

**STUDY COURSE MATERIAL**

**SCIENCE**

**SESSION-2020-21**

**CLASS-VI**

**TOPIC: CH-13 ELECTRICITY AND CIRCUITS**

**DAY-1**

**Topic- Electricity and Electric Cell.**

**\*NCERT BOOK LINK-**

<http://ncert.nic.in/textbook/pdf/fesc1dd.zip>

**\*Teaching Notes-**

You all use electricity for many purposes. It is very important for you as it makes many tasks easier. In the modern world, one cannot think of life without electricity.

Electricity is used at home to run various electrical appliances, in industries to operate different machines, to run trains, etc.

It is possible to light up houses, roads, offices, markets and factories after sunset only because of electricity.

**\*Electricity-**

It is a form of energy that can be converted into various different form of energy.

Ex. Electric bell converts electrical energy into sound energy.

Electric bulb converts electrical energy into heat and light energy.

An electric current can flow only when its path forms a closed loop. The flow of electric current is caused due to the flow of electrons through the electric wire. Since the electrons flow from negative terminal of the cell to the positive terminal, the flow of electric current is from the positive to the negative terminal.

### **\*Electrical appliances-**

Device which need electricity to work. Ex. Television.

### **\*Ammeter-**

An instrument which is used to measure the amount of electric current flowing in a circuit.

### **\*Sources of Electricity-**

- Wind mills
- Solar panels etc.

### **\*Electric Cell-**

It is a device which is used as a source of electricity. It is invented by Alessandro Volta. It has two terminals, positive(+) and negative(-).

Positive terminal have a small metal cap and negative terminal have a small metal disc.

Certain chemical reaction in a cell produces electric current.



Fig: Electric Cell.

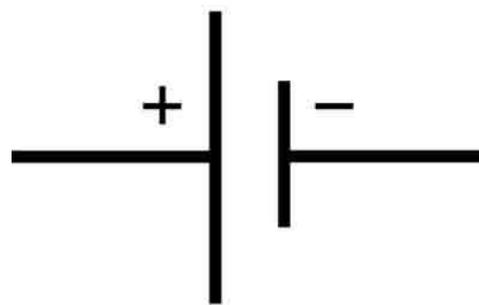


Fig: Symbol of Electric Cell.

### **\*Types of Electric Cell-**

There are two types of electric Cell-

#### **1.Primary Cell-**

- The chemical reaction that occur inside the cell is irreversible.
- Can not be recharged and are discarded when exhausted.
- Generate small amount of current.
- Used to operate small devices such as wall clock etc.

#### **2. Secondary cell-**

- The chemical reaction that occur inside the cell is reversible.
- Can be recharged and used repeatedly.
- Also termed as storage cells or accumulators.

- Used to operate big devices also such as laptops, trucks, headlight etc.

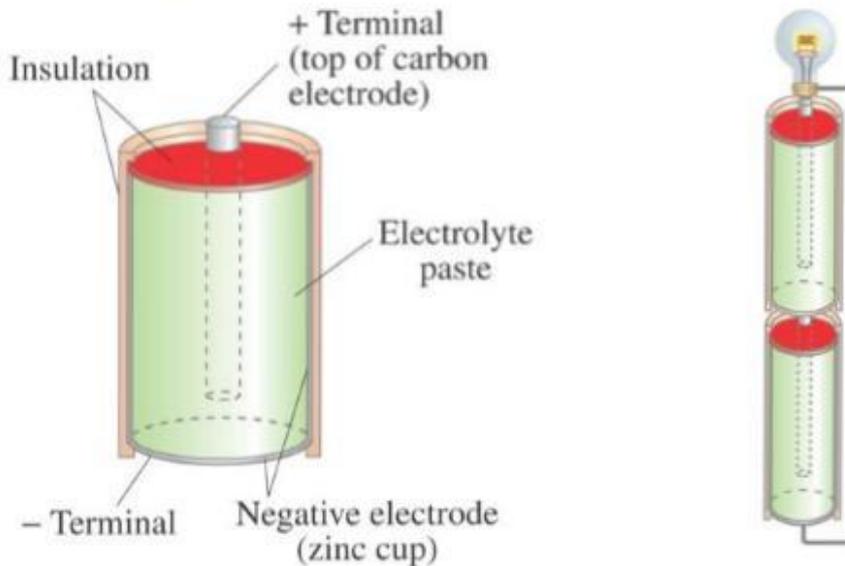
### \*Battery-

**Battery:** When two or more cells are joined together, the combination is called a battery.

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## 25-1 The Electric Battery

Several cells connected together make a battery, although now we refer to a single cell as a battery as well.



