
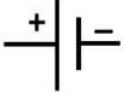












## Chapter – 14

### Electric Current And Its Effects

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#### Symbols of electric components

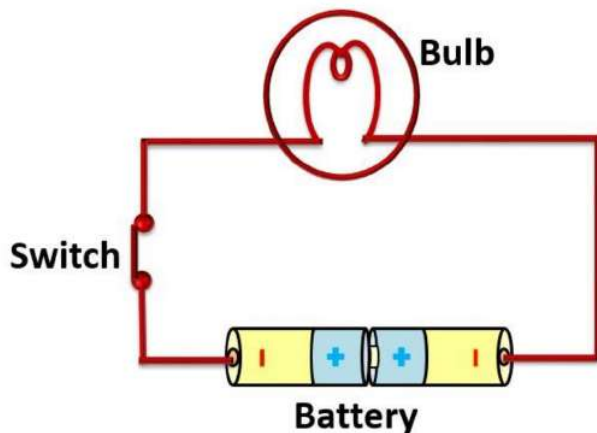
Electric Component	Symbol
 Electric Cell	
 Battery	
 Bulb	
 Switch OFF	
 Switch ON	
 Wire	

**Cell:** In the symbol positive terminal is represented with a longer line and the negative terminal is represented as the thicker, shorter line.

**Battery:** A combination of more than one electric cell is called a battery.

In a battery, the positive terminal of one cell is connected with the negative terminal of the next cell.

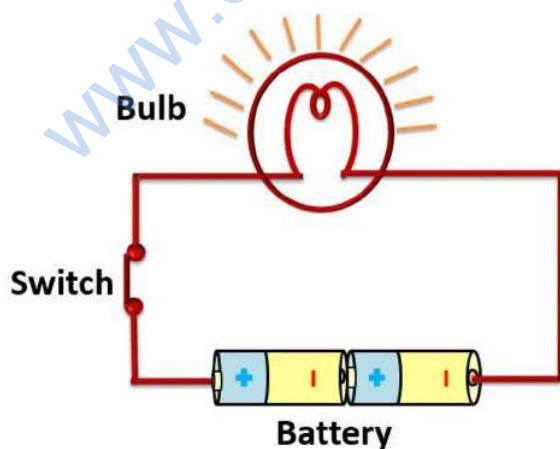
**Example:** The bulb shown in the circuit does not glow. Re-arrange the circuit in the correct order to make the bulb glow.



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

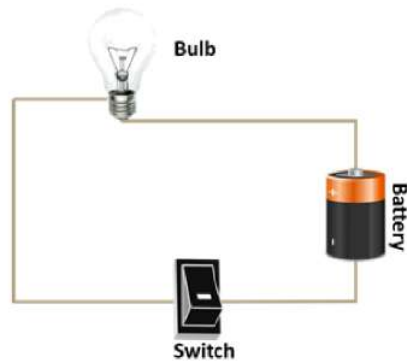
In the above arrangement, the batteries are not connected correctly. For the current to flow the positive terminal of one battery should be connected to the negative terminal of other battery.

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



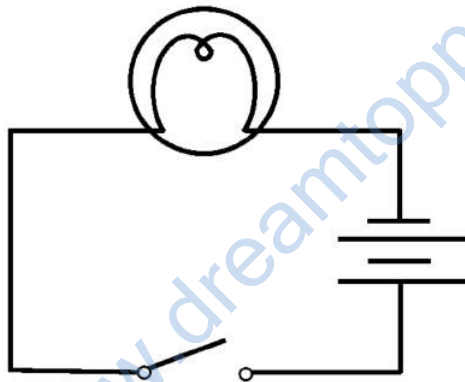
Now, the positive terminal of one cell is connected to the negative terminal of the next cell and the circuit is complete. Now the bulb in the circuit will glow.

**Example:** Draw the circuit diagram for the given setup.



**Solution:** The electric circuit setup contains a bulb, battery and a switch in OFF position.

Symbolic representation of the circuit:



### Heating effect of electric current

**Heating effect of electric current:** When the electric current flows through a conductor, the conductor gets heated. This effect of electric current is called the heating effect of electric current.

**Appliances which works on the heating effect of electric current:** When electricity passes through the conductor, some amount of electrical energy is converted into heat energy. This principle is used in the appliance like electric iron, heater, bulb, toaster, hairdryers, electric ovens etc.



**Bulb:** An electric bulb consists of a coiled filament made of tungsten (having a high melting point). When electric current passes through the filament, it gets heated to such a high temperature that it starts glowing.

**Example:** Why it is preferred to use CFL (Compact Fluorescent Lamps) instead of an electric bulb?

**Solution:** i) CFL generate less amount of heat as compared to the electric bulb.

(ii) In the electric bulb, a large amount of electricity is wasted whereas CFL consumes 90% of energy.

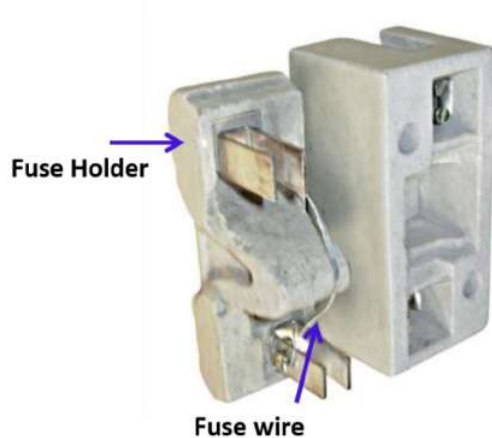
(iii) CFL is durable.

**Fuse:** A fuse is a safety device which prevents damages to electrical circuits.

Wires which have low melting point are used as fused wires. For example, an alloy of tin and lead is used as the material of the fuse wire.

