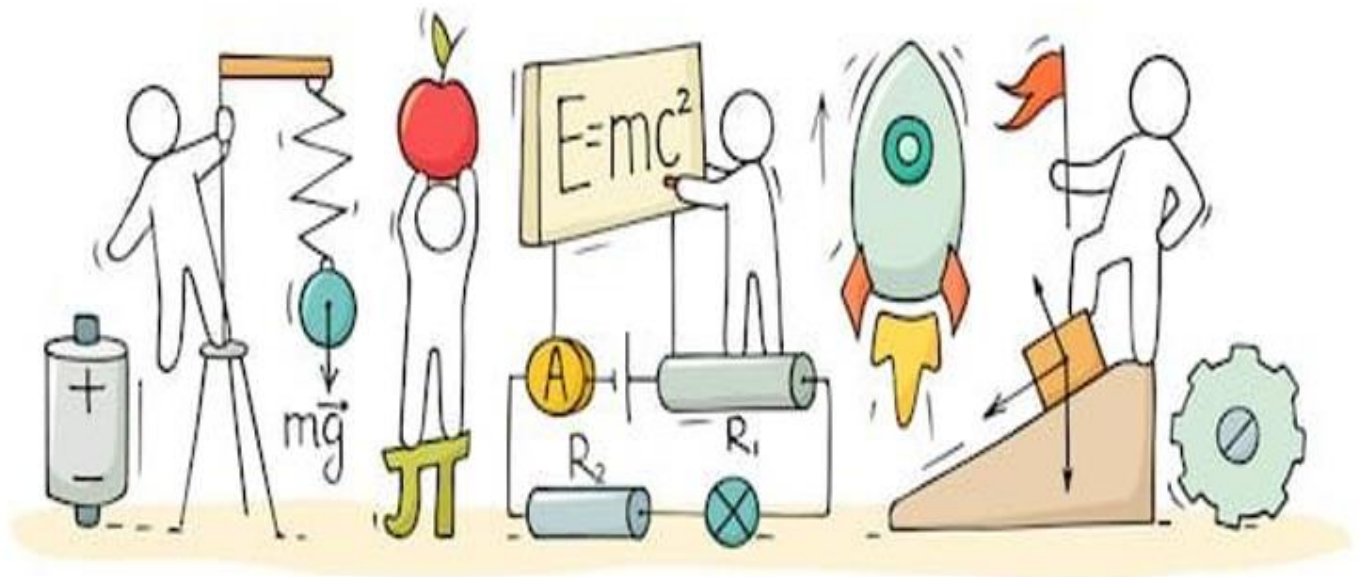


Science

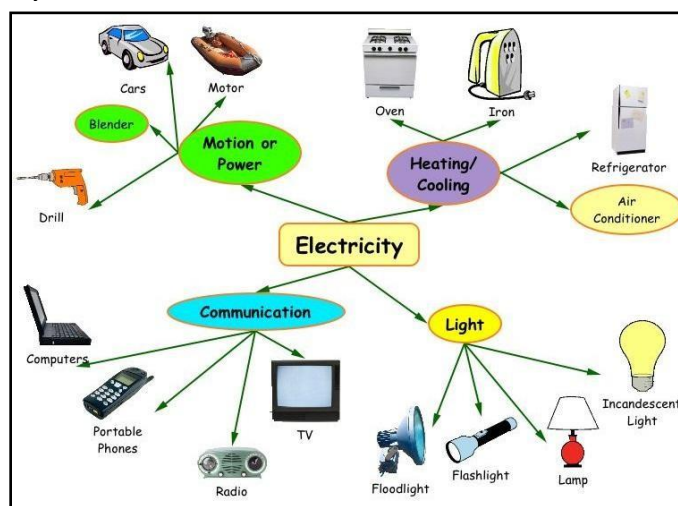
Chapter 12: Electricity and Circuits



Electricity and Circuits



- Electricity is an important source of energy.
- We get electricity from sources such as wind energy, solar energy, mechanical energy of water, nuclear energy, heat energy and chemical energy.
- Lights, fans, motors, radios, television, computers etc. are some common appliances which work on electricity.



- Electricity is provided by a power station.

Sources Of Electricity

The main sources of electricity are based on the production or conversion of the energy:-

Large-scale production

Power stations: Power stations are responsible for generating a big amount of electricity for industries, factories, houses and school etc.

