

ELECTRICITY & CIRCUITS

ELECTRIC CHARGE

Electrical charge is a property of matter.

PROPERTIES OF ELECTRIC CHARGE

Electric charge is a scalar quantity.

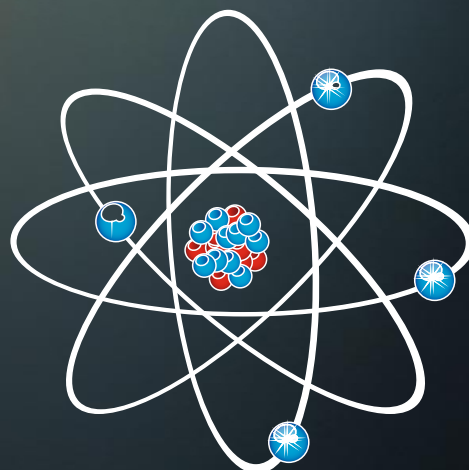
It can be of two types only : positive and negative

Electric charge is measured in a unit 'Coulomb'.

Like charges repel each other while unlike charges attract each other.

Matter consists of tiny particles called atoms. Atoms contain particles called protons, neutrons and electrons.

Neutrons	➡	No electric charge.
Protons	➡	Positive electric charge
Electrons	➡	Negative electric charge.



- ➔ Atom contains equal number of protons and electrons.
- ➔ An atom becomes negatively charged when it gains extra electrons. If an atom loses electrons it becomes positively charged.

ELECTROSTATICS

The study of electric charges at rest, the forces between them called 'electrostatics'.

- ➔ The electricity developed on the surfaces of insulating bodies when rubbed against each other is called 'frictional electricity' or 'static electricity'.



★ **Source of static electricity**

When two substances are rubbed together, some electrons are removed from the atoms on the surface of one and transferred to the other.

★ **Induction**

- ➔ The process of charging a conductor from a charged body without touching them together is called 'induction'.
- ➔ The charges developed on an object without any contact with other charged object are called 'induced charges'.

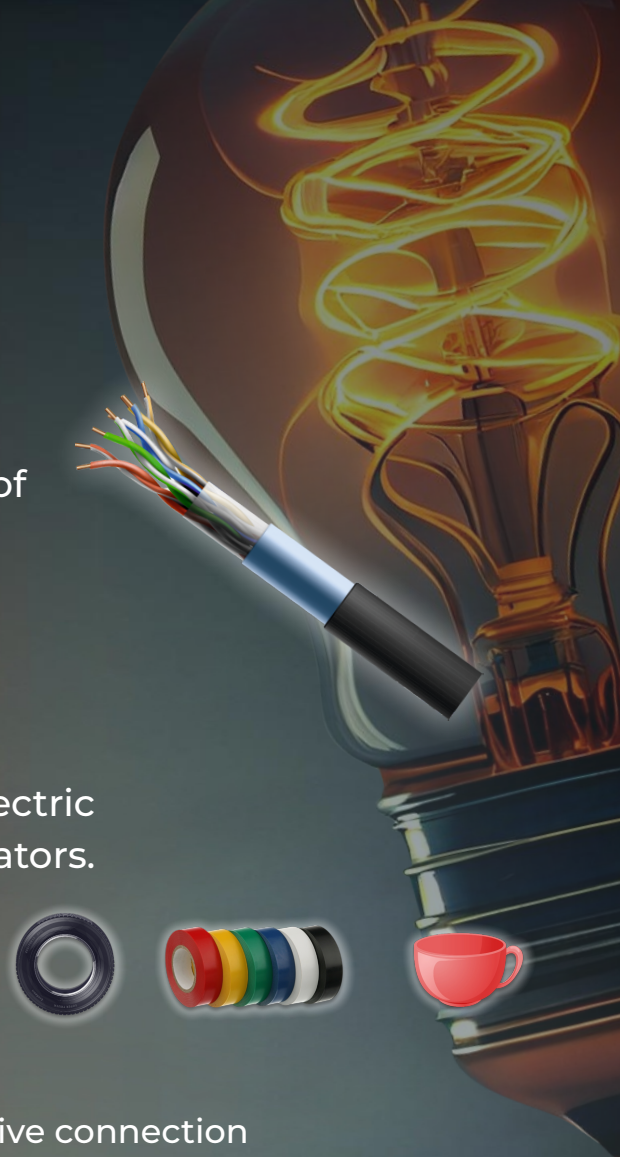
★ Conductors

Conductors are 'materials which allow electric current to pass through them are conductors of electricity'. e.g., copper and silver are good conductors of electricity. Metals are good conductors as they have large number of free electrons.

