Hi learners, do you know how do we get the electricity in our houses? Also why do some objects have a higher requirement of electricity compared to others? All these questions will be answered in our present discussion of the topic electricity. Electricity or current electricity is the movement of charge / electrons through a wire. It could be direct or indirect and we shall discuss many more aspects related to it.

Electric current

If two bodies charged to different potentials are connected together by means of a conducting wire, charges begin to flow from one body to another. The charges continue to flow till the potentials of the two become equal. The flow of electric charges through a conductor constitutes an electric current. Quantitatively, electric current in a conductor across an area held perpendicular to the direction of flow of charge is defined as the amount of charge flowing across that area per unit time.

If a charge ΔQ passes through an area in time t to (t + Δt), then the current I at time is given by I = ΔQ/ Δt I = Q / t or Electric current = electric charge / time SI unit = 1 ampere 1 ampere = 1 coulomb/ 1 sec

Properties of Electric Current:

After we defined electric current, let us learn the properties of electric current. Electric current is an important quantity in electronic circuits. We have adapted electricity in our lives so much that it becomes impossible to imagine life without it. Therefore, it is important to know the properties of the electric current. We know that electric current is the result of the flow of electrons. The work done in moving the electron stream is known as electrical energy. The electrical energy can be converted into other forms of energy such as heat energy, light energy, etc. For example, in an iron box, electric energy is converted to heat energy. Likewise, the electric energy in a bulb is converted into light energy.

There are two types of electric current known as alternating current (AC) and direct current (DC). The direct current can flow only in one direction, whereas the alternating direction flows in two directions. Direct current is seldom used as a primary energy source in industries. It is mostly used in low voltage applications such as charging batteries, aircraft applications, etc. Alternating current is used to operate appliances for both household and industrial and commercial use. The electric current is measured in Ampere. One ampere of current represents one coulomb of electric charge moving past a specific point in one second.

Ohm's Law

Ohm's law states the relationship between electric current and potential difference. The current that flows through most conductors is directly proportional to the voltage applied to it. Georg Simon Ohm, a German physicist was the first to verify Ohm's law experimentally.

Ohm's law states that the current flowing through a conductor is directly proportional to the voltage across it, provided all physical conditions and temperature remain constant.

Mathematically: $I \propto R$ or $R \propto V \Rightarrow V = IR \Rightarrow R = V/I$, SI unit = Ω (ohm)

Factors affecting the Resistance:

1. Length: The resistance R of a conductor is directly proportional to its length i.e. $R \propto l$

2. Area of cross section: The resistance R of a uniform conductor is inversely proportional to its area of cross section A i.e. $R \propto 1/A$

3. Nature of the material: The resistance of a conductor also depends on the nature of its material. Combining the above factors, we get $R \propto A \Rightarrow R = \rho 1/A$ Where ρ is the constant of proportionality called resistivity or specific resistance of the material of the conductor. It depends on the nature of the material of the conductor and on the physical conditions like temperature and pressure, but it is independent of its size or shape.

Resistivity or specific resistance

If in the above equation, we take L = 1 unit, and A = 1 square unit, then R = ρ. Resistivity of a material may be defined as the resistance of a conductor of that material, having unit length and unit area of cross section. SI unit = Ωm (ohm metre)
Effect of temperature of the conductor: If the temperature of the conductor connected in the circuit increases, its resistance increases.

This was all about Electricity, electic current, Ohm's Law, Resistivity and in next blog we will be discussing combinations of resistance and heating effect of current.