Chapter 14

Electric Circuits

Points to study

Figure 14.1 Electric cell

Electricity is very important in our daily life. We use electricity for many purposes to make our tasks easier. We use a lot of electric appliances such as, refrigerator, television, fans, bulbs, desert coolers, etc. Also, we use electric pumps to pump water from wells. Electricity made it possible to light our homes, work places, roads, markets, etc. We get electricity in our homes from power houses. However, sometimes the supply of electricity from these power houses may fail and it becomes dark. In these situations, we use electric torches, generators, inverters, etc. for backup.

14.1 Electric Cell

Make a list of the places where you use an electric cell. Observe the electric cell used in a torch.

The electric cell has a metal cap on one end and a metal disc on the other end. The metal cap is the positive terminal of the cell and the metal disc is the negative terminal of the cell. Inside the cell, some chemicals are present in which chemical reactions takes place. The electricity is produced by these chemical reactions. If we use a cell for a long time it stop working. The electric cell then has to be replaced by a new one.

14.2 Electric Bulb

Activity - 1

Take an electric bulb that is used in a torch. Observe it carefully. You will find that a thin wire is fixed to two thicker wires for support inside the glass bulb. The thin wire is called the filament. See fig. 14.2

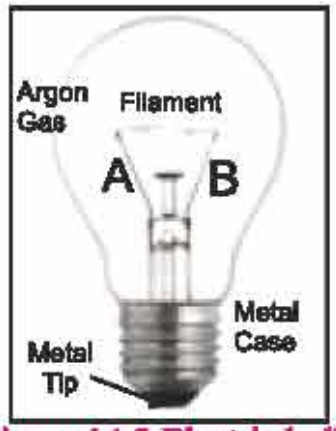


Figure 14.2 Electric bulb

One of these thick wires is connected to the metal case at the base of the bulb and the other wire is connected to the metal tip at the centre of the base. These are the two terminals of the bulb.

Compare the bulb used in homes with the bulb used in torch. What are the similarities between the two?

14.3 Simple Electric Circuit

Activity - 2

Take a cell and an electric bulb. Take two electric wires of different colours of 10 cm each. Remove the plastic coverings from the ends of the wires and join the wires with the help of insulating tape as shown in fig. 14.3.

In Fig. 14.3 (a) the bulb is glowing but in Fig. 14.3 (b) the bulb is not glowing. Discuss its reason with your friends. In this activity you have connected the terminals of electric cell with the terminals of the bulb with the help of wires. This is an example of a simple electric circuit. The electric circuit shows the flow of electric current between the two terminals of the electric cell. The bulb only glows when electric current flows through the electric circuit. When electricity flows through the filament, it heats up to a very high temperature and glows.

(a) (b)

Figure 14.3 Simple electric circuit

We call a flowing river as a river current. Similarly, we call flowing electricity as electric current.

The electric current flows through the positive terminal of the cell to the negative terminal of the cell.

Sometimes, we see that even in a complete electric circuit, the bulb does not glow. What is the cause of it? It only happens when the connection of the circuit is not complete or the wires are not properly connected or the bulb is damaged. The damaged bulb is also known as a fused bulb. Take a working bulb and a fused bulb and differentiate between them.

14.4 Electric Switch

We use switches to turn 'on' and 'off' electric bulbs, fans, coolers, etc. in our homes. Generally, we call an electric switch simply a 'button'.

How a switch works? Let us find out.

Function of an Electric Switch

Activity - 3

Take a drawing board and a safty -pin. Insert a drawing pin into the ring at one end of the safety pin and fix it on the drawing board at point 'B'.Fix the other drawing pin 'A' on the drawing sheet in such a way that the free end of the safety pin can touch it.

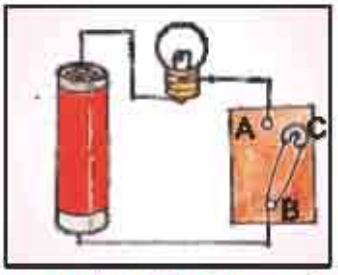


Figure 14.4 (a) Open circuit

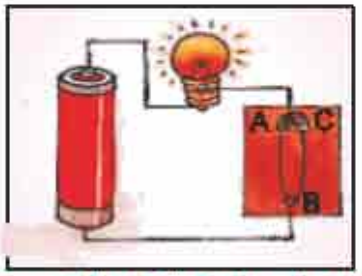


Figure 14.4 (b) Closed circuit

Now with the help of wires, connect drawing pin 'A' to the electric bulb, connect the other terminal of the bulb with an electric cell and connect the other terminal of the cell to the drawing pin 'B' [Fig. 14.4 (a)].

Rotate the free end 'C' of the safety pin so that it touches the drawing pin 'A'. By this, the circuit will be complete and the bulb will glow. In Fig. 14.4 (b) the circuit is complete. A complete circuit is also called as a closed circuit. but when we move the free end 'C' of the safety pin away from drawing pin 'A' the bulb stops glowing. In this case, a gap remains between the drawing pin 'A' and the free end 'C' of the safety pin and the circuit remains incomplete. An incomplete circuit is also called as an open circuit. In this condition, the electric current does not flow through the circuit [Fig. 14.4 (a)].

