INTRODUCTION TO ELECTROLYSIS

Electrolysis

Electrolysis –

Electrolysis is the chemical decomposition caused by passing an electrical current through a compound which is either molten or is a solution. In simple words, electrolysis is the decomposition/break down by electricity. Passing an electric current through a compound which is either molten or in solution causes chemical changes, the chemical reactions produce new products – new substances. Therefore, in simple words, electrolysis involves the formation of new substances when ionic compounds conduct electricity.

Electrolytes are ionic compounds that are:

- in the molten state (heated so they become liquids), or
- dissolved in water

Under these conditions, the ions in electrolytes are free to move within the liquid or solution.

Not all electrolytes are ionic substances. Certain molecular substances dissolve in water to form ions. The resulting solution is electrically conducting, and so we say that the molecular substance is an electrolyte.

An example is hydrogen chloride gas, $HCl\,(g)$, which is a molecular substance. Hydrogen chloride gas dissolves in water, giving $HCl\,(aq)$, which in turn produces hydrogen ions, H^+, and chloride ions, Cl^-, in aqueous solution. (The solution of H^+ and Cl^- ions is called hydrochloric acid).

$$HCl\,(g) + H_2O\,(l) \rightarrow H^+\,(aq) + Cl^-\,(aq)$$

Note:
To test for conductivity, include a sample of the substance in a circuit that contains a source of direct current (for example: a cell or power pack) and a bulb or an ammeter.
If current flows through the substance when it is molten or dissolved, it is an electrolyte.

Electrolytes –

To be an electrolyte, a substance must be able to conduct electricity. Inert electrodes do not react with the electrolyte or the products formed during electrolysis. They just provide a surface for ions to gain or lose electrons so they form products. Graphite (a form of carbon) and platinum are commonly used to make inert electrodes.

In other words, an electrolyte is a substance that dissolves in water to give an electrically conducting solution. In aqueous or molten state, it will conduct electricity with decomposition at the electrodes.

Non – Electrolyte –

A nonelectrolyte is a substance that dissolves in water to give a non – conducting or very poorly conducting solution. In aqueous or molten state, it does not conduct electricity and therefore, does not go through decomposition at the electrode.

A common example is sucrose, $C_{12}H_{22}O_{11}$, which is ordinary table sugar. Another example is methanol, CH_3OH, a compound used in car window washer solution. Both of these are molecular substances. The solution process occurs because molecules of the substance mix with molecules of water. Molecules are electrically neutral and cannot carry an electric current, so the solution is electrically non – conducting.