(c) What is meant by ionic strength of a solution? Calculate the ionic strength of a solution prepared by mixing 50 ml of 0.2 M KNO_3, 20 ml of 0.15 M K_2SO_4 and 30 ml of 0.05 M Cu $(NO_3)_2$. (5,5,5)

5. (a) Describe the Hittorf's theoretical device to show that although most of the ions differ largely in their mobilities, their equivalent amount is discharged, onelectrolysis, at the appropriate electrodes.

(b) Illustrate how the solubility of a spraningly soluble salt can be determined with the help of conductance measurements.

(c) Calculate Λ°_m for $CH_2ClCOOH$, given that the $\Lambda^\circ_m/10^{-2}$ $Sm^{-2}mol^{-1}$ values are 4.261 for HCl, 1.4986 for KCl and 1.132 for $CH_2ClCOOK$. (5,5,5)

6. (a) Calculate the pH of 0.01 M Aqueous solution of CH_3COONa at 25°C.
Ka for $CH_3COOH = 1.75 \times 10^{-5}$; Kw = 1.008×10^{-14}

(b) Discuss the principle underlying potentiometric titrations. How would you carry out the potentiometric titrations of a solution of HCl against a standard solution of NaOH.

(c) Explain different types of electrodes with examples. (5,5,5)

(100)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5046 **J**

Unique Paper Code : 2174001008

Name of the Paper : GE: CONDUCTANCE AND ELECTROCHEMISTRY

Name of the Course : **All Undergraduate Courses Except Chemistry**

Semester : II / IV / VI

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. This question paper has **6** questions. Out of these only **4** have to be attempted.
3. **All** questions contain equal marks.
4. Use of calculator is allowed.
5. While answering, mention the question number properly.

P.T.O.

1. (a) Explain the terms conductance, specific conductance, equivalent conductance as applied to the solutions of the electrolytes. In which units are these expressed? How is specific conductance related to equivalent conductance?

   (b) What is the principle underlying conductometric titrations? Discuss the titration curves obtained in titration of :

      (i) A Strong acid with Strong Base

      (ii) A Strong Acid with Weak Base

   (c) A zinc rod is placed in 0.1 M solution of zinc sulphate at 25°C. Assuming that the salt is dissociated to the extent of 90 percent at this dilution, calculate, occurring in the zinc – silver cell at 25°C the potential of the electrode at this temperature ($E°Zn^{2+}/Zn = -0.76$ V) (5,5,5)

2. (a) The solubility product of Magnesium Hydroxide $Mg(OH)_2$ at 25°C is 1.4×10^{-11}. Calculate the solubility of magnesium hydroxide in grams per litre? (The atomic masses are: Mg = 24, O = 16 and H = 1)

   (b) What is meant by "degree of hydrolysis" and "hydrolysis constant"? Describe the various methods used for determination of degree of hydrolysis of a salt.

   (c) What is Ostwald's dilution law for weak electrolytes? (5,5,5)

3. (a) Calculate the equilibrium constant of the cell reaction $2\ Ag^+ + Zn \longrightarrow 2\ Ag + Zn^{2+}$, occurring in the zinc-silver cell at 25°C, when $[Zn^{2+}] = 0.10$ M and $[Ag^+] = 10$ M. The EMF of the cell is found to be 1.62 V.

   (b) Calculate the liquid junction potential at 25°C between two solutions of HCl having mean ionic activities of 0.01 and 0.001 respectively. The transference number of H+ ion (t+) in HCl may be taken as 0.83.

   (c) State and explain the Kohlrausch's law. Illustrate how this law is used for calculation of molar ionic conductance at infinite dilution of weak electrolytes. (5,5,5)

4. (a) Calculate the mean ionic activity coefficient of :

      (i) NaCl at a mobility of 0.01 N

      (ii) Na_2SO_4 at a mobility of 0.001 N aqueous solution at 25°C

   (b) Discuss the Debye-Huckel theory of mean ionic activity coefficients. Derive the Debye Huckle Limiting law.