



ELECTRIC CURRENT AND ITS EFFECTS

- x **Electricity** is a form of energy which is used to run many electrical appliances like bulbs, television, stereo system, refrigerator etc.
- x Electricity is produced in power stations from where it is brought to our house through wires and electric poles or underground cables in the form of electric current.
- x So, **ELECTRIC CURRENT** is the flow of electricity through a conductor (wires, cables).










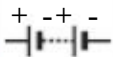


ELECTRIC CIRCUIT

- x Electric circuit is a **closed and continuous path of electric current**.
- x An electric circuit can be **represented with the help of a circuit diagram**.
- x A circuit diagram tells us how the various components in an electric circuit have been connected by using electric symbols of the components.

SYMBOLS OF ELECTRIC COMPONENTS

Some of the commonly used symbols of electric components are shown here -

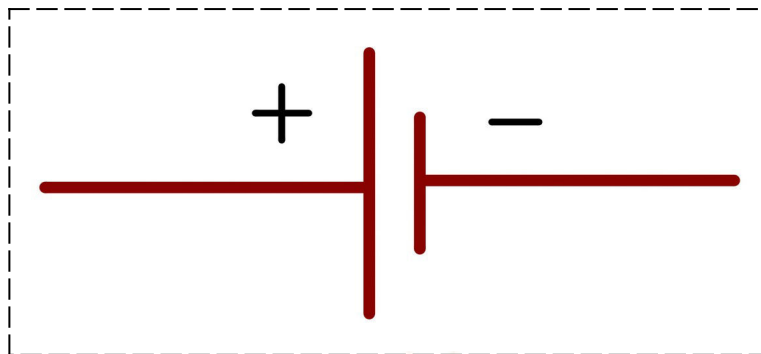
- x In an electric circuit, the **key or switch** can be placed anywhere in the circuit.
- x When the **switch is in ON position**, the circuit is then said to be closed and current will flow throughout the circuit instantly. So, bulb will glow.
- x When the **switch is in the OFF position**, the circuit is then said to be open and no current will flow through any part of the circuit. So, the bulb does not glow.

| S.No. | Electric component | Symbol |
|-------|---|---|
| 1. | Electric cell  |  |
| 2. | Electric bulb  |  |
| 3. | Switch in 'ON' position  |  |
| 4. | Switch in 'OFF' position  |  |
| 5. | Battery  |  |
| 6. | Wire  |  |

- ✗ Sometimes, the bulb does not glow even when the switch is in the ON position. This condition can occur if the **bulb get fused**, i.e. its **filament breaks**.

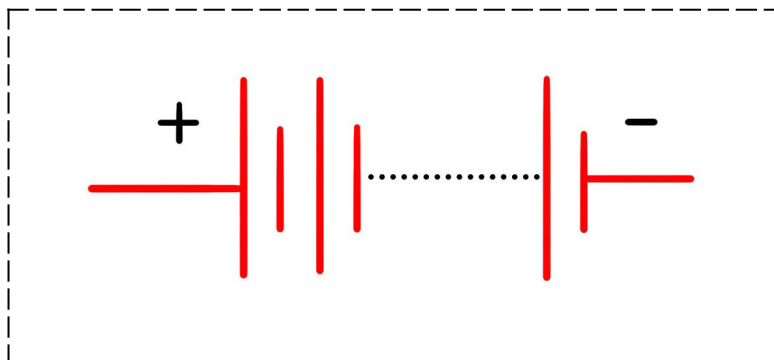
ELECTRIC CELL

- The common source of electricity to run the number of devices (e.g. torches, radio, clock etc.) is an electric cell.
- In an electric cell the positive terminal is represented with a longer line and the negative cell is represented as the thicker, shorter line.



