

EASTERN UNIVERSITY, SRI LANKA

FIRST SEMESTER THIRD EXAMINATION IN SCIENCE

2009/2010 (JUNE – JULY 2011)

CH 303: ELECTROCHEMISTRY

(Proper & Repeat)

Answer all questions

Time Allowed: One hour

$$R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1} \quad 2.303 RT/F = 0.0591 \text{ V}$$

(1) a) i. Define 'ionic strength'

(05 marks)

ii. Estimate the mean ionic activity coefficient of CaCl_2 (aq) in a solution that contains 0.01 M CaCl_2 and 0.03 M NaF (aq)

(25 marks)

b) Calculate the molar conductivity of HIO_4 at infinite dilution from the following data observed at 25°C .

$$\Lambda_{\text{KIO}_4}^0 = 127.92 \times 10^{-4} \Omega^{-1} \text{ m}^2 \text{ mol}^{-1}$$

$$\Lambda_{\text{HCl}}^0 = 127.92 \times 10^{-4} \Omega^{-1} \text{ m}^2 \text{ mol}^{-1}$$

$$\Lambda_{\text{KCl}}^0 = 127.92 \times 10^{-4} \Omega^{-1} \text{ m}^2 \text{ mol}^{-1}$$

(30 marks)

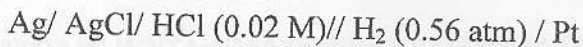
c) i) Define 'Transport number' and for a strong electrolyte and show that $\sum_i t_i = 1$

(20 marks)

ii) If the ionic mobility of Ca^{2+} and Cl^- at infinite dilution are $7.21 \times 10^{-8} \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$ and $7.91 \times 10^{-8} \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$ respectively. Calculate the transport number of Ca^{2+} and Cl^- at infinite dilution

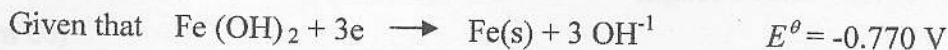
(20 marks)

(2) a) Consider the following cell of $E_{Cl^{-1}, AgCl(s), Ag(s)}^{\theta} = 0.2225 \text{ V}$



- i) Write the electrode and overall reaction (10 marks)
- ii) Calculate e.m.f. of the cell at 25°C neglecting the activity coefficients (15 marks)
- iii) Calculate the e.m.f. of the cell using activities, obtaining activity coefficients by using Dedye – Huckel limiting law (35 marks)

b) Calculate the solubility product of the reaction



(40 marks)