



Eastern University, Sri Lanka

Third Year First Semester Examination in Science -2011/2012

CH 303: Electrochemistry

Answer all questions

Time allowed: 01 hour

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

- i) Conductance
- ii) Molar conductivity
- iii) Transport number

(15 marks)

(b) i) Kohlrausch's Law relates the variation of molar conductivity with concentration for strong electrolytes by the equation $\Lambda = \Lambda^0 - K\sqrt{c}$. Explain the terms involved in it.

ii) The resistances of two different aqueous solutions of the salt MX, were measured at 25°C in a conductivity cell having a cell constant equal to 18.72 m⁻¹. When the concentration of MX solution was 0.0005 mol dm⁻³ the cell resistance was 2622 Ω. When the concentration was changed to 0.005 mol dm⁻³ the resistance was found to be 270.4 Ω. Assume that solutions of MX obey the Kohlrausch law.

iii) Calculate the molar conductivity (Λ) of MX at two different concentrations 0.0005 and 0.005 mol dm⁻³.

iv) Use the equation in part (b) (i) to find the limiting molar conductivity (Λ^0) of MX and the constant K.

(50 marks)

Contd....

- (c) If the limiting (molar) ionic conductivity (Λ_+) for M^+ is $7.55 \text{ S m}^2 \text{ mol}^{-1}$ at 25°C , use your answer to part (b) (ii) to calculate the transport number for M^+ in the solution of MX .

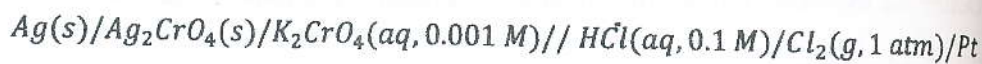
$$\left[\text{Use } t_+ = \frac{v_+ \Lambda_+}{v_+ \Lambda_+ + v_- \Lambda_-} \right]$$

(20 marks)

- (d) Briefly explain why a solution of acetic acid does not follow the Kohlrausch law and describe how the acid dissociation constant, K_a can be obtained from conductance measurements on acetic acid solutions.

(15 marks)

2. (a) For the following cell,

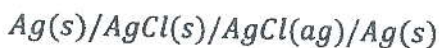


- Write the half – cell reactions and cell reaction.
- Calculate the standard electrode potential and electrode potential of the cell.

$$\left[E_{\text{Ag}_2\text{CrO}_4, \text{CrO}_4^{2-}, \text{Ag}}^\theta = 0.45 \text{ V}, E_{\text{Cl}^-, \text{Cl}_2}^\theta = 1.36 \text{ V}, 2.303 \frac{RT}{F} = 0.0591 \text{ V} \right]$$

(40 marks)

- (b) Calculate the solubility and solubility product of the following cell.



$$\left[E_{\text{Ag}^+, \text{Ag}}^\theta = 0.80 \text{ V}, E_{\text{AgCl}, \text{Ag}, \text{Cl}^-}^\theta = 0.22 \text{ V} \right]$$

(40 marks)

- (c) Briefly explain the conductrimetric titration of strong acid versus weak base.

(20 marks)

End of Paper