Eastern University, Sri Lanka

Third Year Special Repeat Examination in Science

2008/2009 (February2010)

CH 303 Electrochemistry

Time Allowed: **ONE HOUR**

Answer all questions

1. (a) Define the term 'molar conductivity' (10 marks)

(b) 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)

(c) The resistance of a 0.01 M solution of acetic acid measured in a cell of cell constant 0.20 cm^{-1} was found to be 760 Ω at 25 ^{0} C. The limiting molar conductivity of CH_3COONa, HCl and NaCl at the same temperature are 91.0, 425.0 and 128.0 S cm^2 mol^{-1} respectively. Calculate,

i) the molar conductivity ($\wedge$) of the acid solution (20 marks)

ii) the molar conductivity of acetic acid at infinite dilution ($\wedge^0_{CH_3COOH}$) (20 marks)

iii) the degree of dissociation (α) (10 marks)

Turn Over

(d) 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.

(25 marks)

2. (a) Write the electrode half – reactions and the cell reactions for the following cells.

i. $Ni(s)/Ni^{2+}(aq)//Ag^{+}(aq)/Ag(s)$ (15 marks)

ii. $Cd(Hg)/CdSO_4(aq)/Hg_2SO_4(s),Hg(s)$ (15 marks)

(b) Calculate the mean ionic activity coefficient of 0.1 M HCl at 25 ^{0} C giving that the E_{cell} and E^{θ}_{cell} of the cell $H_2(1atm)/HCl(aq),AgCl(s)/Ag(s)$ are 0.3524 V and 0.2224 V respectively at the same temperature. $[2.303\frac{RT}{F}=0.0591]$

(Cell reaction: $AgCl(s)+1/2H_2(g)\rightarrow Ag(s)+Cl^{-}(aq)+H^{+}(aq)$)

(40 marks)

(c) Discuss the variations on conductivity with respect to added volume of base during a strong acid – strong base titration.

(30 marks)

End of paper