Electrochemistry : Is that branch of chemistry which deals with the study of production of electricity from energy released during spontaneous chemical reactions and the use of electrical energy to bring about non-spontaneous chemical transformations.

Importance of Electrochemistry
1. Production of metals like Na, Mg. Ca and Al.
2. Electroplating.
3. Purification of metals.
4. Batteries and cells used in various instruments.

TYPES OF SUBSTANCES BASED ON ELECTRICAL CONDUCTANCE

Based on electrical conductivity, the materials are divided into two types as follows:

1) Insulators: The substances which resist the flow of electric current through them are called insulators. They do not have free electrons or freely moving charged particles.

E.g. Organic polymers (like plastics), glass, diamond, quartz etc.,

2) Conductors: The substances which allow the flow of electricity through them with little resistance are known as conductors.

They are again divided into:

i) Metallic or electronic conductors: The conductors which conduct the electricity through the electrons.

E.g. All metals, Graphite etc.

In case of metallic conductors;

* No chemical reaction occurs during the conduction of electricity.

* Conductivity decreases with increase in temperature due to vibrational disturbances.

Electrolytic Conductors or Electrolytes

Substances which allow the passage of electricity through their fused state or aqueous solution and undergo chemical decomposition are called electrolytic conductors, e.g., aqueous solution of acids. bases and salts.

Electrolytes are of two types:

1. **Strong electrolytes** : The electrolytes that completely dissociate or ionise into ions are called strong electrolytes. e.g., HCl, NaOH, K_2SO_4.

2. **Weak electrolytes** : The electrolytes that dissociate partially (ex < 1) are called weak electrolytes, e.g., CH_3COOH, H_2CO_3, NH_4OH,H_2S, etc.

Conductance (G): It is the ease of flow of electric current through the conductor. It is reciprocal of resistance (R).

G = (1/R), units ohm^{-1} mhos or Ω^{-1}

specific conductance or conductivity (κ): It is the conductance of a material or solution occupying one cm^3 volume.

It is measured in:

$ohm^{-1}. cm^{-1}$ = mho. cm^{-1} (C.G.S system)

or

Siemens. m^{-1} (S.I system)

* The specific conductance depends on the nature of substance or the electrolyte.

* It increases with increase in concentration of the electrolytic solution since the number of ions per unit area increases.

Cell constant (l/A): The ratio of the distance between the electrodes, *l* to the cross sectional area, A of the electrodes is known as cell constant.

$$\text{cell constant } (G^*) = \frac{l}{A}$$

The cell constant can be determined by using following relations which can be derived easily from expressions discussed above.

$$G^* = \frac{l}{A} = \frac{R}{\rho} = \frac{\kappa}{G} = R\kappa = \frac{1}{G.\rho}$$

Unit of cell constant is cm^{-1} or m^{-1}.