They are located near the rivers, waterfalls or highly windy areas.

Windmills: A group of aerogenerators placed in windy areas that convert wind energy into electrical energy.

They also produce electrical energy on a large scale.

Solar Panels or Plates:

An arrangement of photovoltaic cells on a framework of plates that converts solar energy into electrical energy.

There are varieties of solar panels that exist based on the requirement of the energy in a particular place.

Standby generators: When the electricity cuts, the standby generators provide electricity to the place.

They work on fuels like petrol and diesel.

Inverters:

They are used when the electricity cuts.

They work on batteries that are charged by electricity.

- The cells combined to form a battery. They are arranged by opposite terminals. For example, the negative terminal of a cell is connected with the positive terminal of another cell.
- There are some chemicals inside a cell that react with each other to create an electric current.
- When the chemicals are saturated, the cell stops producing electric current.
- In an electric cell, the body is designed in a cylindrical shape, and its outer cover is covered with plastic or rubber. So, we prevent ourselves from the electric shock.

Electric Cell

- An electric cell provides electricity to various devices in which electricity cannot be supplied directly.



- It consists of two terminals:
 1. Positive terminal with a metal cap.
 2. Negative terminal with a metal disc.
- A chemical is present in the cell which helps to produce electricity.
- Electricity to a bulb is provided by an electric cell.
- A bulb consists of two terminals:
 1. A filament inside the bulb is a spirally wound wire which is supported by two thick wires at its ends.
 2. An electrical cell is connected to the terminals of the bulb so that electricity from the cell can pass through it.
 3. This electricity makes the filament in the bulb glow and thus emit light.
 4. Electric cells are also used in alarm clocks, wristwatches, transistor radios, cameras and

many other devices.



Types of electric cell

There are two types of electric cells:

Primary electric cell:

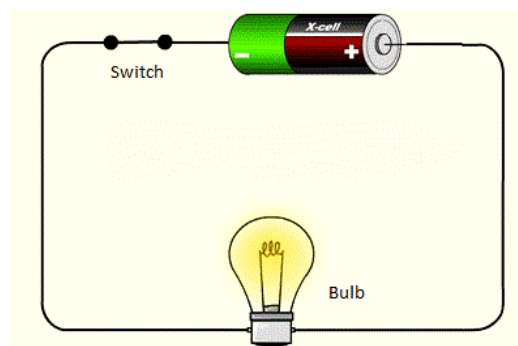
- The chemicals inside the cell convert the chemical energy into electrical energy. This process is completely irreversible.
- They generate only a small amount of electric current.
- They are used in the devices such as remote controls, wall clocks, toys flashlights and radios.

Secondary electric cell:

- It is a reversible process which means the cell can be recharged and used repeatedly.
- They are also called storage cells or accumulators.
- These types of cells are used in mobile devices, camcorders, laptops, power tools and motor drives.
- In vehicles, they are used for the highlights and air-conditioning system.

Electric Circuit

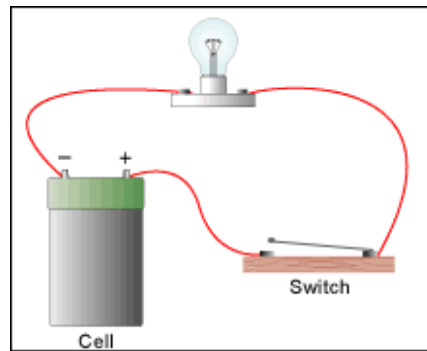
- An electric circuit consists of a complete path for electricity to pass.
- The simplest form of a circuit is when two terminals of a cell are connected to the two terminals of a bulb and a switch.



- When the terminals of the bulb are connected with the electric cell by wires, the current passes through the filament of the bulb making it glow.
- The direction of current flow is from the positive terminal to the negative terminal of the electric cell.

Electric Switch

- A device used to stop the flow of electricity by breaking the circuit is called a **switch**.



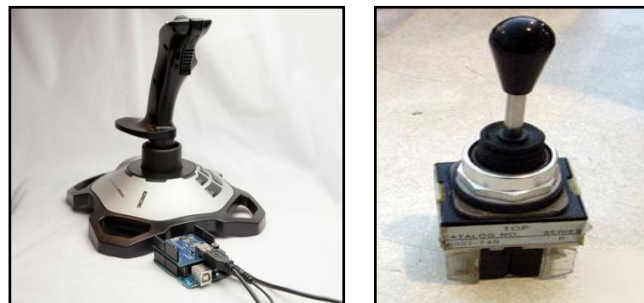
- A switch may be directly manipulated by a human as a control signal to a system, such as a computer's keyboard button, or to control power flow in a circuit, a light switch.
- Switches have different applications:
 1. Toggle switches: Used in our houses.