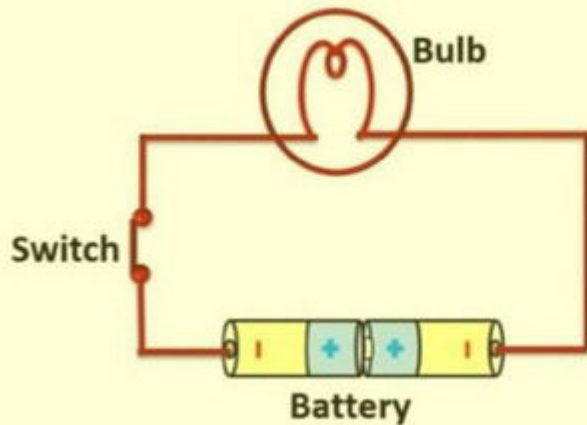
ELECTRIC BATTERY

- Sometimes a single cell is not sufficient to run many devices as they require high voltage to run.
- So, in such cases, we **use the combination of cells** i.e. called a battery.
- In a battery, the positive terminal of one cell is connected with the negative terminal of the next cell.



Question:

The bulb shown in the figure does not glow. Re-arrange the circuit in the correct order to make the bulb glow.

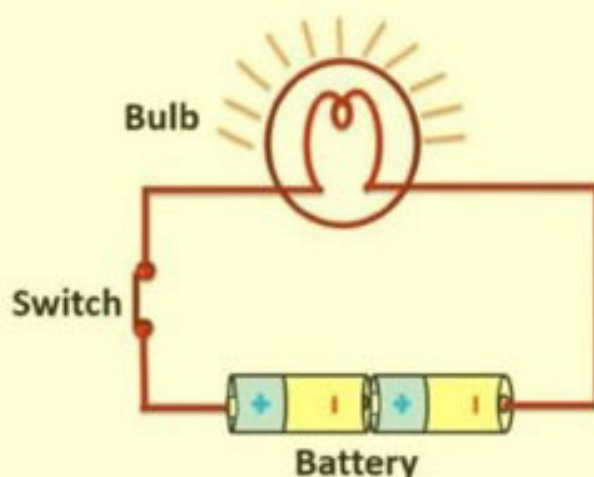


Answer:

The direction of the current flow in a circuit is from the positive terminal to the negative terminal of the battery.

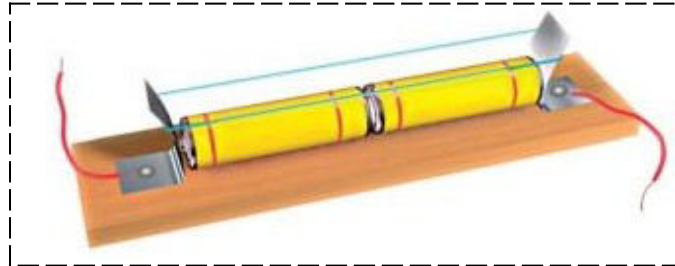
In the above arrangement, the batteries are not connected correctly. For the current to flow the positive terminal of one battery should be connected to the negative terminal of the other battery.

The following circuit shows the correct arrangement of the battery so that the bulb in the circuit can glow.

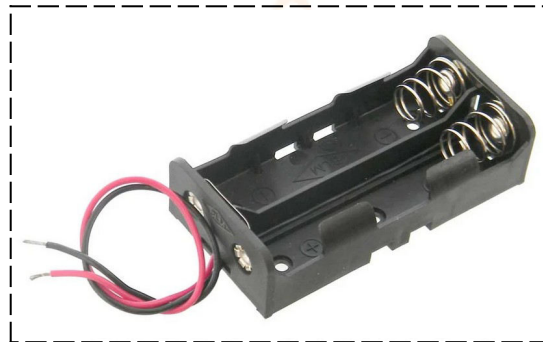


CELL HOLDER

- It is a simple device in which more than one cell can be placed properly to form a battery.
- To ensure that the cells are placed correctly the cell holder has the symbols (+) and (-) printed on it.

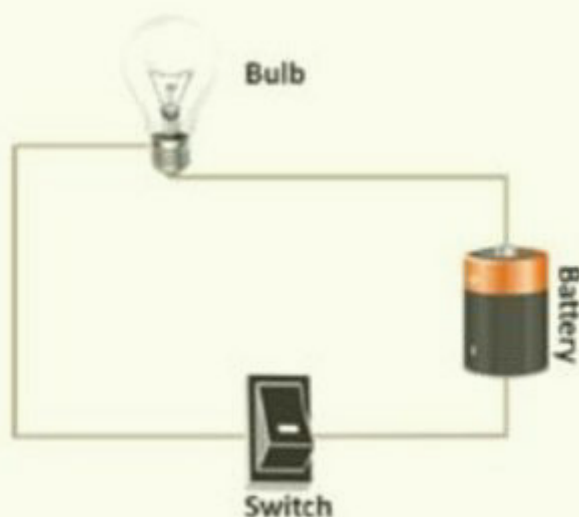


- But in some devices, cells are not placed one after the other, e.g. in a TV remote control, the two cells are placed **parallel** or **side by side** to each other.



