Electricity

You all must have noticed that when you get light everywhere its ok...but when we switch off the button ,there is no light and we say that there is no electricity or that electricity has gone off.

So what exactly happens when we say that Electricity is ON? It means that something starts flowing to an object or an appliance and because of this something, there is some light, or movement or some change that is observed in the object.

WHAT IS THIS SOMETHING ??

This something is an energy that is flowing from one place to another and this energy is a powerful energy also called as the Electrical Energy .

We all know that everything on our earth is made up of matter. When this matter is broken, it breaks further into smaller particles called atoms. Though the atom is the smallest particle yet, it too has 3 tiny particles in it called the electrons, protons and neutrons.

The protons and neutrons are packed in a nucleus or the centre of the atom while the electrons move around this nucleus in high speeds in fixed paths called orbits. These electrons are very much capable of jumping out of their shells if a force is applied on them.
And when these electrons jump and move fast, we say that a charge is moving or there is an electric current which is moving.

HOW DOES A BULB GLOW?

- Why do you think a bulb glows when it is connected to a wire?
- This is because there is something which is flowing within the wires and this something also has some energy in it which leads to the lighting up of the bulb.
- This something is called an Electric Current.
- **Electric Current is defined as the flow of energy or charges through a conductor.**

-In nature Clouds display electricity in lighting when a charge jumps from one cloud to another...
-Electrostatic charge moves through hair and comb

-There are various devices such as Cells, Batteries, Generators etc. which can be used to produce this electric current.

-In car, the battery does it
-In homes the electricity comes from the one generated in Hydro power plants / coal power plants/ wind power plants

Such devices that produce electric current are called Sources of Electric Current

ELECTRIC CELLS

- A cell is a device that is used to generate electricity.
- It consists of a container which is made out of a metal called Zinc.
- It has a metal cap which is called the positive terminal '+'.
- It has a metal disc on the opposite side which is called the negative terminal '-'.

- Cells produce electric current by a chemical reaction that changes the chemical energy into electrical energy.
- There are two types of cells : Primary and Secondary Cells.

1. **Primary Cells :**

- **Primary cells produce electricity from the chemical stored in them**. When the chemicals are all used up these cells stop working.
  e.g. Dry Cells and Simple voltaic cells are primary cells.

2. **Secondary Cells / Rechargeable Cells**

- **In such cells chemical reaction is reversible and electrical energy can be restored in them.**
  e.g. Lead accumulator and nickel – iron accumulator
  Mainly used in mobile phones, Car batteries , computers

SOLAR CELLS

Now a days another kind of cells called solar cells is being used :

- A solar cell converts solar energy to electrical energy and hence also referred to as a photo-voltaic cell. Here photo stands for light (Solar) energy and voltaic stands for electrical energy.
- These cells are used in calculators, Traffic signals, Satellites and are also used to provide electricity in areas where the laying of power cables is not easy.

BUTTON CELLS

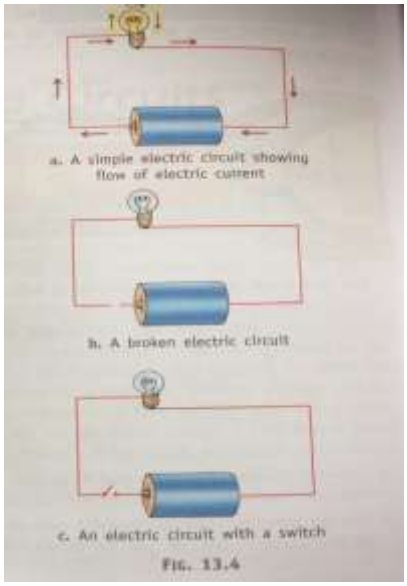
- It is small, almost size of a button.
- It is used in small electronic devices like, wrist watches, calculators, hearing aids.

