Answer all questions.   Time: 01 Hour

1. (i) Define the following terms:
     (a) Molar conductivity
     (b) Mobility
     (c) Flux

   Show that $\lambda/\lambda^\infty = \alpha$ for a weak electrolyte.
   (λ- Molar conductivity, λ^∞ molar conductivity at infinite dilution and α- dissociation constant of the weak acid)

   (ii) Conductivity of a saturated aqueous solution of silver chloride is 1.980×10^{-4} Sm^{-1}. If the conductivity of the water used to prepare the solution is 1.78×10^{-5} Sm^{-1}, calculate
     (a) the solubility
     (b) the solubility product of silver chloride .
   λ^∞ for Ag$^+$ and Cl$^-$ are 6.35×10^{-3} Sm^{2}mol^{-1} and 7.55×10^{-3} Sm^{2}mol^{-1} respectively. All data are at 25^0C.

2. (a) i) Briefly describe how you can determine ionic product of water.

   ii) If the conductivity of pure water is 5.5×10^{-6} Ω^{-1} m^{-1}, determine the ionic product of water at 298 K. The molar conductivities (in Ω^{-1} m^2 mol^{-1}) of NaOH, HCl and NaCl are 0.02484, 0.04262 and 0.01265 respectively at infinite dilution.

   (b) Calculate the potential difference between hydrogen electrodes in the following cell at 298 K. The activity coefficients of 0.01 M and 0.1 M HCl solutions in the cell are 0.95 and 0.85 respectively.

   Pt / H$_2$(g), HCl / AgCl(s),Ag // Ag, AgCl(s)/ HCl, H$_2$(g)/Pt
     (1 atm) (c$_1$= 0.01)   (c$_2$ =0.1) (1 atm)

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