Some Important Definitions

CHAPTER: - ELECTROCHEMISTRY

1. ELECTROCHEMICAL CELL: -

   An electrochemical cell is a device in which chemical energy of redox reaction is converted into electrical energy. It consists of two metallic electrodes dipping in electrolytic solutions.

2. LIMITING MOLAR CONDUCTIVITY: -

   The molar conductivity of a solution at finite dilution is called limiting molar conductivity and is represented by the symbol $\Lambda^{\circ}m$.

3. CONDUCTIVITY: -

   Conductivity of a solution is the conductance of ions present in a unit volume of the solution or in other words, it is defined as the conductance of a solution of 1 cm in length and area of cross section of 1 sq. cm.

   It is reciprocal of resistance.

   $G = \frac{1}{R}$ and $G \propto \frac{l}{A}$

   $\therefore G = \frac{l}{RA}$

4. KOHLRAUSCH'S LAW: -

   It states that the limiting molar Conductivity of an electrolyte can be expressed as the sum of the individual contributions of the anion and the cation of the electrolyte, e.g.

   $\Lambda^{\circ}m_{(CH_3COOH)} = \lambda^{\circ}_{CH_3COO^-} + \lambda^{\circ}_{H}$

   The conductivity of a solution is related to the number of ions present per unit volume of the solution.

When the solution is diluted, the number of ions per unit volume decreases. Hence, conductivity or specific conductance of the solution decreases.

5. MOLAR CONDUCTIVITY: -

It is defined as the conductance of the solution which contains one mole of the electrolyte such that entire solution is in between the two electrodes kept one centimeter apart and large enough to contain all the electrolytes.

Molar Conductivity, $\Lambda_m = \frac{\kappa}{C}$

6. DERGREE OF DISSOCIATION $(\propto)$: -

The ratio of molar conductivity at a specific concentration to the molar conductivity at infinite dilution (limiting molar conductivity) is known as degree of dissociation $(\propto)$.

i.e. $\propto = \frac{\Lambda_m^C}{\Lambda_m^\circ}$

where, Λ_m^C is molar conductance at concentration "C" and Λ_m° is molar conductance at infinite dilution. For a weak electrolyte, if K_a is dissociation constant, then,

$K_a = \frac{C \propto^2}{1 - \propto}$

7. FUEL CELL: -

They are galvanic cells that are designed to convert the energy of combustion of fuels like hydrogen, methane, methanol directly into electrical energy e.g. hydrogen-oxygen fuel cell in which hydrogen and oxygen are bubbled through porous carbon electrodes into concentrated KOH solution.

8. FARADAY'S FIRST LAW OF ELECTROLYSIS: -

The amount of chemical reaction which occurs at any electrode during electrolysis by passing current is proportional to the quantity of electricity passing through the electrolyte (in solution or in molten state).

Thus, W gram of the substance gets deposit on passing Q coulomb of electricity.

$W \propto Q$ or $W = ZQ$ or $W = ZIT$

Where, $Q =$ Quantity of electricity

$I =$ Current (in A)

$t =$ Time (in sec)

$Z =$ Constant of proportionality called electrochemical equivalent.