2. Pushbutton switches: Used in the starter of a water pump and in an engine.



3. Joystick switches: Used in the remote control unit of a toy car.



Electric Conductors and Insulators

Conductors

- Materials which allow electricity to pass through them are called conductors.
- Metals are good conductors of electricity.
- Electric wires are made of metals which act as conducting materials and are therefore used to make electrical circuits.



Insulators

- Materials which do not allow electricity to pass through them are called **insulators**.
- Insulators oppose electric current, and are therefore used as **protection** from the dangerous effects of electricity.
- **Water** is a **good conductor** of electricity. However, in its purest form i.e. **distilled water**, it acts as an insulator and is used in batteries.

Electric Bulb

- It is the first electrical device (Figure 2) used by a common man.
- An electric bulb consists of a transparent glass covering and enclosed with a thin-coiled metal wire called the filament.
- The filament is made up of tungsten and has two thick wires that are connected to the metal base of the bulb. These are called the terminals of the bulb.
- A bulb converts electrical energy into heat and light energy.
- The filament becomes hot when the bulb glows.
- If the filament is broken then the bulb does not glow.

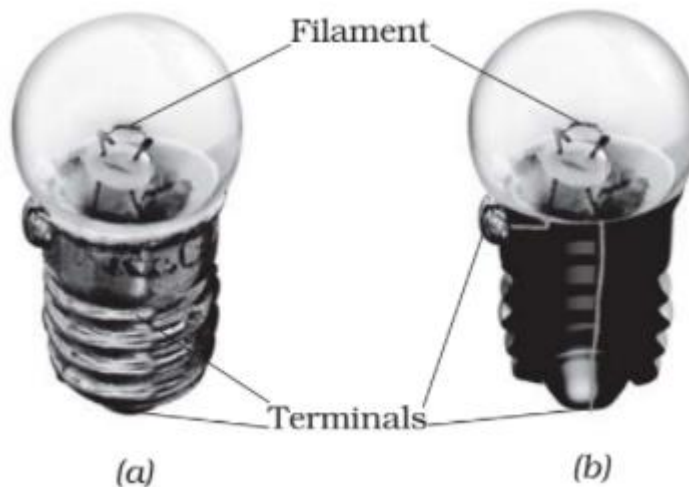


Figure 2: An Electric Bulb

Torch

A torch is a device that works on two or more cells to light a bulb (Figure 3).

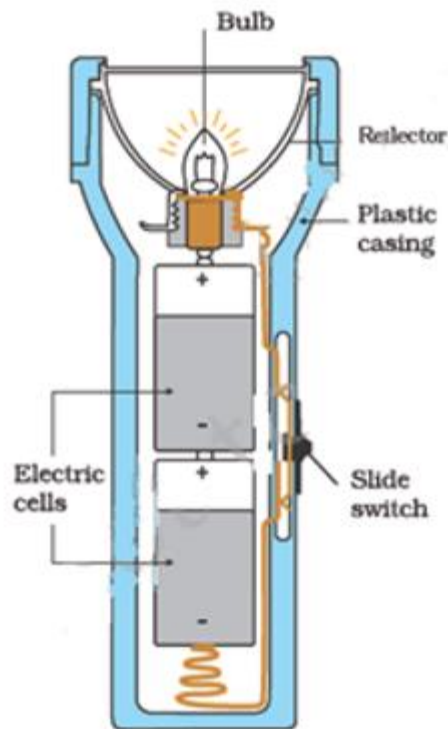


Figure 3: Parts of a torch

The different parts of an electric torch are:

