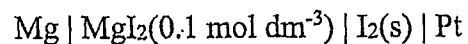


- (b) Calculate the transport numbers of H^+ and Cl^- ions from the following data obtained by moving boundary method using $CdCl_2$ as the indicator electrolyte; concentration of HCl solution = 0.1 M, mass of Ag deposited in the coulometer = 0.120 g; movement of boundary = 7.50 cm and cross-sectional area of the tube = 1.24 cm^2 .
- (c) Difference between concentration cells with and without transference? Explain giving example.

(5,5,5)

6. (a) Write the cell reaction and calculate E_{cell} of the cell given below at 25°C assuming activity and fugacity equal to molar concentration and pressure, respectively.



$$(E_{I^-/I_2}^0 = 0.535 \text{ V and } E_{Mg^{2+}/Mg}^0 = -2.363 \text{ V}).$$

- (b) What is the underlying principle of Potentiometric titrations? What are the advantage over volumetric titration.
- (c) Write a short note on the Wein effect and Debye Falkenhagen effect.

(1000)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3320

I

Unique Paper Code : 2174001008

Name of the Paper : Conductance and Electrochemistry

Name of the Course : B.Sc. (Hons)/ B.Sc. (Prog)

Semester : I/III/V

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. Attempt any four questions.
 3. Use of scientific calculator is allowed.
1. (a) State and explain Kohlrausch's law of independent migration of ions. How does it help in determining the molar conductivity at infinite dilution of a weak electrolyte?

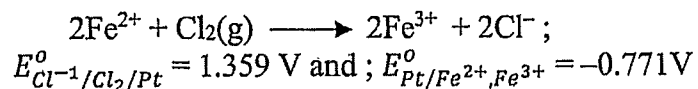
P.T.O.

- (b) Explain the difference between a reversible and irreversible cell.
- (c) Will permanganate ion in acidic medium oxidises oxalic acid under standard condition. Explain and write the cell reaction involved.

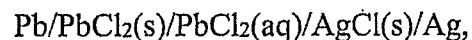
$$(E_{\text{Oxalic acid, H}^+/\text{CO}_2/\text{Pt}}^0 = -0.49 \text{ V and } E_{\text{MnO}_4^-, \text{Mn}^{2+}, \text{H}^+/\text{Pt}}^0 = 1.51 \text{ V}).$$

(5,5,5)

2. (a) Define transport number and explain any one method to determine it.
- (b) Predict whether the reaction will proceed in forward/backward direction at 25°C when all concentration and pressure terms are unity;



- (c) Why can't we use a voltmeter for determining the voltage of a Galvanic cell? (5,5,5)
3. (a) For the following cell:



the potential at 298 K is 0.490 V and the variation of EMF with temperature is given by $E = a - (1.86 \times 10^{-4} \text{ V K}^{-1})(T - 25 \text{ K})$. Write the equation for the cell reaction and calculate ΔG , ΔH and ΔS for the reaction at 298 K.

- (b) What is a standard hydrogen electrode? Write few drawbacks of hydrogen electrode.
- (c) State and explain Faraday's laws of electrolysis.

(5,5,5)

4. (a) Calculate the equivalent conductivity and molar conductivity at infinite dilution of KOOCCOONa (assuming complete ionization) at 25 °C from the following data. Ionic mobilities at 25 °C of Na^+ , K^+ and $\text{C}_2\text{O}_4^{2-}$ are 0.005 19, 0.000 762 and 0.000 768 $\text{cm}^2 \text{ V}^{-1} \text{ s}^{-1}$, respectively.
- (b) Discuss electrolytic and galvanic cells highlighting the similarities and differences.
- (c) What is reference electrode? Give one example and write half-cell reaction involved. (5,5,5)
5. (a) Write any three applications of conductometric measurements. Discuss the titration curved obtained in the conductometric titration of strong acid with strong base.