

5. (a) Explain, why the variation of molar conductivity on dilution of a strong electrolyte differs from that of a weak electrolyte. Sketch a diagram indicating the typical variations of molar conductivities for these two electrolytes.
- (b) Describe the construction and electrode reaction of calomel electrode.
- (c) What will be the conductance of the solution if the specific conductance of an electrolyte solution is $0.2\Omega^{-1}\text{cm}^{-1}$ and electrodes in the cell are 2.2cm apart with an area of 3.8cm^2 . (5,5,5)
6. (a) What is the equilibrium constant (K_c) of the following reaction?
- $$\text{Cu(s)} + 2\text{Ag}^+(\text{aq}) \longrightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{Ag(s)}; E_{\text{cell}}^{\circ} = 0.46\text{V}$$
- (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) Write the cell reaction and derive Nernst equation for Standard Hydrogen Electrode. (5,5,5)

(1000)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3523

I

Unique Paper Code : 2174001008

Name of the Paper : Conductance and Electrochemistry

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

Semester : I / III / V

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

- Write your Roll No. on the top immediately on receipt of this question paper.
 - Attempt any **four** questions.
 - Use of scientific calculator is allowed.
- (a) Will dichromate ion in acidic medium oxidise Fe^{2+} to Fe^{3+} under standard condition. Explain and write the cell reaction involved.
 $(E_{\text{Fe}^{3+},\text{Fe}^{2+}/\text{Pt}}^{\circ} = 0.771\text{ V} \text{ and } E_{\text{Cr}_2\text{O}_7^{2-},\text{Cr}^{3+},\text{H}^+/\text{Pt}}^{\circ} = 1.33\text{ V}).$

(b) Describe the Hittorff's method for determination of transference number of ions.

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

Ag/AgBr(s)/HBr (0.02 mol dm⁻³/H₂ (0.5 bar)/Pt.

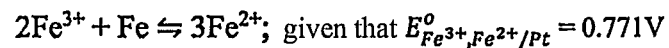
$$(E_{\text{H}^+/\text{H}_2/\text{Pt}}^0 = 0 \text{ and } E_{\text{Br}^-/\text{AgBr}/\text{Pt}}^0 = 0.0713 \text{ V})$$

(5,5,5)

2. (a) Difference between concentration cells with and without transference? Explain giving example.

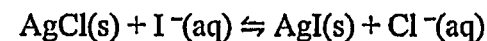
- (b) A conductivity cell filled with 0.1 M solution of potassium chloride at 25°C has a measured resistance of 24.96Ω. Calculate the cell constant if the conductivity κ for 0.1 M solution of KCl is 0.011639 S cm⁻¹ and conductivity water with $\kappa = 7.5 \times 10^{-8}$ S cm⁻¹ is used to make up the solutions. When the cell is filled with a 0.01 M solution of acetic acid, the cell resistance is 1982Ω. Calculate the molar conductivity of acetic acid at this concentration.

- (c) Answer whether the following reaction is possible or not under standard conditions, through appropriate calculations.



$$\text{and } E_{\text{Fe}^{2+}/\text{Fe}}^0 = -0.44 \text{ V.} \quad (5,5,5)$$

3. (a) Construct the galvanic cell for the following reaction and write the Nernst equation



- (b) Draw and discuss the titration curve obtained in the conductometric titration of weak acid with strong base.

- (c) Write short notes on any **one** :

(i) Reversible and Irreversible electrode

(ii) Quinhydrone electrode (5,5,5)

4. (a) What is the function of a salt bridge. Which one is preferred to make a salt bridge: KCl or KNO₃. Why?

- (b) Briefly discuss the potentiometric titration curve of weak acid and strong base.

- (c) Calculate the molar and equivalent conductivities at infinite dilution of the salt KOOC.COONa. Given the molar ionic conductivities at infinite dilution of C₂O₄²⁻, K⁺ and Na⁺ as 148.2, 50.1 and 73.5 S cm² mol⁻¹, respectively. (5,5,5)