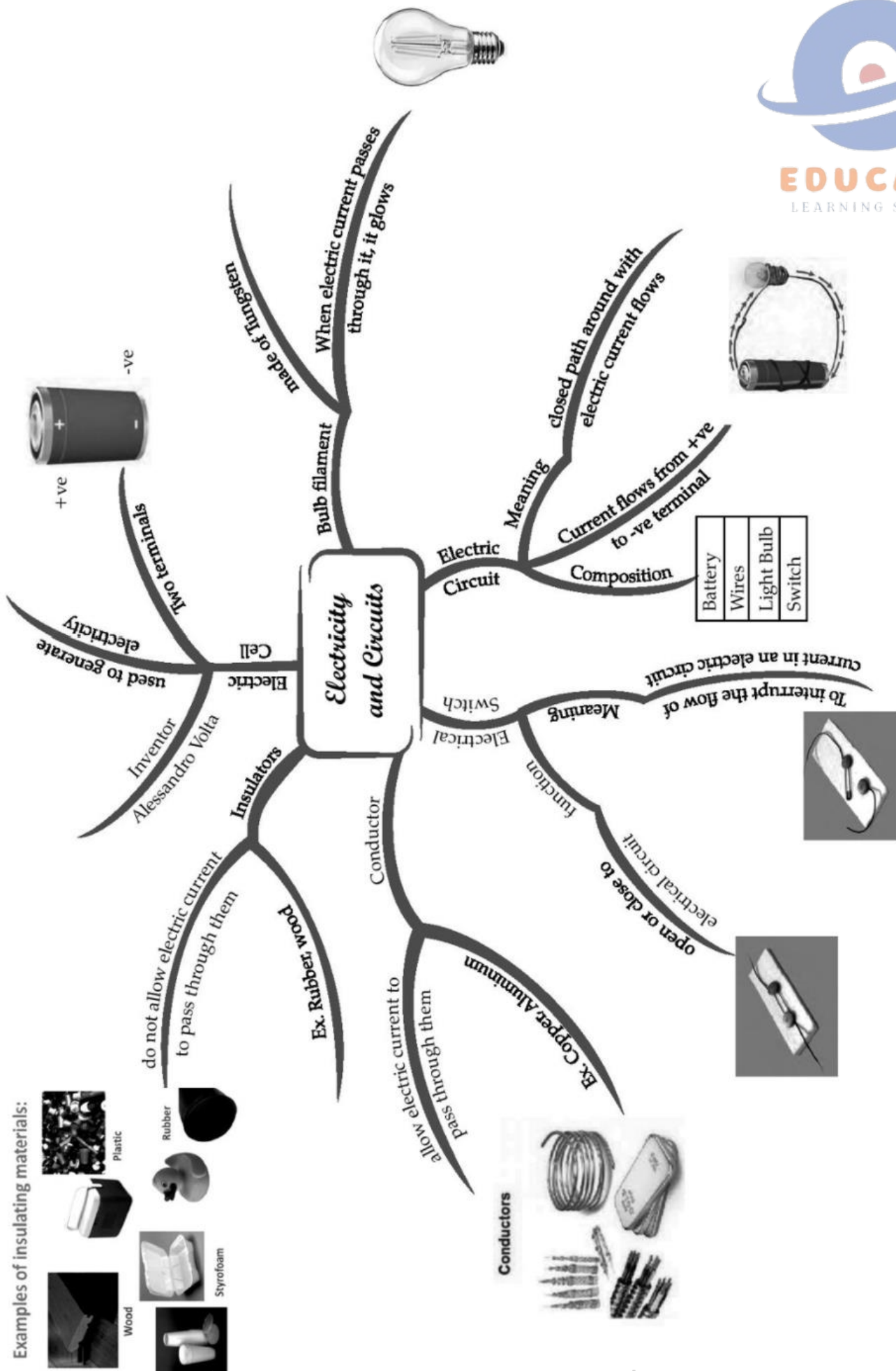
Wire and Spring:

- The wire is connected with the bulb, whereas the spring is responsible for the connection of the cells and the switch.
- The cells are placed between the spring and the terminals.
- The position of the positive terminal of the battery points towards the bulb.
- The one end of the wire is connected to a terminal of the bulb, while the other end of the wire is joined with the switch.
- A switch is the link between the wire and the spring.

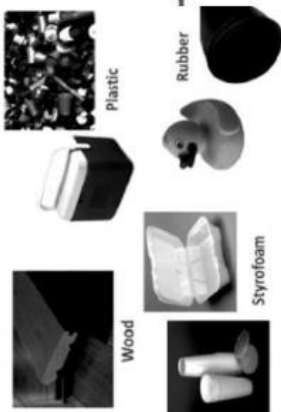
Working of a torch

- When the switch is on, the bulb glows because the wire and the spring connected by the metal strip under the switch. Thus, the parts of the torch form a closed-circuit path.
- When the switch is off, the bulb does not glow because the parts of the torch form an open circuit.