### \*Assignments-

1. Define electricity.
2. Differentiate between primary and secondary cell.

### \*Video Link-

[https://youtu.be/9LRHMw\\_inao](https://youtu.be/9LRHMw_inao)

### \*PPT Link-

[https://www.slideshare.net/mobile/reflective\\_learning/summary-electricity](https://www.slideshare.net/mobile/reflective_learning/summary-electricity)

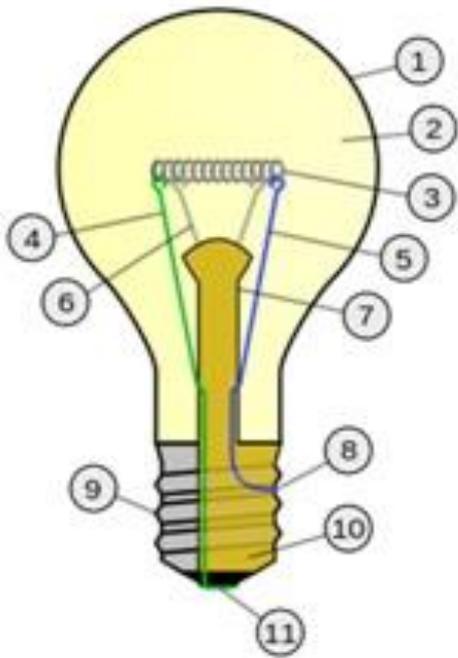
## DAY-2

### Topic- Electric Bulb.

#### **\*Teaching Notes-**

An **electric bulb** is a device which produces light when electricity is passed through its terminals.

- The bulb has two thick contact wires in the center with a thin wire attached between them. This thin wire is called **filament**.
- One of the thick wires is connected to the metal case at the base of the bulb and the other is connected to the metal tip at the center of the base. These two form the terminals.
- When electricity is passed through the terminals of the bulb, the filament gets heated up and produces light.
- A bulb is said to be fused if the filament gets broken. Fused bulb doesn't glow.
- The two terminals do not directly touch each other to avoid short circuit.



1. Outline of Glass bulb
2. Low pressure inert gas
3. Filament
4. Contact wire (goes out of stem)
5. Contact wire (goes into stem)
6. Support wires (one end embedded in stem; conduct no current)
7. Stem (glass mount)
8. Contact wire (goes out of stem)
9. Cap (sleeve)
10. Insulation
11. Electrical contact

Electric Bulb



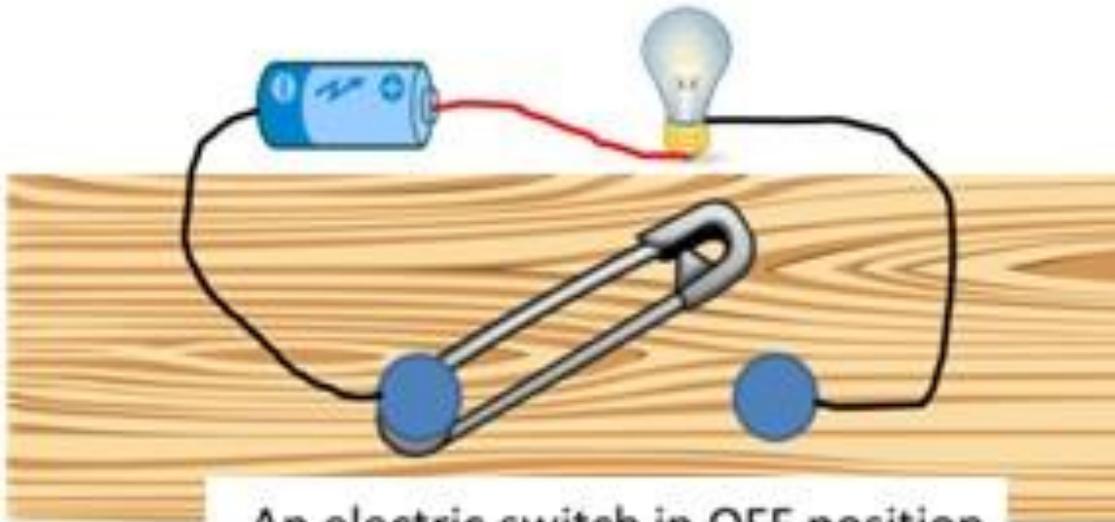
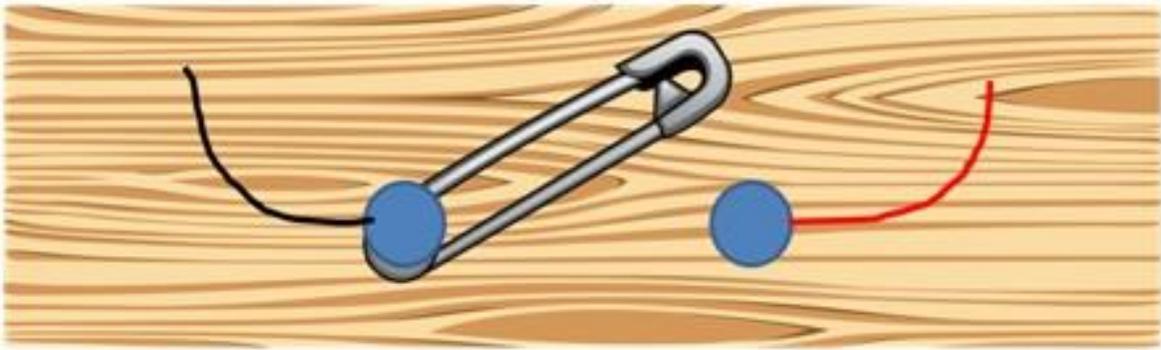
Fig: Symbol of Electric Bulb.