When the 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 Breakers (MCBs):** Miniature circuit breakers (MCBs) are increasingly being used in place of fuses. Because MCBs are automatically turned off when the current in a circuit exceeds the safe limit.

The MCB tripping is an indication either that the circuit has been overloaded or that a short circuit has occurred somewhere in the system.

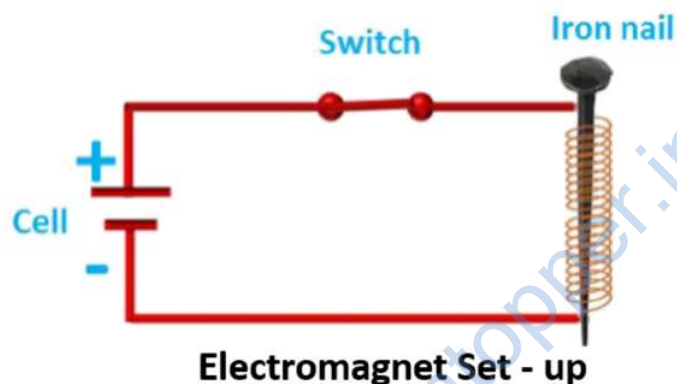


### **Magnetic effect of electric current**

**Magnetic effect of electric current:** When an electric current passes through a wire, it behaves like a magnet. This is called the magnetic effect of the electric current.

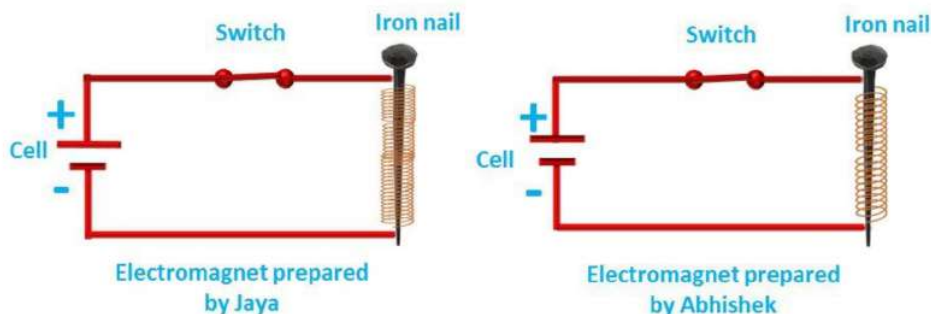
**Tip:** Remember Hans Christian Oersted discovered the magnetic effect of electric current when he observed the deflection of compass needle every time the current was passed through the wire.

**Electromagnets:** A current-carrying coil of an insulated wire wrapped around a piece of iron is called an electromagnet. Electromagnets are temporary magnets.



**Tip:** Remember the strength of the electromagnet can be increased by increasing the number of turns in the coil and the amount of current flowing in the wire.

**Example:** In a science laboratory, Jaya and Abhishek each prepared an electromagnet. The number of turns of wire, wrapped around the nail in Jaya's electromagnet is twice the number of turns in the electromagnet prepared by Abhishek. Who prepared the stronger electromagnet?



**Solution:** The number of turns of wires is twice in Jaya's electromagnet as compared to the electromagnet prepared by Abhishek. It means that the electromagnet prepared by Jaya has a higher amount of current flow in the circuit and produces a stronger magnetic field.

Therefore, the electromagnet prepared by Jaya is a stronger electromagnet as compared to the electromagnet prepared by Abhishek.

### **Uses of Electromagnets:**

- 1) The electromagnets are used to separate magnetic material from non-magnetic materials.
- 2) Doctors use tiny electromagnets to take out small pieces of magnetic material that have accidentally fallen in the eye.
- 3) Electromagnets attached to large cranes to carry heavy loads of magnetic substance mainly used in shipyards.
- 4) Electromagnets are used in electric bells, telephones, transformers, speakers etc.

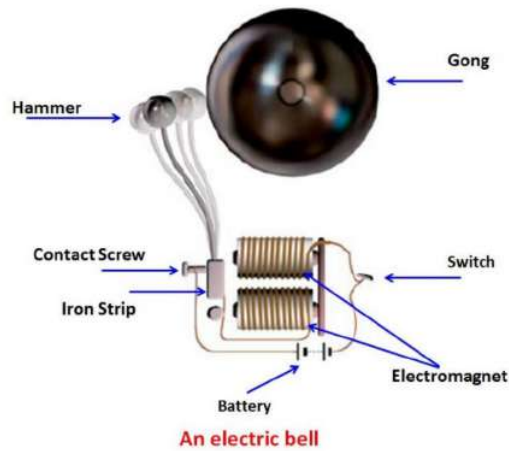
### **Electric bell**

**Electric bell:** An electric bell is a device which is used for ringing, it is based on the principle of an electromagnet.

**Example:** Explain the working of an electric bell.

**Solution:** 1) An electric bell consists of the gong, switch, electromagnet, battery, iron strip, contact screw, and hammer.

The following figure shows the circuit of an electric bell.



- 2) A current-carrying coil of insulated wire wrapped around a piece of the iron core.
- 3) When the switch is closed, the current starts flowing through the winding of an electromagnet.
- 4) In this process, the iron strip is pulled towards the electromagnet, the hammer at the end of the strip strikes the gong of the bell to produce a sound. As a result of which contact screw and iron strip move away from each other and the circuit is open again.
- 5) When the circuit is open, the electromagnet in the circuit loses its magnetism. It means the coil is no longer an electromagnet due to which the iron strip moves to its original position i.e., again it comes in contact with the contact screw and completes the circuit.
- 6) As long as the switch is closed hammer will strike on the gong and produces sound. This is how the bell rings.