. What are commercial cells? Give its applications.
5. Define specific conductance. Mention its unit.
6. Define ionic mobility.
7. Calculate the ionic strength of 0.2M NaCl solution.
8. State degree of dissociation.
9. Define concentration polarisation.
10. Write down the Ilkovic equation and mention the terms involved in it.

PART – B

Answer any EIGHT questions.

(8 x 5 = 40 marks)

11. Describe the construction and working of Weston cell.
12. A zinc electrode is placed in 0.1M solution of zinc sulphate at 25°C. If the degree of dissociation of salt at this concentration is found to be 0.95. Calculate the electrode potential of the electrode at 25°C.
Given that $E_{Zn^0, Zn^{2+}}^0 = -0.76$ volt.
13. Derive an expression for the EMF of electrolyte concentration cells with transference.
14. What are fuel cells? Explain H₂-O₂ fuel cell.
15. Derive Nernst equation.
16. Calculate the equilibrium constant for the electrochemical reaction in the
 $Zn | Zn^{2+}(1M) || Cu^{2+}(1M) | Cu$ at 298 K from the following data :
 $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$; $F = 96500 \text{ C mol}^{-1}$,
 $E^{\circ} Zn^{2+}/Zn = -0.765 \text{ V}$, $E^{\circ} Cu^{2+}/Cu = 0.337 \text{ V}$.
17. Explain the determination of transference number by moving boundary method.
18. State and explain Faraday's law of electrolysis.
19. How is the equivalence conductance of an electrolyte determined?
20. Mention the principle of conductometric titrations. Discuss the titration curve obtained in the titration of a strong acid with a weak base.
21. Describe Debye Huckel theory of strong electrolytes.
22. Explain polarisation and overvoltage.

PART – C

Answer any FOUR questions.

(4 x 10 = 40 marks)

23. Explain the following :
- (i) Redox electrode (5)
 - (ii) Amalgam electrode (5)
24. Discuss the principle underlying Potentiometric titrations and how would you carry out acid-base and redox titrations potentiometrically? (10)
25. Explain any four applications of EMF. (10)
26. (i) Discuss the evidences and limitations of Arrhenius theory of electrolytic dissociation. (5)
- (ii) The equivalent ionic conductivity at infinite dilution of Na^+ and Cl^- are $50.1 \text{ S cm}^2 \text{ eq}^{-1}$ and $76.3 \text{ S cm}^2 \text{ eq}^{-1}$ respectively. Calculate the transport number of Na^+ and Cl^- ions in a very dilute solution of sodium chloride. (5)
27. (i) State and explain Kohlrausch's law. (5)
- (ii) Explain the variation of equivalent conductance with concentration. (5)
28. (i) Describe the principle and applications of Polarography. (5)
- (ii) Calculate the value of mean activity coefficient of 0.2M AlCl_3 solution. Given that, $A = 0.60$. (5)
