



Eastern University, Sri Lanka

Third Year First Semester Examination in Science

External degree – Repeat-2016

EXTCH 303 Electrochemistry

Answer all questions

Time: One hour

Useful constants: $R = 8.134 \text{ J mol}^{-1} \text{ K}^{-1}$, $F = 96485 \text{ C mol}^{-1}$, $2.303 RT/F = 0.0591 \text{ V}$

(a) Define the following terms which refer to the properties of ionic solutions

- (i) Ionic strength
- (ii) Molar conductivity
- (iii) Ion mobility

(15 marks)

(b) (i) Write the Debye – Huckel equation for the mean activity coefficient of electrolytes and identify the terms in it.

(ii) Briefly outline the assumptions made in the Debye – Huckel model for ionic solutions.

(iii) Calculate the ionic strength and the mean activity coefficient of 0.001 M solution of CaCl_2 at 25°C

(50 marks)

(c) Calculate the molar conductivity of HIO_4 at infinite dilution from the following data observed at 25°C . $\Lambda_{\text{KIO}_4}^0 = 127.92 \times 10^{-4} \Omega^{-1} \text{m}^2 \text{mol}^{-1}$, $\Lambda_{\text{HCl}}^0 = 426.16 \times 10^{-4} \Omega^{-1} \text{m}^2 \text{mol}^{-1}$, and $\Lambda_{\text{KCl}}^0 = 149.86 \times 10^{-4} \Omega^{-1} \text{m}^2 \text{mol}^{-1}$

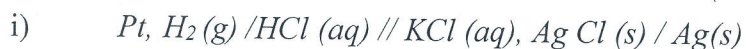
(35 marks)

Cond.

2. (a) What is meant by Electrode potential of a cell?

(10 ma

(b) Write down the reactions taking place at anode and cathode and complete cell reaction of the following cells



(30 ma

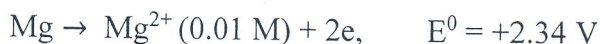
(c) Devise the electrochemical cell suitable for the following equilibria and calculate standard electrode potential of the cell at 298 K.



$$(E_{Ce^{4+}/Ce^{3+}}^{\theta} = 0.73V, E_{Fe^{3+}/Fe^{2+}} = 0.771V)$$

(30 ma

(d) i) Represent the cell made up of the following half-cell reactions



ii) Calculate the EMF of the cell at 25 °C.

(30 ma

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