CHAPTER - 12 ELECTRICITY AND CIRCUITS



Examples of insulating materials:



Conductors



Important Questions



Multiple Choice Questions:

Question 1. Cell is a device which

- (a) converts chemical energy into electrical energy
- (b) electrical energy into light energy
- (c) electrical energy into magnetic energy
- (d) None of these

Question 2. A bulb has

- (a) two terminals and one filament
- (b) two terminals and two filaments
- (c) multiple terminals and single filament
- (d) single terminal and single filament

Question 3. Filament of a bulb is made up of

- (a) aluminium
- (b) chromium
- (c) platinum
- (d) tungsten

Question 4. Bulb glows only in

- (a) closed circuit
- (b) open circuit
- (c) in both circuits
- (d) open circuit if bulb is not fused

Question 5. A battery is

- (a) a single cell
- (b) a combination of cells in which cells are joined (+) to (-)
- (c) a combination of cells in which cells are joined (+) to (+)
- (d) None of these

Question 6. A substance which allows electricity to pass through it is called

- (a) a conductor
- (b) an insulator
- (c) semiconductor

(d) superconductor

Question 7. Which is an example of an insulator

(a) bakelite

(b) aluminium

(c) tap water

(d) All of these

Question 8. An example of a conductor is

(a) tap water

(b) salt solution

(c) metal wire

(d) all of these

Question 9. How many terminals are there in a dry cell?

(a) One

(b) Two

(c) Three

(d) Four

Question 10. To prevent electric shocks, the metallic electrical wires are covered with

(a) paper

(b) cotton

(c) aluminium

(d) plastic

Very Short Question:

1. What is the direction of flow of current in a dry cell?
2. Name the +ve terminal of dry cell.
3. Name the -ve terminal of a dry cell.
4. What is dry cell?
5. What is solar cell?
6. What is open circuit?
7. Write one use of insulators.
8. What is the name of thin wire in the electric bulb?

Short Questions:

1. Mention two advantages of a dry cell.





2. Draw a diagram showing the two terminals of a bulb.
3. Draw the circuit diagram for operating a bulb with the help of a dry cell.
4. Define conductors and insulators. Give one example of each.
5. Identify conductors and insulators from the following: Eraser, paper, matchstick, copper wire, pencil lead, polythene
6. Name the scientist who invented electric cell and the scientist who invented electric bulb.
7. Give one activity to prove that air is an insulator.
8. In any electric circuit, when the switch is on and the current flows through it why do the wire, switches, bulb or devices become hot?

Long Questions:

1. (i) What is electric circuit?
(ii) How many types of electric circuit are there? Define them.
(iii) Draw a diagram to show the closed circuit for switch, bulb and dry cell.
- 2 What is the difference between conductor and an insulator? Explain with examples.

Answer Key-

Multiple Choice Answers:

1. (a) converts chemical energy into electrical energy
2. (a) two terminals and one filament
3. (d) tungsten
4. (a) closed circuit
5. (b) a combination of cells in which cells are joined (+) to (-)
6. (a) a conductor
7. (a) bakelite
8. (d) all of these
9. (b) Two
10. (d) plastic

Very Short Answers:

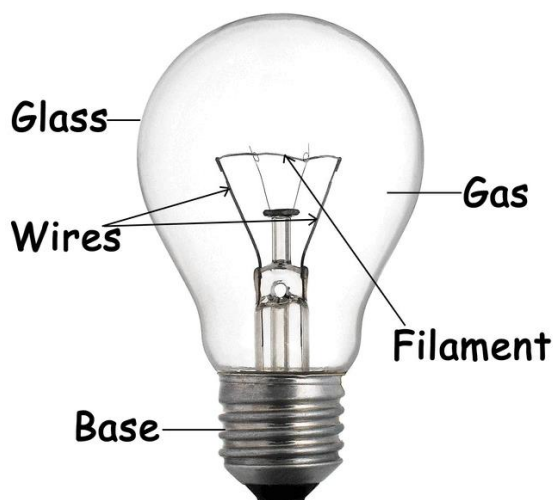
1. Answer: The current flows in closed circuit from +ve to -ve terminal of cell.
2. Answer: Carbon rod with a metal cap on it.
3. Answer: Zinc metal plate.
4. Answer: It is a device which converts chemical energy into electrical energy.

