Chapter- 11
Current electricity
Class: x
Note of worksheet 1 (1st week)

Electric current:

When two bodies of different potential are connected by a conducting wire, electrons flow from the body of low potential to that of higher potential. This flow of electron continues until the potential difference between the two bodies becomes zero. If by any process the potential difference between the two objects is maintained, then this flow of electron goes on continuously. This continuous flow of electrons is electric current.

The amount of charge that flows in unit time through any cross section of a conductor is called electric current. If through any cross section of a conductor, the quantity of charge Q flows in time t, then the electric current will be I = Q/t.

Direction of electric current and direction of electron flow:

When current electricity was invented first, it was assumed that the electricity was produced due to the flow of positive charges. This positive charge flows from higher potential to lower potential. So, the direction of conventional current is taken to be from higher potential to lower potential or from positive plate to negative plate of an electric cell. But we know that actually electric current is the flow of negative charges or of electrons, so the actual direction of electric current is from lower potential to higher potential. That is from negative plate to positive plate of an electric cell. Therefore, the actual direction of electric current is opposite to that of conventional current. The arrow demonstrated in the diagram is indicating the direction of conventional current.

Electromotive Force:

Electromotive force is defined as *the electric potential produced by either electrochemical cell or by changing the magnetic field.* EMF is the commonly used acronym for electromotive force.

Generator or a battery is used for the conversion of energy from one form to another. In these devices, one terminal becomes positively charged while the other becomes negatively charged. Therefore, an electromotive force is the work done on a unit electric charge

$E = \frac{W}{Q}$

The unit of Electromotive force is JC^{-1}

Potential Difference:

Potential difference is the amount of work energy required to move an electric charge from one point to another.

The unit of potential difference is volt

Difference between Electromotive Force and Potential Difference

Electromotive Force	Potential Difference
EMF is defined as the work done on a unit charge	Potential difference is defined as the energy which is dissipated as the unit charge pass through the components
EMF remains constant	Potential difference is not constant
EMF is independent of circuit resistance	The potential difference depends on the resistance between the two points during the measurement
Due to EMF, electric, magnetic, and the gravitational field is caused	Due to potential difference, only electric field is induced
It is represented by E	It is represented by V

Conductor: The materials through which electric current can flow very easily are called conductors. Electrons can flow freely within these materials. In metal wires the charges are carried by electrons. So, the metallic materials are good conductors of electricity. Copper, silver, aluminium etc. are good conductors. Due to this reason, metallic wires are used as electric connectors.

Insulator: The materials through which electric current cannot flow are called insulators. Therefore, the materials where electrons are not free to move about are the insulators. For example: Plastic, rubber, wood, glass etc. There are no free electrons inside insulating materials.

Semiconductor: The materials whose current conduction capacity lies between that of conductors and insulators in normal temperature are called semiconductors. For example- germanium, silicon etc. The current conduction capacity of semiconductor can be increased by adding suitable impurities.

Ohm's law :

The current passing through a conductor at constant temperature is directly proportional to the potential difference between the two ends of the conductor.

Now at constant temperature, if the current passing through the conductor is I and potential difference v

Then according to ohm's law,

$I \propto V$

Or , $v = RI$ [Here R is resistance constant]