POTENTIAL DIFFERENCE AND ELECTRIC CURRENT

An electric charge can be at rest or in motion. When charges are at rest the phenomenon is called Static Electricity, but when they are in motion, the phenomenon is referred to as Current Electricity. This implies that the flow of charges along a conductor is called current.

Current along a conductor, e.g. a wire can be expressed in terms of the quantity of electric charge, Q which moves past each section of the conductor in a given time t. Hence, current I is given as

$$I = \frac{quantity\ of\ charge}{time} = \frac{Q}{t}$$

If Q is in Coulombs, and t is in seconds, the current I is in Amperes (A). $1A = 1Cs^{-1}$

Ammeter is an instrument used for measuring current. Milliammeters measure smaller currents.

Very small currents are detected by sensitive instruments called galvanometers.

An ammeter is said to be sensitive if it can detect or measure very small currents. It is said to be accurate, if the current it measures is close to the true value.

Electric Circuit

An electric circuit to the path provided for the flow of electric current. The circuit consists of the source of electrical energy (e.g. a battery) connected through a conductor (e.g. a wire) to a load (e.g. an electric bulb), and a key or a switch. The switch serves to complete (close) or break (open) the circuits.

A closed circuit is the circuit in which there is no gap (key is closed) along the conducting path. In such a circuit the current flows through an external resistor (or load). An open circuit is a circuit with a gap or opening (key is open) in the conducting path. In such a circuit, the battery maintains no current in external resistor or load. A

short circuit is a circuit is a closed circuit with no load on it.

Potential Difference

The Potential Difference between any two points in an electric field is defined as the work done in moving a positive charge of 1 coulomb from one point in the electric field to another.

Potential difference is an essential condition for the flow of current in an electric circuit as it tells us the direction of flow of current.

In order to maintain a flow of current round a circuit or along a conductor, there must be a source of electricity that keeps the charge (electrons) flowing through the conductor. Some energy is expended in maintaining the flow of current round the circuit. Such energy can be supplied by an agency, e.g. a cell (or battery) or by a generator. The battery serves as the source of potential difference that makes it possible for current to flow. The battery is said to have an electromotive force (emf) when it is able to

maintain current electricity through a circuit. The electromotive force is measured by the energy expended in causing a quantity of electricity of 1 coulomb to flow round the circuit. The unit of the emf is the volt. Thus, electromotive force can be defined as the total work done in driving one coulomb of electricity round a circuit or as the total energy per coulomb charge obtained from a cell or battery.

Mathematically, it is given as:

$$Emf\ (E) = \frac{work}{charge} = \frac{W}{Q}$$

Also, the emf of a cell can be defined as the p.d. between the terminals of a cell when it is not delivering any current in an external circuit (or when it is in an open circuit).

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