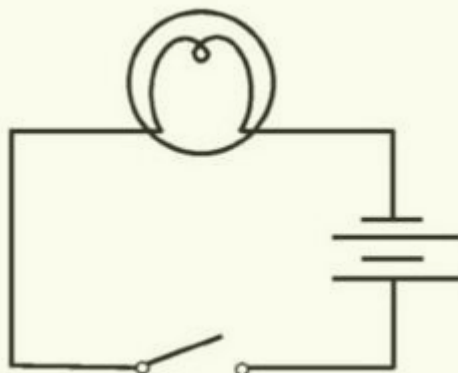
Question:

Draw the circuit diagram of given setup.



Answer:

The electric circuit contains a bulb, battery and a switch in OFF position.
Symbolic representation of the circuit:



HEATING EFFECT OF ELECTRIC CURRENT

- ✕ The **production of heat in an electric device due to flow of electric current** is called heating effect of electric current.
- ✕ So, when appliances like (electric iron, bulb or room heater) are switched ON after connecting to electric supply, then a **coil of wire** called **element** present inside the device becomes red hot and releases heat.
- ✕ **Nichrome wire is used to make coils or element** because nichrome has a very high melting point and does not melt easily.

FACTORS ON WHICH THE HEATING EFFECT OF CURRENT DEPENDS -

1. Type of material used for wire.
2. Length of wire.
3. Thickness of wire.

APPLIANCES WHICH WORKS ON THE HEATING EFFECT OF ELECTRIC CURRENT -

1. For the production of light in the electric bulbs.
2. To make safety devices like electric fuse.
3. For the working of electric heating appliances such as room heater, water heater etc.



COMPACT FLUORESCENT LAMPS (CFLs)

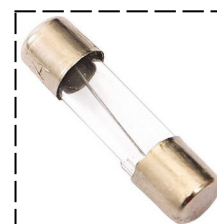
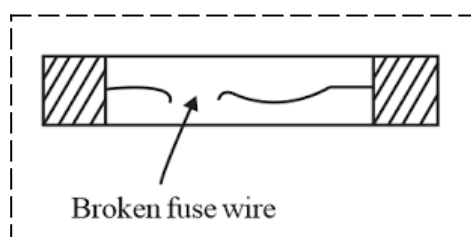
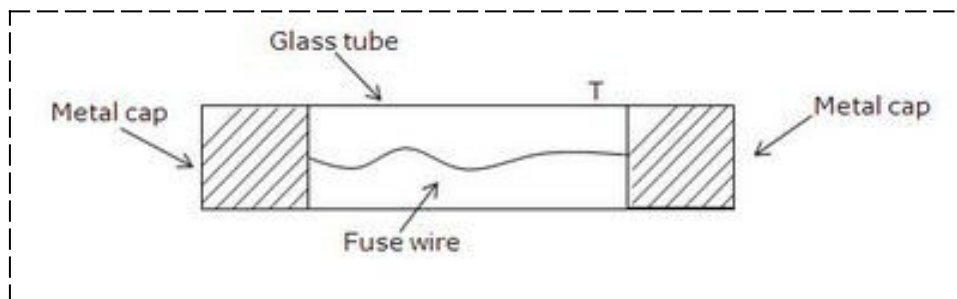
An electric bulb is basically used for producing light but it also release the heat which is not desirable because a major part of the electricity consumed by the filament of the bulb is converted into heat and results in the wastage of electricity.

So, the wastage can be decreased by using fluorescent tubelight or CFLs and also CFLs are more durable than electric bulb.



ELECTRIC FUSE

- × Fuse is a **safety device used to prevent damages to electric circuits.**
- × Wires which have **low melting point and high resistance** are used as **fuse wires**. e.g. an alloy of tin and lead.
- × When excessive current is flowing through the circuit, the **fuse wire melts quickly and breaks the circuit.**



- ✗ In buildings, offices and working places fuses are inserted in all electrical circuits to prevent them from damage, whenever excessive current flows through the circuit.