### \*Switch-

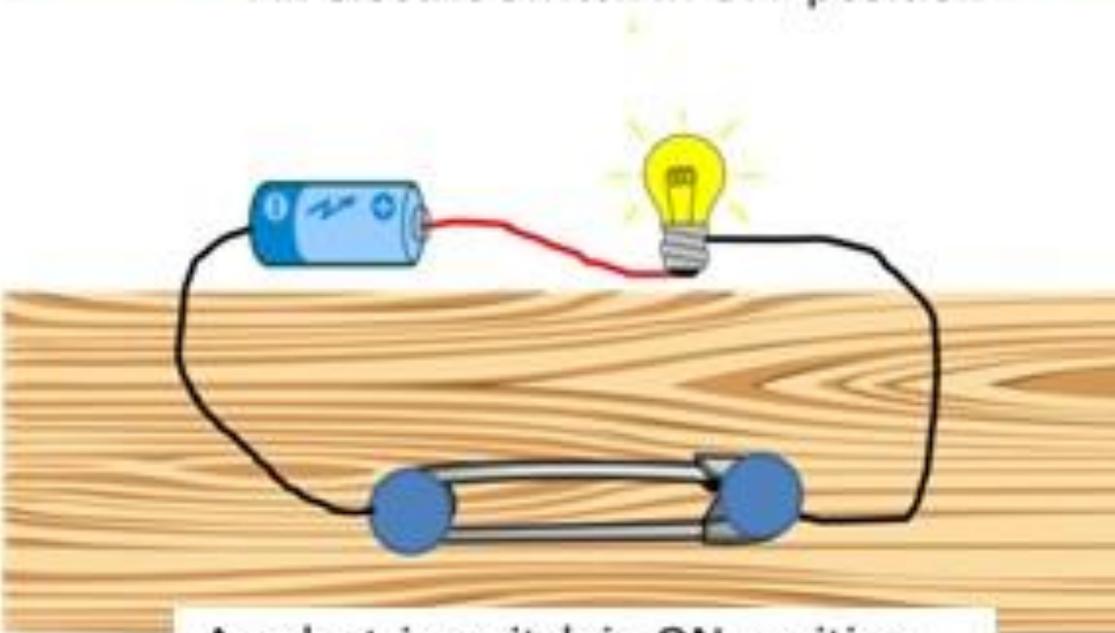
#### Electric Switch

**Electric Switch** is an electrical device which can make or break an electric circuit.

- A switch is said to be in **'ON' position** when it **makes or completes the circuit** and allows the current to pass through.
- Similarly, a switch is in **'OFF' position** when it **breaks the circuit** and does not allow the current to pass through.
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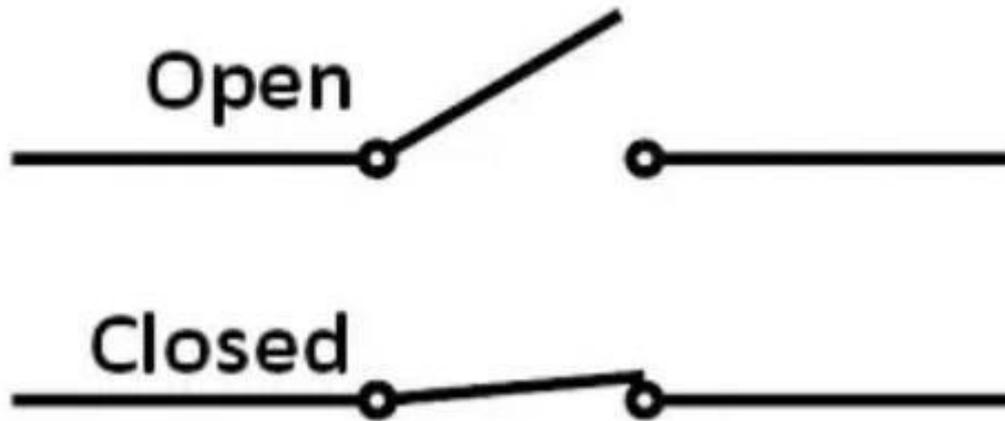


An electric switch in OFF position



An electric switch in ON position

Fig: Symbol of open and closed switch.