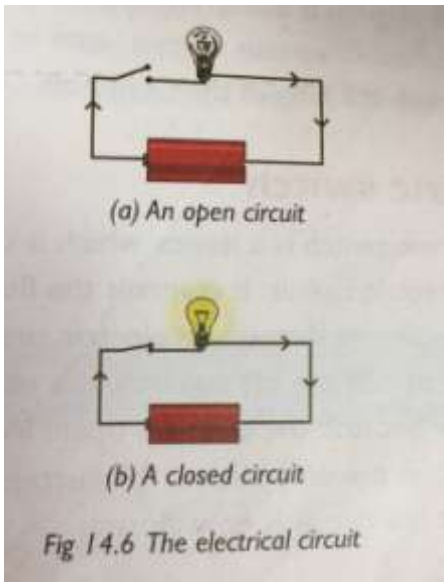
ELECTRICAL CIRCUIT

- **The complete path of flow of electric current from one (+ve) terminal of the cell to the other(-ve) terminal through all the components like wire, bulb, switch etc. is called an Electric Circuit.**
- If the contact between any of the component in the electric circuit gets broken then the circuit becomes an open circuit.
- If the electric current flows between the terminals of the cells then the circuit is called a closed circuit.
- Hence we see that :

There are various components of an Electric Circuit:

1) A source of electric current e.g. a Cell or a Battery
2) Connecting wires that conduct electricity
3) A key or a switch (which helps to break or close the circuit)
4) A device or an appliance (e.g. bulb) that uses the electric current in the cell for some useful purpose.





BATTERY

Sometimes when the energy provided by a single cell is not enough then two or more dry cells are placed together so that the extra energy can be generated. **The combination of cells placed together in such a manner that the positive terminal in one cell remains in contact with the negative terminal of the other cells is called a Battery. It is a combination of 2 or more cells.**

ELECTRIC WIRE – This is usually made up of copper, aluminium& tungsten (Since they are good conductors of electricity) and are covered by plastic (Since plastic is a bad conductor of electricity) and the user does not get an electric shock.

ELECTRIC KEY/ SWITCH

- An electric switch is a device which is used in every electric circuit.
- It controls the flow of electric current through the circuit.
- When the switch is in off position then the current will not flow as the circuit is open.
- When the switch is in on position then the current will flow as the circuit is closed.

BULB

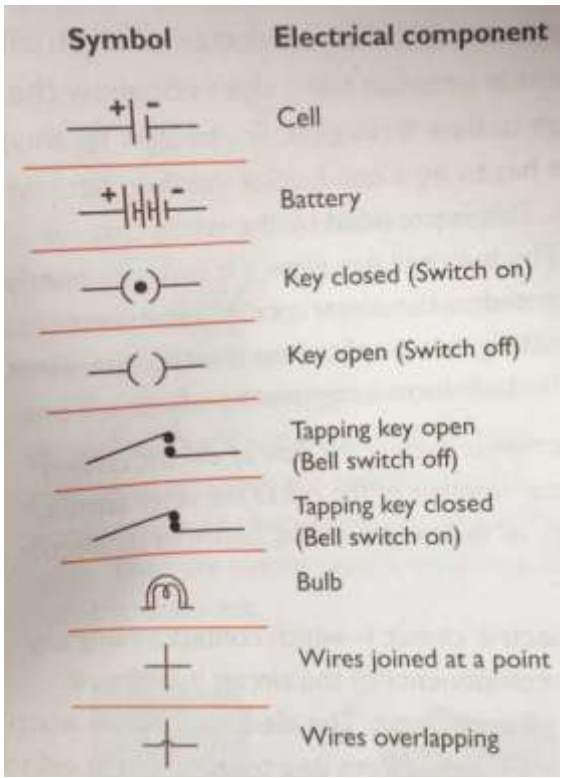
- A bulb consists of a glass fixed on a metal base.
- Inside the glass is a thin wire called filament (which is often made of tungsten which has a very high melting point and will not melt easily. But this filament can catch fire if it interacts with oxygen. Hence this filament is cased in a glass container which glows when current flows through it..
- The filament is fixed with two thick wires which also provide support to it.

- One of these thick wires is connected to the metal case at the base of the bulb while the other thick wire is connected to the metal tip at the center of the base . These are the two terminals of the bulb.
- The two terminals are fixed in such a way that they do not touch each other.
- Hence both the electric cell and the bulb have two terminals each.
- A bulb does not glow when the filament gets broken because the broken filament breaks the circuit of the current.

AMMETER – Ammeter is another circuit element and is an instrument which is used to measure an electric current flowing in a circuit.

SYMBOLS OF A FEW ELECTRICAL COMPONENTS

- Cells, Batteries, Bulbs, Switches and wires are some components of electric circuits.
- A circuit diagram is a diagram which shows the arrangement of various components in an electric circuits with the help of their symbols.



