

Current Electricity

- **Electric potential:** The Electric potential of a point in an electric field is defined as the work to be done to move a unit positive charge from infinity to that point.
- **Potential difference:** The potential difference between two separate points is defined as the work done to move a unit positive charge from one point to another.

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

Unit: Volt

$$1 \text{ Volt} = \frac{1 \text{ joule}}{1 \text{ coulomb}}$$

$$1 \text{ V} = 1 \text{ J C}^{-1}$$

- **Electric cell**— A device used to maintain constant potential difference between conductors
- **Primary cell:** Chemical energy directly converted to electrical energy
- **Secondary cell:** Electric energy stored in the form of chemical energy, which on demand converts into electric energy
- **Simple voltaic cell:**

Copper rod acts as +ve terminal and zinc acts as –ve terminal.

Electron flows externally from zinc to copper and current flows from copper to zinc.

1. Symbols of Electric components

Electric component

Symbol

Electric cell



Electric bulb



Battery



Wire



Switch in ON position



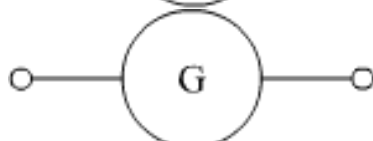
Switch in OFF position



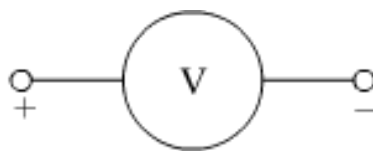
Ammeter



Galvanometer



Voltmeter



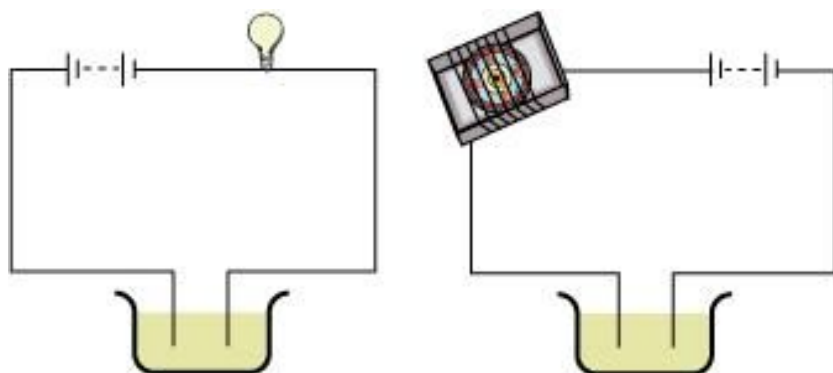
2. Combination of cells

Positive (or negative) terminal of a cell is connected to the negative (or positive) terminal of the other cell. This combination is called a **battery**.

3. An unbroken path or line that makes electrical current flow possible through conducting wires connected to other resistances is known as an electric circuit.

4. The circuits where the appliances in connection operates simultaneously once the switch is closed are known as series circuits. In series circuit, the working of each appliance is dependent on each other.

5. The circuits where the working of each appliance present in the circuit is independent on each other are known as parallel circuits.

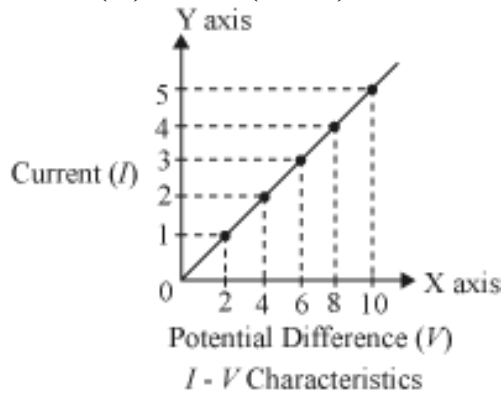


- The bulb will glow or the magnetic needle will show deflection if the liquid in the beaker is a good conductor of electricity.
- Greater the deflection of needle or brighter the light, better is the conductivity of the liquid.

Good conductor	Poor conductor
Lemon Juice	Coal tar
Vinegar	Distilled water
Acid solutions	Honey
Basic solutions	Vegetable oil
Salty water	Kerosene

- Conducting liquids are also called electrolytes.
- The electric current passing through a conducting liquid (electrolyte) causes chemical reactions (electrolysis).

- **Ohm' law:** Under constant physical conditions (i.e., constant temperature, pressure etc.), the current flowing through a conductor is directly proportional to the potential difference across the conductor.
- $V \propto I$
- $V = IR$ (R = resistance)
- **Unit** (R) $\rightarrow \Omega$ (Ohm)



$$1\Omega = \frac{1V}{1A}$$

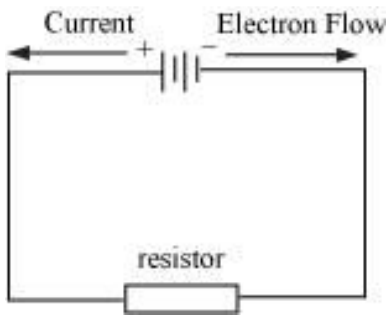
- **Ohmic resistors:**

Conductors which follow the ohm's law at constant temperature are called ohmic resistors. Examples: All metallic conductors (Copper, Aluminium, silver etc.), copper sulphate solution with copper electrodes, and dilute sulphuric acid etc.

- **Non-ohmic resistors:**

Conductors which do not follow the ohm's law are called non-ohmic resistors. Examples: LED, solar cell, junction diode, transistor, bulb filament etc.

- Potential difference (which is measured in Voltage) is the cause of current (which is measured in Ampere).
- In conductors, flow of electrons constitutes the current. In a circuit current flow from the positive terminal of the battery to the negative terminal, but electrons travel from negative terminal to the positive terminal. The negative terminal of a battery is said to be at lower potential and the positive terminal is said to be at higher potential.



- When a battery is not connected to any circuit, the potential difference across the terminals of the battery is equal to the EMF of the battery. (EMF = Electro Motive Force).
- The more the number of collisions of electron with the atoms, the more is the resistance offered by a conductor.
- Electric resistance can be defined as the obstruction or opposition to the drifting electrons.
- Electric resistance completely depends on the nature of a conductor.
- **Units of Resistance:**

Resistance is measured in ohms (Ω).

- Materials which allow electric current to pass through them are called **conductors** of electricity.
- Materials which do not allow electric current to pass through them are called **insulators**.
- Differences between Conductors and Insulators:

Electrical conductors	Electrical insulators
Electricity can pass through certain materials. These materials are known as electrical conductors.	Electricity cannot pass through certain materials. These materials are known as electrical insulators.
All metals (for example, aluminium, copper, iron, and steel) are good conductors of electricity. Therefore, electrical wires are made up of metals such as aluminium and copper.	Few examples of good electrical insulators are plastic, wood, glass, and rubber. Therefore, plastic or rubber is often used to cover electrical wires.

- Conductors and insulators are equally important for us.