8th - Chemical Effects of Electric Current I

All matter is made up of tiny particles called atoms. Every atom contains charged particles. These charged particles come in two 'types': Positive and negative. Flow of charged particles inside a substance constitutes an electric current.

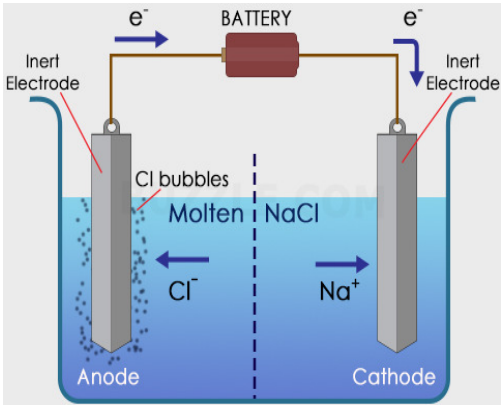
Conductors and insulators: Materials in which charged particles can move freely are called **conductors**. Conductors allow an electric current to flow through them easily. Materials in which charged particles cannot move easily are called **insulators**. Insulators do not allow an electric current to flow through them easily.

Electrical conductivity: The measure of the ability of a substance to allow the flow of an electric current is called electrical conductivity. Substances that are good conductors have high electrical conductivity as compared to substances that are poor conductors (i.e. insulators). Some liquids, but not all, are good conductors.

Electrical conductivity of water: Pure water is a poor conductor. But, the water that we use in our homes is not pure. Generally, tap water, pond water, and well water, etc, contain a lot of **impurities**, most of which are usually dissolved salts. The presence of even a small amount of impurities makes water a good conductor. Remember, getting an electric shock could result in very serious consequences, even death. So, always take care while operating electrical appliances.

Electrical conductivity of other liquids: Most acids and bases dissolved in water are good conductors of electricity. To test the electrical conductivity of two common acids, **lemon juice and vinegar**. When salts like sodium chloride (common salt), potassium iodide, etc, are heated, the molten salts so obtained are **good conductors**. Most substances that exist as liquids at room temperature, like alcohol, oils, etc. are bad conductors.

Effect of impurities on electrical conductivity of water: Moving charged particles are also referred to as charge carriers. In metals, which are good conductors, the charge carriers are a type of particles called **electrons**. In liquids, the charge carriers are generally **ions**. Atoms or a group of atoms with a positive or a negative charge are called ions. We dissolve a small quantity of common salt (sodium chloride, NaCl) in pure water. When salt dissolves in water, if forms **ions of sodium and chlorine**. An electric current will flow in the circuit. Such an arrangement is called an **electrolytic cell**. Pure water does not form enough ions to conduct electricity. **That is why pure water is a poor conductor of electricity.**



In the diagram, rods are made of conducting material (called **electrodes**). The electrode connected to the negative terminal of battery is called cathode and the one connected to positive terminal of battery is called anode.

The liquid that conducts electricity because of presence of ions is called **electrolyte**. Examples are: salt solution, dilute solution of acids.

A process called **electrolysis** occurs in an electrolytic cell when a current is passed through the **electrolyte**. Let us learn more about electrolysis.

Electrolytes: We say that – a compound that conduct electricity in molten (fused) or aqueous (solution) state and which simultaneously undergoes decomposition

(breaking into ions), with the passage of an electric current through it, is an **electrolyte**. We classify electrolytes as strong electrolytes and weak electrolytes. This is done on the basis of the extent to which the electrolyte breaks into ions.

1. **Strong electrolytes**: these are the electrolytes that ionize completely to form free mobile ions in the solution. A large number of free mobile ions are available, in them, to conduct electricity.
2. **Week electrolytes**: these are the electrolytes that ionize only partially to form free mobile ions. Only a small number of free mobile ions are available, in them, to conduct electricity.

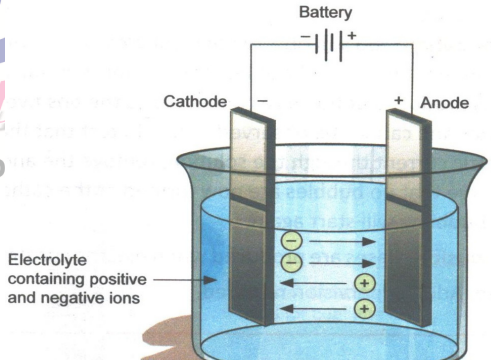
Some examples of strong and weak electrolytes:

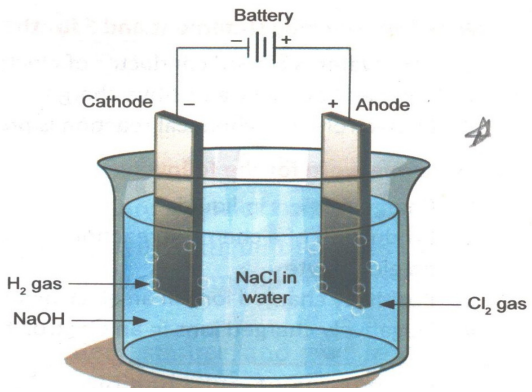
Strong electrolyte	Weak electrolyte
Sea water	Ordinary tap water
Nitric acid	Oxalic acid
Copper sulphate solution	Carbonic acid
Sodium chloride	Ammonium hydroxide
Sulphuric acid	Citric acid

Chemical effects of electric current: Michael faraday, a well- known British experimental physicist, began his experiments on the passage of electricity through liquids (electrolyte) in 1834.

He observed interesting chemical changes (effects) taking place when an electric current pass through an ionic solution. The resulting effects are known as chemical effects of current. Faraday called this phenomenon, of passage of electricity through liquids, as electrolysis. This is because; it causes chemical changes within the electrolyte.

Electrolysis: The production of a chemical reaction by passing an electric current through an electrolyte is called **electrolysis**. An electrolyte contains ions, which are charged. The positively charged ions are called **cations**, because they are attracted to the cathode, and the negatively charged ones are called **anions**, because they are attracted to the anode. We know that unlike charges attract and like charges repel. A chemical reaction takes place at the **anode and the cathode**. This can be observed as formation of bubbles or decomposition of metal on electrodes.





The oxygen bubbles are formed on the electrode (called **anode**) connected to the **positive terminal** of the battery and hydrogen bubbles are formed on the other electrode (called **cathode**) connected to the negative terminal of the battery.

We thus, **conclude** that the passage of an electric current through an ionic solution causes chemical changes.

The chemical reactions taking place in the solution depend on-
1. Nature of the electrodes.
2. Nature and concentration of the solution.

Some of the prominent effects of the chemical reactions taking place at electrodes, and within the solution are-
1. Metals may get deposited at the electrode surface
2. Gaseous bubbles may form near the electrodes.
3. Change of colour of solution may occur due to dissolving of different ions.

ABHYAS Academy, Behind Pragat Shiv Mandir, Near Govt. College, Nishat Cinema Road, Ambala Cantt.
Ph No. +91-171-2631595, 9416541198, e-Mail: anusethi1968@yahoo.com Website: www. abhyasonline.in