CONDUCTORS AND INSULATORS

CONDUCTORS

- Materials which allow electric current to pass through them are called conductors. For e.g. Metals like gold, silver, copper, aluminium, iron.
- Water is also a good conductor of electricity.
- Graphite is the only material which is not a metal but is a good conductor of electricity.

INSULATORS

- Materials that do not allow electric current through them are called insulators. All non metals except graphite are insulators.
- Other Examples of insulators are plastic, wood, rubber, paper, glass.

NOTE : The handles of an electrician's screw driver are made up of plastic because plastic is an insulators which protects the person from getting an electric shock while working with live wires.

OPEN AND CLOSED CIRCUITS

CLOSED CIRCUIT

An electric circuit is closed or complete if there are no breaks in it.

OPEN CIRCUIT

An electric circuit is open or incomplete if there are breaks in it.
A circuit could get a break because of :

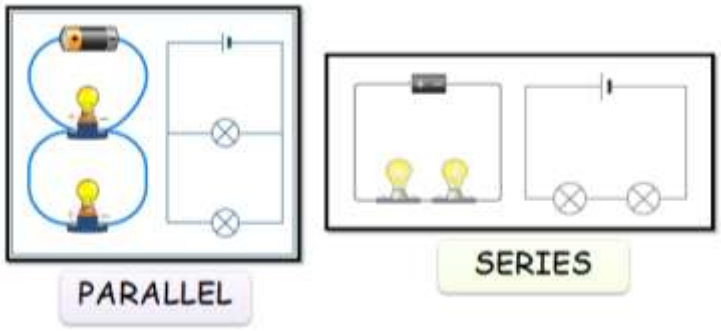
- A broken wire -A fused bulb
- An expired cell -A faulty or open switch / key
- Presence of an insulator in the path of the circuit.

When will current not flow in a circuit?

1. When bulb is fused / appliance is faulty.
2. When the cell / battery is all used up and has no chemical left.
3. When the connection amongst the components is not proper.
4. When the connecting wire is broken / the medium is an insulator.
5. When the key is open and not closed.
6. When an insulator is kept in the path of the circuit.

SERIES AND PARALLEL CIRCUITS

A series circuit is a closed circuit in which the same current flows through all the components in the circuit. Hence the current only has 1 one path.
So if say, 2 bulbs and 1 fan are connected in series and any one of then fuses or gets faulty the the remaining 2 things shall also not work.
A circuit is said to be in parallel if it has multiple paths for electricity to flow through. Hence even if one of the 2 bulbs or fan gets fused, the other 2 keep working.



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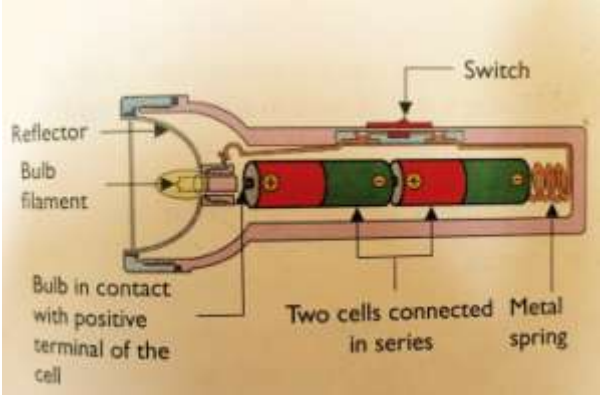
ELECTRIC TORCH



An electric torch is a simple device which converts electric energy into light.

WORKING OF AN ELECTRIC TORCH

- A torch has a bulb, electric cells, a switch and a outer body.
- The group of cells or battery act as a source of electricity.
- Its bulb consists of a thin tungsten wire called filament and this filament is enclosed in glass case.
- The bulb has two terminals.
- The battery (group of cells) which is placed in a torch have one of their negative terminal touching a metal spring at the opposite end of the torch.
- The positive terminal of the battery touches the bulb at the other end.
- A switch is present on the outer body of the torch and this switch can be turned on and off to complete or break the circuit between the wire, spring, cells and the bulb.
- When the switch is turned on the current flows through the filament it heats up and start glowing. This glow is the source of light from the bulb.
- The body of the torch has a reflector and lens, which focus the light that is given out by the bulb.
- Hence the bulb glows when the switch is open and circuit is closed and does not glow when the switch is closed and the circuit is open.