5. Answer: A device which converts solar energy into electrical energy.
6. Answer: An electric circuit in which electrical contact at any point is broken is called open circuit.
7. Answer: Insulators are used in making switchboard, handles of testers, screw drivers.
8. Answer: Filament.

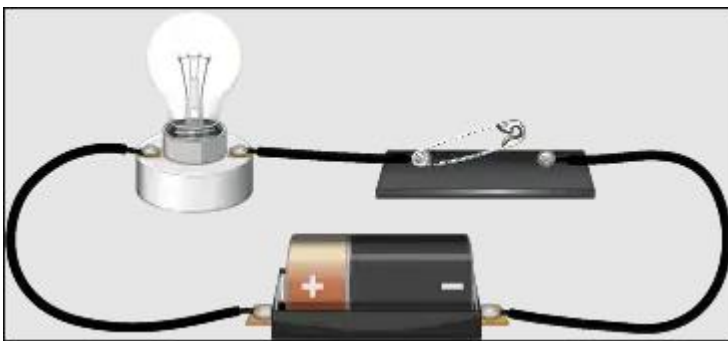


Short Answer:

1. Answer:
 1. It converts chemical energy into electrical energy.
 2. It is light and small in size.
2. Answer:



3. Answer:



4. Answer: A conductor is that which easily allows the passage of current through it.
Example: Aluminium or any metal.
An insulator is that which does not allow the passage of current through it. Example: Rubber.
5. Answer: Conductors: Copper wire, pencil lead.
Insulator. Eraser, paper, matchstick, polythene.
6. Answer: Electric cell: Alessandro Volta.

Electric bulb: Thomas Alva Edison.

7. Answer: Take an electric circuit, keep the terminals unconnected in the air. The bulb do not glow, as air is an insulator and does not allow the current to flow through it.
8. Answer: This is because electric energy changes into heat energy.

Long Answer:

1. Answer:

(i) The diagram that shows the path of electric current is called electric circuit.

(ii) There are two types of electric circuit:

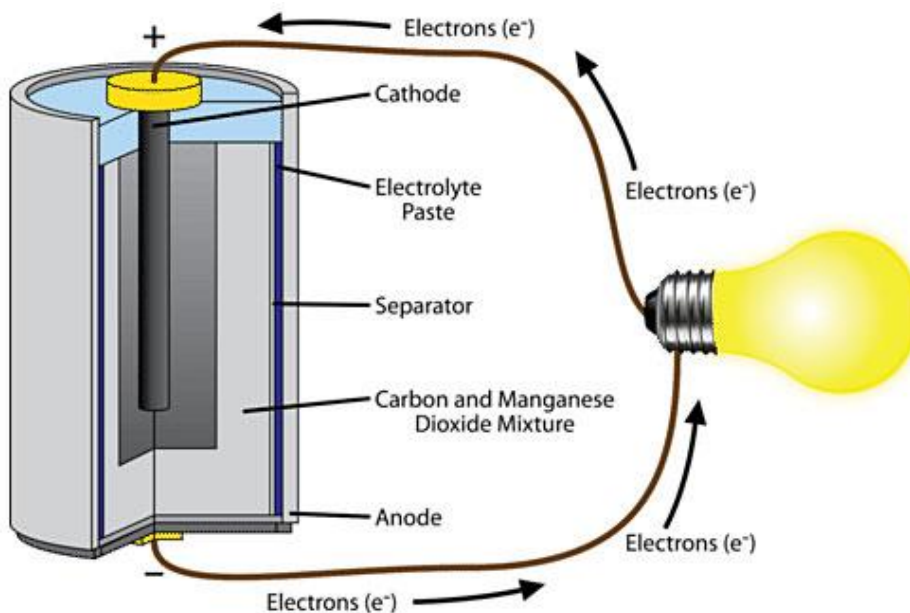
(a) Open electric circuit

(b) Closed electric circuit

(a) **Open electric circuit:** The circuit in which electrical contact at any point is broken is called open electric circuit.

(b) **Closed electric circuit:** The circuit in which electric current flows from one terminal of a cell or battery to the other is called a closed circuit.

(iii)



2. Answer: Materials that allow electric current to pass through them are called conductors. For example: iron, copper etc. Metals are good conductors. Materials that do not allow electric current to pass through them are called insulators. For example- rubber, plastic etc.