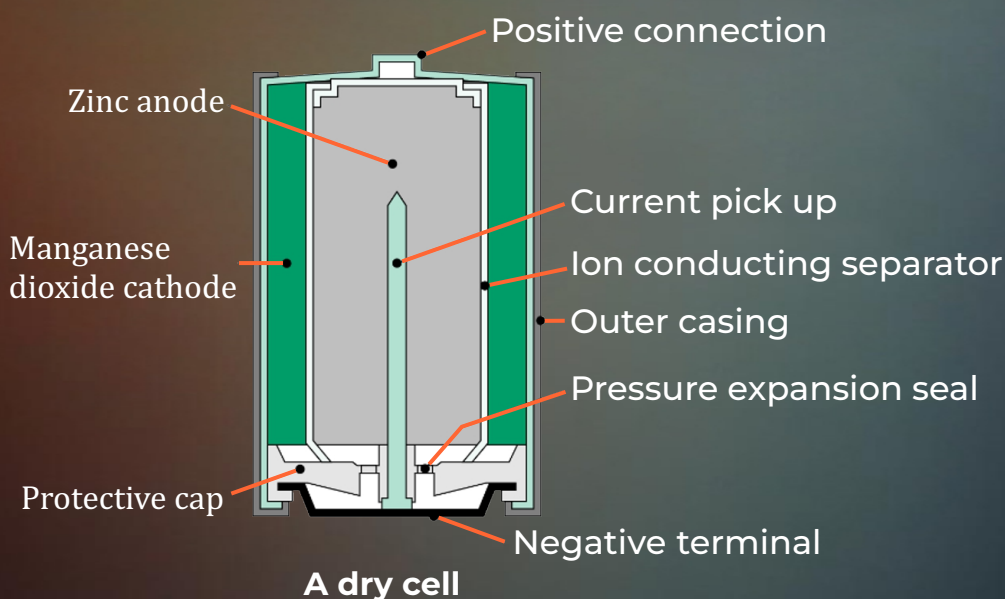
★ Insulators

The substances which do not allow the electric current to flow through them are called insulators. They do not have free electrons.

Examples of insulators: Rubber, glass, wood, plastics, porcelain, pure water, sugar, etc.



Electric cell



An electric cell produces electricity from the chemicals stored inside it. That is, in an electric cell 'Chemical energy is converted into electric energy'. When the chemicals in the electric cell are used up, the electric cell stops producing electricity. Then, the electric cell then has to be replaced with a new one.

A combination of two or more cell is called a battery. There are many kinds of cells or batteries. They come in different sizes and shapes. Batteries are often called power source or voltage sources.

CURRENT ELECTRICITY

★ **Electric current**

The rate of flow of electric charge through any cross-section is called 'electric current'. Current,

- ➔ Electric current is a scalar quantity.
- ➔ SI Unit of electric current : Ampere (A)
- ➔ Electric current is measured by using ammeter.

★ **Voltage**

Voltage is the strength of a power source.

- ➔ Unit of voltage : Volt (V)
- ➔ Voltage is measured by using voltmeter.

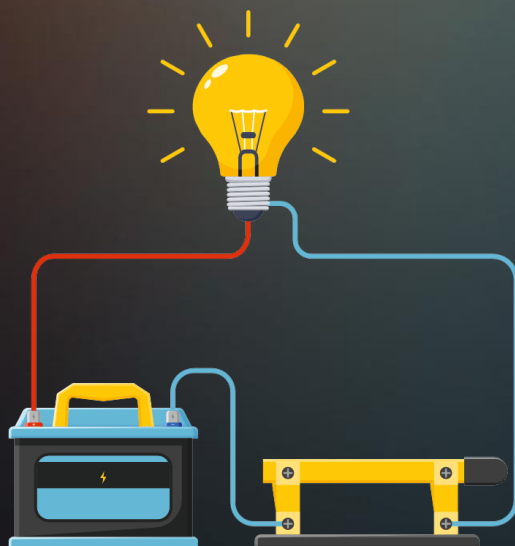
★ **Resistance**

Resistance is the property of a substance to oppose or slow down electric current.

- ➔ Unit of resistance : ohm.
- ➔ Electric current is inversely proportional to the resistance in a circuit, i.e. more the resistance less is the electric current in the circuit.

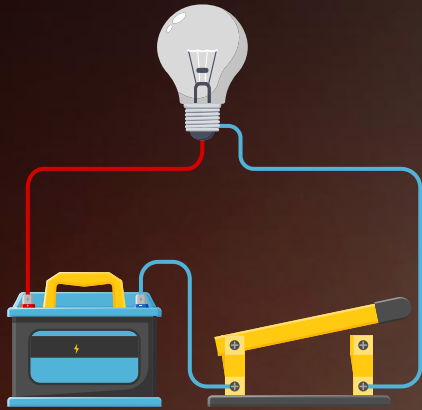
★ **Circuits**

The path along which electric current flows is called a circuit.