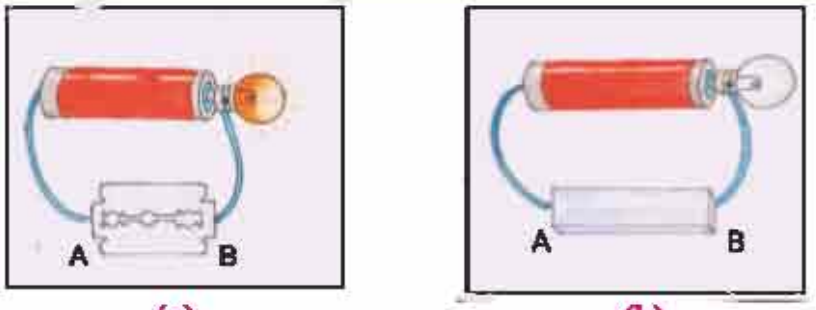
In homes, when electric bulb glows then circuit is closed and when bulb does not glow then circuit is open.

Can electricity flow through all type of substances? Let us find out.

14.5 Electric Conductors and Insulators

Activity - 4

Insert two drawing pins 'A' and 'B' with some gap between them (2cm approx.) in a drawing board. With the help of wires, connect 'A' and 'B' with a cell and a bulb as shown in Fig. 14.5. Now one by one place all these objects between 'A' and 'B' Eraser, Coin, Glass, Wood, Iron nail, Metal key, Plastic scale, Blade, Graphite lead of a pencil, Needle, Paper, Candle, etc.



(a) (b)

Figure 14.5 Identification of conductors and insulators

Now record your observations in the following Table 14.1 -

Table 14.1

S.No.	Object placed between 'A' and 'B'	Raw material from which it is made	Bulb glowed (yes/no)
1	Iron nail	Iron	Yes
2	Scale	Plastic	No
3	Eraser	Rubber	--
4	Paper	Paper	--
5	Piece of glass	Glass	--
6	Needle	Iron	--
7	Key	Metal	--
8	Pencil	Graphite	--
9	Coin	Iron	--

By placing some of these substances between 'A' and 'B', the bulb glows and electric current flows through them. The substances through which electricity can flow easily are known as conductors of electricity.

On the other hand, by placing some of these substances between 'A' and 'B', the bulb does not glow and electric current does not flow through them. The substances through which electricity cannot flow easily are known as poor conductors of electricity or insulators of electricity. Since metals are generally good conductors of electricity, they are used to make electric wires.

If you touch a bare electric wire, you will probably get an electric shock. Conductors are important for the flow of electric current but without insulators we will not be able to use them. That's why electric wires are covered with insulating substances (i.e., plastic, rubber, etc.) to prevent electric shocks. Similarly, electric switches, plugs, sockets, etc. are made of insulators (like ebonite) so that we can touch them easily.

Warning (Danger sign) :

This type of danger signs are present on electric poles, transformers, towers, etc. (Fig. 14.6). A danger sign means that there is a danger of electricity around that area, So we should never go close to them. We should also never touch bare electric wires, sockets, etc. with bare or wet hands else we will get an electric shock.

Figure 14.6
danger sign

What have you learnt

- Electricity is produced by the chemical reactions which take place inside the electric cell.
- Electric cell is used as a source of electrical energy.
- The metal cap is the positive terminal and the metal disc is the negative terminal of an electric cell.
- An electric bulb glows when electric current flows through its filament.
- Substances through which electricity can flow easily are known as conductors of electricity.
- Substances through which electricity cannot flow easily are known as insulators of electricity.

Exercises

I. Choose the correct answer from the following -

1) The number of terminal(s) in an electric cell are -

a) One b) Two
c) Three d) None of these ( )

2) Through which of the following, electricity does not flow -

a) Copper b) Iron
c) Wood d) Aluminium ( )

3) Which of the following is used to make electric wires?
   a) Wood b) Copper
   c) Plastic d) Thread ( )

4) Which of the following does not run on electricity?
   a) Fan b) Cooler
   c) Television d) Bicycle ( )

II. Fill in the blanks -

1) The substances through which electricity can flow easily are called .....

2) The thin wire inside the bulb which is fixed to two other thicker wires in the bulb is called .....

III. Short answer questions -

1) Why the person (electrician) wears rubber gloves while climbing on an electric pole?
2) Why are the handles of plyers and screwdrivers are covered with plastic and rubber?
3) What is an open electric circuit? Explain by a diagram.
4) State the differences between an open circuit and a closed circuit.
5) What are conductors and insulators? Give three examples of each.

IV. Long answer questions -

1) What is flow of electric current? Explain with a diagram.
2) Take a used cell and break it to open apart. Now examine and describe each and every content of the cell in detail.
3) Describe the structure of an electric bulb used in torches. Also draw its well labelled diagram.

Practical work

I. Find out about the life of the inventor of electric bulb - Thomas Alva Edison, and write in your notebook.

II. Take a damaged torch and observe it from inside. Draw its diagram in your notebook.

III. Alessandro Volta is the scientist who made the first cell, that cell is called the voltaic cell, after his name. Take a pot of glass, fill it with water and add common salt in it to make a common salt solution. Now insert a copper and a zinc rod (electrodes) into it (make sure that they do not touch each other). Now connect a 1.5-volt electric bulb or a L.E.D through the two rods and pass the current. Does the bulb or L.E.D light up? Now repeat the same activity by taking a plastic container and filling that with cow dung or mud from the field and inserting the same rods again.

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