Metallic and Electrolytic conductors.

(1) **Conductors and Non – conductors:**All substances do not conduct electrical current. The substances which allow the passage of electric current are called conductors. The best metal conductors are such as copper, silver, tin, etc. On the other hand, the substances which do not allow the passage of electric current through them are called **non-conductors or insulators**. Some common examples of insulators are rubber, wood, wax, etc.

(2) **Types of conductors:**The conductors are broadly classified into two types,

(i) **Metallic conductors or electronic conductors**

(a) In metallic conductors, flow of electricity takes place without the decomposition of the substances.

(b) Flow of electricity is due to the flow of electrons only i.e., there is no flow of matter.

(c) In addition to metals, **graphite** and certain minerals also conduct electricity due to presence of free electrons in them, hence they are collectively called as **electronic conductors.**

(d) Metallic conduction decreases with increase of temperature. This is because **kernels** start vibrating which produce hindrance in the flow of electrons.

(e) The resistance offered by metals is also due to vibrating kernels.

(f) Metallic conductors obey Ohm's law.

(ii) **Electrolytic conductors or Ionic conductors**

(a) In electrolytic conductors flow of electricity takes place by the decomposition of the substance (Electrolyte).

(b) Flow of electricity is due to the movement of ions and hence there is flow of matter.

(c) Solutions of acids, bases and salts are the examples of electrolytic conductors.

(d) The electrolytic conduction will not occur unless the ions of the electrolyte are free to move. Therefore, these substances do not conduct electricity in the solid state but conduct electricity in the molten state or in their aqueous solutions.

(e) The electrical conduction increases with increase of temperature. This is generally due to increase in dissociation or decrease in the interionic attractions.

(f) The resistance shown by an electrolytic solution is due to factors like interionic attractions, viscosity of solvent etc.

(g) Electrolytic conductors also obey Ohm's law.

(h) All electrolytes do not ionize to the same extent in solution. On this basis, electrolytes are broadly divided into two types: strong electrolytes and weak electrolytes.

Strong electrolytes: The electrolytes which are almost completely dissociated into ions in solution are called strong electrolytes. For example, $NaCl, KCl, HCl, NaOH, NH_4NO_3$, etc.

Weak electrolytes: The electrolytes which do not ionize completely in solution are called weak electrolytes. For example, $CH_3COOH, H_2CO_3, H_3BO_3, HCN, HgCl_2, ZnCl_2, NH_4OH$, etc. Thus in case of weak electrolytes, an equilibrium is established between the unionized electrolyte and the ions formed in solution. The extent of ionization of a weak electrolyte is expressed in terms of degree of ionization or degree of dissociation. It is defined as the fraction of total number of molecules of the electrolyte which ionize in the solution. It is generally denoted by alpha (α). for strong electrolytes, α is almost equal to 1 and for weak electrolytes, it is always less than 1.

The electrical conductivity of the solutions of electrolytes depends upon the following factors,

(a) Interionic attractions: These depend upon the interactions between the ions of the solute molecules, i.e., solute-solute interactions. If the solute-solute interactions are large, the extent of dissociation will be less. These interactions are also responsible for the classification of electrolytes as strong electrolytes and weak electrolytes.

(b) Solvation of ions: These depend upon the interactions between the ions of the solute and the molecules of the solvent and are called solute-solvent interactions. If the solute-solvent interactions are strong, the ions of the solute will be highly solvated and their electrical conductivity will be low.

(c) Viscosity of the solvent: The viscosity of the solvent depends upon the solvent-solvent interactions. Larger the solvent-solvent interactions, larger will be the viscosity of the solvent and lower will be the electrical conductivity of the ions.