EASTERN UNIVERSITY, SRI LANKA.

THIRD EXAMINATION IN SCIENCE 2005/2006 -PROPER
FIRST SEMESTER (SEPTEMBER 2007)
CH 303: ELECTROCHEMISTRY

Time allowed: **ONE Hour**

Answer all the questions

The use of a non-programmable calculator is permitted

[2.303RT/F = 0.0591]

1. (i) Define the term 'molar conductivity'

(10 marks)

(ii) By using Arrhenius ionization theory Show that $\frac{\Lambda}{\Lambda^0} = \alpha$, for a weak electrolyte.

where Λ - molar conductivity, Λ^0 - molar conductivity at infinite dilution and α - degree of dissociation of a weak electrolyte.

(15 marks)

(iii) The molar conductivities of $Ba(OH)_2$, $BaCl_2$ and NH_4Cl are at infinite dilution are given below.

$$\Lambda^0(Ba(OH)_2) = 457.6\ \Omega^{-1}\ cm^2\ mol^{-1}$$

$$\Lambda^0(BaCl_2) = 240.6\ \Omega^{-1}\ cm^2\ mol^{-1}$$

$$\Lambda^0(NH_4Cl) = 129.8\ \Omega^{-1}\ cm^2\ mol^{-1}$$

(a) Calculate molar conductivity at infinite dilution for NH_4OH

(25 marks)

(b) If the moalr conductivity of NH_4OH is 9.35 $\Omega\ cm^{-1}mol^{-1}$, calculate degree of dissociation of NH_4OH.

(10 marks)

(c) Calculate the dissociation constant of 0.01 M NH_4OH

(20 marks)

(iv) The resistance of 0.01 M NaCl solution at 298 K is 200 Ω. Cell constant of the conductivity cell is 2 cm^{-1}. Calculate the molar conductivity of the solution.

(20 marks)

Turn over

2. (a) (i) What is meant by 'standard electrode potential'?

(10 marks)

(ii) How would you determine the standard electrode potential of zinc electrode?

(15 marks)

(b) The standard electrode potential for the following half cell reaction is 1.76 V

$$Pd(OH)_2 + 2e \rightarrow Pd\ (s) + 2OH^-(aq)\ .$$

Determine the K_{sp} for $Pd(OH)_2$, given that $E^{\theta}_{Pd^{2+}/Pd} = 0.915$ V.

(35 marks)

(c) Calculate the electrode potential at 25 ^{0} C of the Cr^{3+}(0.01 M), $Cr_2O_7^{2-}$ (0.01 M) electrode at pH at 3. Assume that all activity coefficients are unity, given that $E^{\theta}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33$ V

(30 marks)

(d) Give four advantages of conductimetric titrations.

(10 marks)

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