MINIATURE CIRCUIT BREAKER (MCBs)

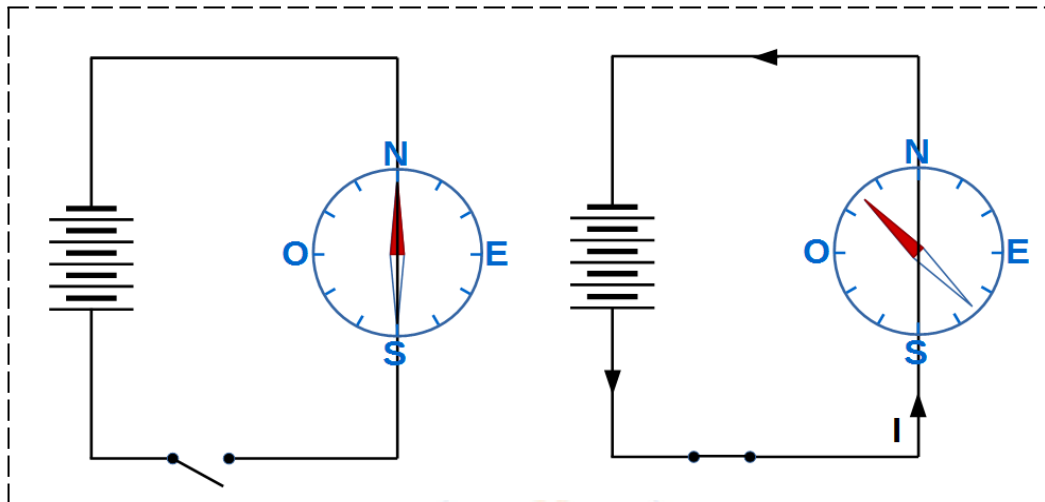
- Miniature circuit breaker (MCBs) are increasingly used in place of fuses. Because MCBs are **automatically turned off when the current exceeds the safe limit**.
- The MCB tripping is an indication that either the circuit has been overloaded or that a **short circuit has occurred somewhere in the system**.



MAGNETIC EFFECT OF ELECTRIC CURRENT

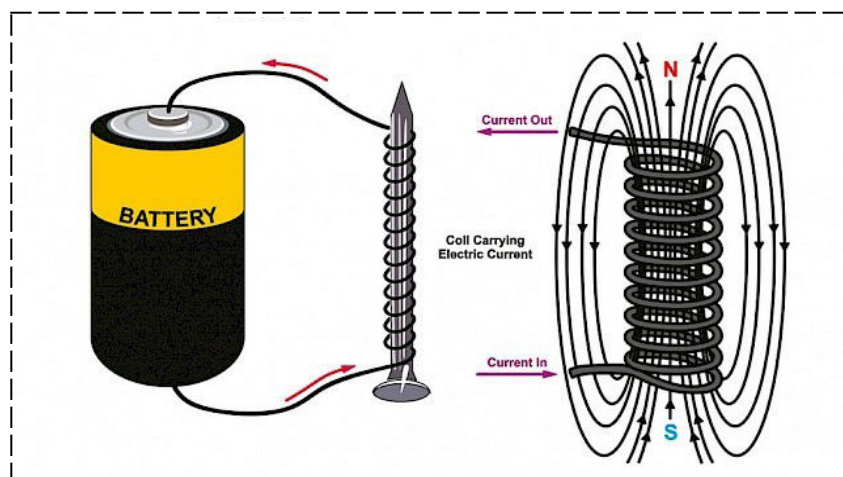
When an electric current passes through a wire, then the **current carrying wire behaves like a magnet**. This phenomenon is known as magnetic effect of electric current.

It was discovered by **Hans Christian Oersted** when he observed the deflection of compass needle every time the current was passes through the wire.



ELECTROMAGNET

- x When electric current flows through a coil, the coil behaves like a magnet, Such **coil is called electromagnets**.
- x An electromagnet consists of a coil of insulated wire wrapped around a piece of iron which is magnetised only when electric current is passed through the coil.