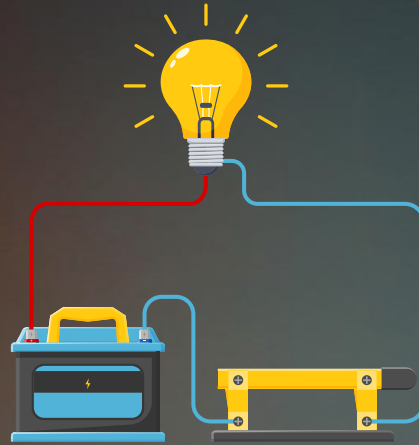


★ Switch

A switch turns electric current on and off.



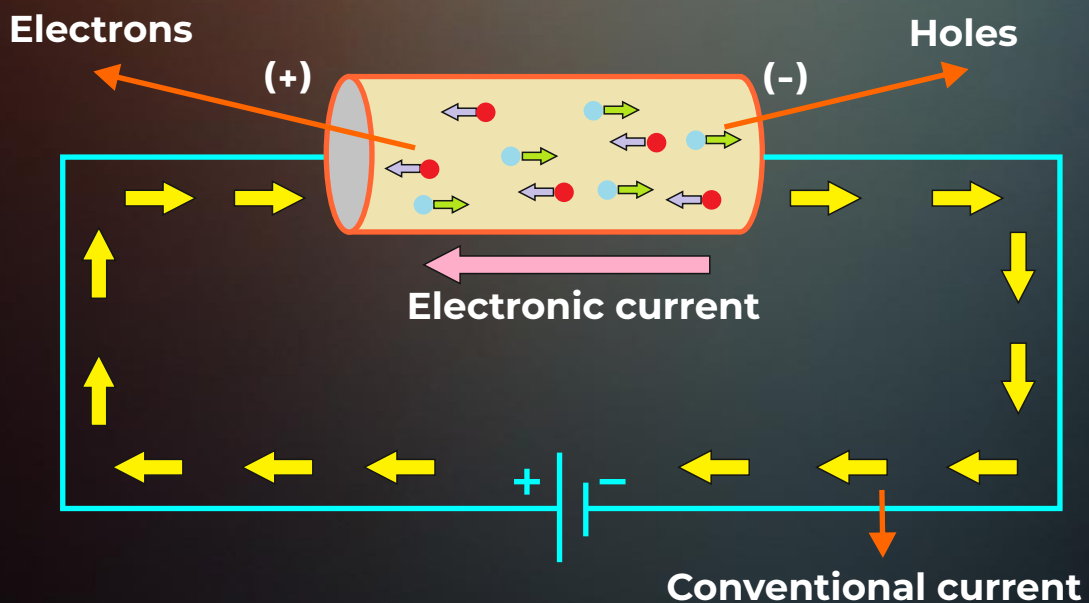
Open circuits :
The circuit has any breaks or openings, it is called an open circuit.



Closed circuits :
A complete, unbroken circuit is called a closed circuit.

★ Conventional direction of current

Electric current is always said to flow from the positive terminal to the negative terminal in a circuit. This is called conventional current.



Torch bulb

➔ A torch bulb or any other electric bulb has an outer case of glass that is fixed on a metallic base. Inside the bulb, there is a thin wire that gives off light which is called the filament of the bulb.

- ➔ Tungsten is used as the filament of the bulb.
- ➔ One of these thick wires is connected to the metal case at the base of the bulb.
- ➔ The other thick wire is connected to the metal tip at the centre of the base.
- ➔ The base of the bulb and the metal tip of the base are the two terminals of the bulb.
- ➔ The filament of an electric bulb has high resistance and high melting point.
- ➔ If the filament of an electric bulb of the torch bulb burns out or breaks, it makes the circuit an open circuit.



★ Electric circuit of a torch (flashlight)

- ➔ The negative terminal of the cell 1 presses against the spring at the base of the torch. Positive terminal of the cell 1 touches the negative terminal of the cell 2.
- ➔ The positive terminal of the cell 2 presses against the metal tip at the base of the bulb.
- ➔ There are three metal strips. Strip A connected with the metal case of the bulb, strip B connected with the spring and strip C which is part of the switch.
- ➔ While metal strips A and B are fixed, strip C can be pressed and made to slide.
- ➔ When you press the switch, the strip C touches strips A and B and the circuit is complete. Then current flows in the circuit and makes the bulb glow.