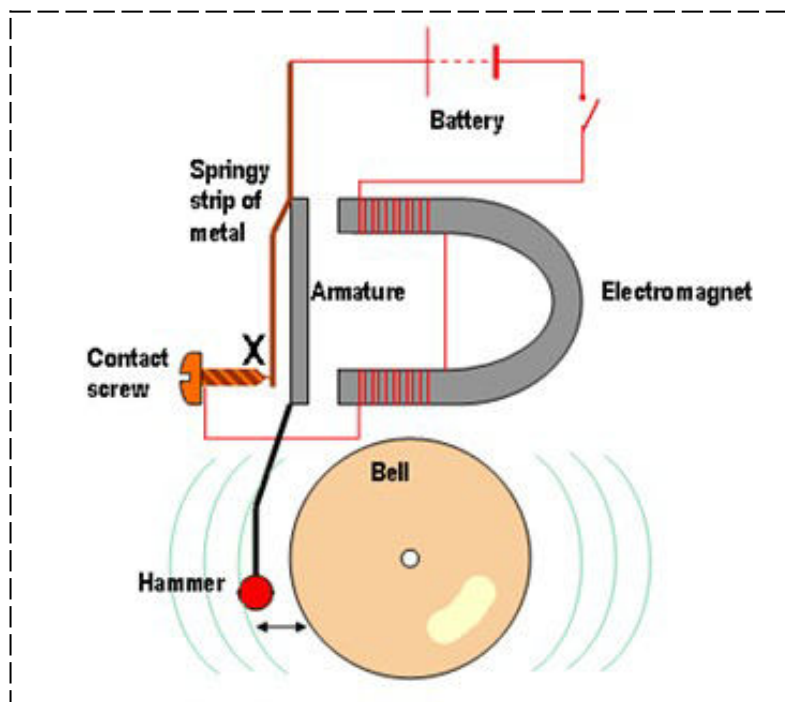
- x There are **two factors through which electromagnet can be made stronger**, i.e.
- By increasing the amount of current in the coil.
 - By increasing the number of turns forming the coil.

USES OF ELECTROMAGNETS

- Electromagnets are used in electrical appliances like electric bell, electric fan, electric motor.
- These magnets have their utilization in electric generators where a very strong magnetic field is required.
- Doctors use tiny electromagnets to take out tiny pieces of magnetic material that have accidentally fallen in the eye.
- Used to separate magnetic material from non-magnetic material.
- Electromagnets attached to large cranes to carry heavy load of magnetic substances mainly used in shipyards.

ELECTRIC BELL

- Electric Bell is a **device which is used for ringing** and is **based on the principle of magnetic effect of electric current**.
- The electric bell has a U-shaped electromagnet.
- There is a small iron bar called **armature** which is held in front of the poles of the electromagnet.
- The lower end of the iron bar is attached to a flat spring and the flat spring is itself fixed to a metal bracket.
- The upper end of the iron bar has a clapper attached to it.
- A metal gong (bell) is fixed near the clapper.



WORKING OF ELECTRIC BELL

- When we press the switch of the bell to ring it, an electric current starts flowing in the electromagnet.
- As the electromagnet gets magnetised, it starts attracting the metal spring towards itself.
- As the flat or metal spring moves towards the electromagnet, the clapper which is attached to it strikes the gong and produce a sound.
- When the metal spring is attached towards the electromagnet, it is no longer in contact with the screw and hence the circuit breaks.
- When electric circuit breaks, no current flows through the coil, this make the metal spring to go back to its original position and the clapper (hammer) also moves away from the gong.
- The process continues as long as we are pressing the switch.

GLOSSARY

- **Electric current** – It is defined as the flow of electricity through a conductor.
- **Electric circuit** – A closed path through which an electric current flows is called an electric circuit.
- **Battery** – A battery is defined as the combination of two or more cells.
- **Cell holder** – It is a simple device in which more than one cell can be placed properly to form a battery.
- **Electric fuse** – A safety device used in the electric circuit which prevents electric fires or damage to appliances due to excessive flow of current is called electric fuse.
- **Electromagnet** – When electric current flows through a coil, the coil behaves like a magnet. Such coil is known as an electromagnet,
- **Electric bell** – It is a device which produce a sound and works on the magnetic effect of electric current.