### \*Assignments-

1. Explain the structure and working of a bulb.
2. What is switch?

### \*Video Link-

[https://youtu.be/9LRHMw\\_inao](https://youtu.be/9LRHMw_inao)

### \*PPT Link-

[https://www.slideshare.net/mobile/reflective\\_learning/summary-electricity](https://www.slideshare.net/mobile/reflective_learning/summary-electricity)

## DAY-3

### Topic- Torch-

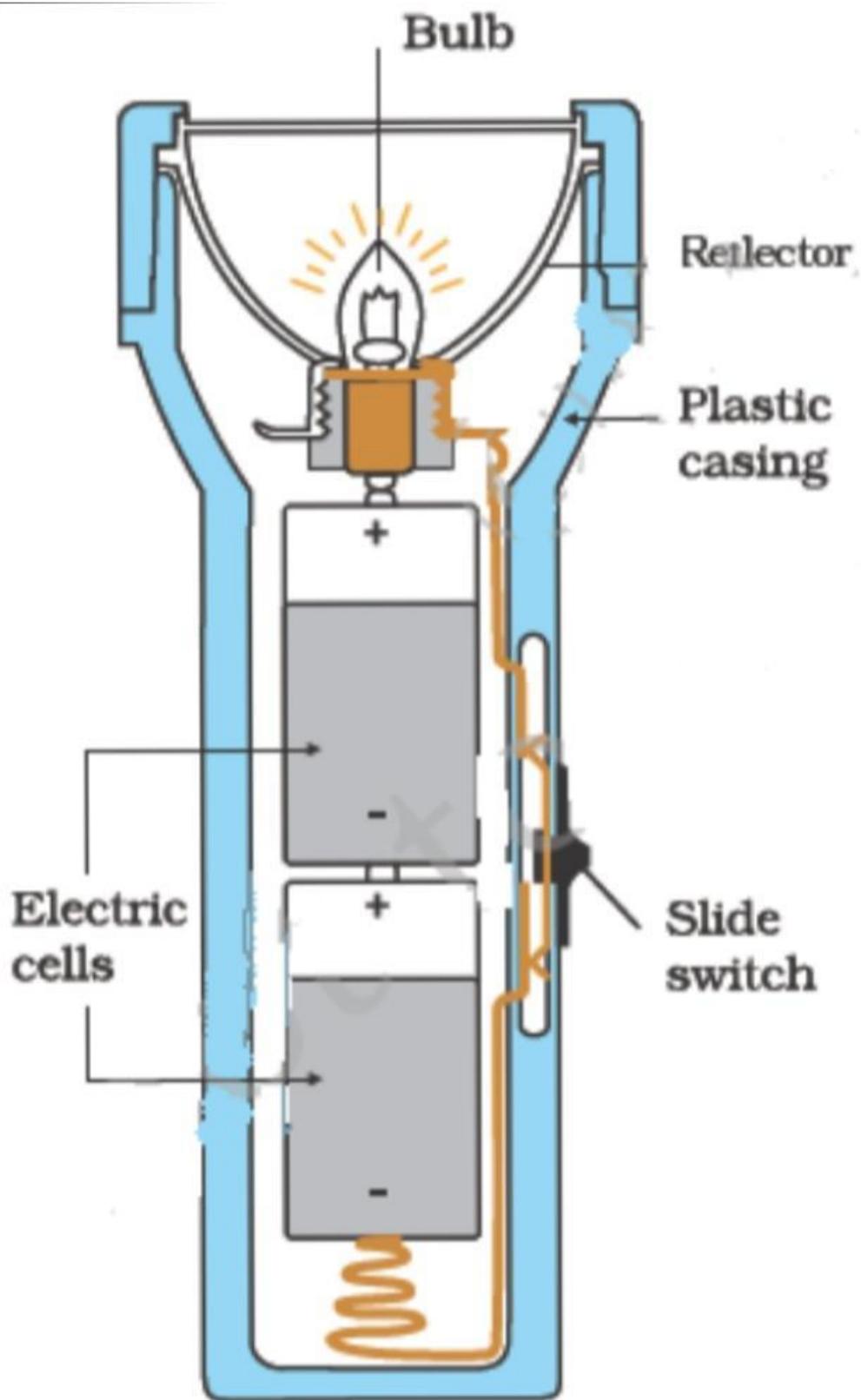
### \*Teaching Notes-

Torch is an electric lamp which uses two or more cells to light a small bulb.

Different parts of a torch are-

- Bulb
- Battery
- Switch
- Wire

- Spring



### **\*Working of a torch-**

1. When Torch is in ON position-

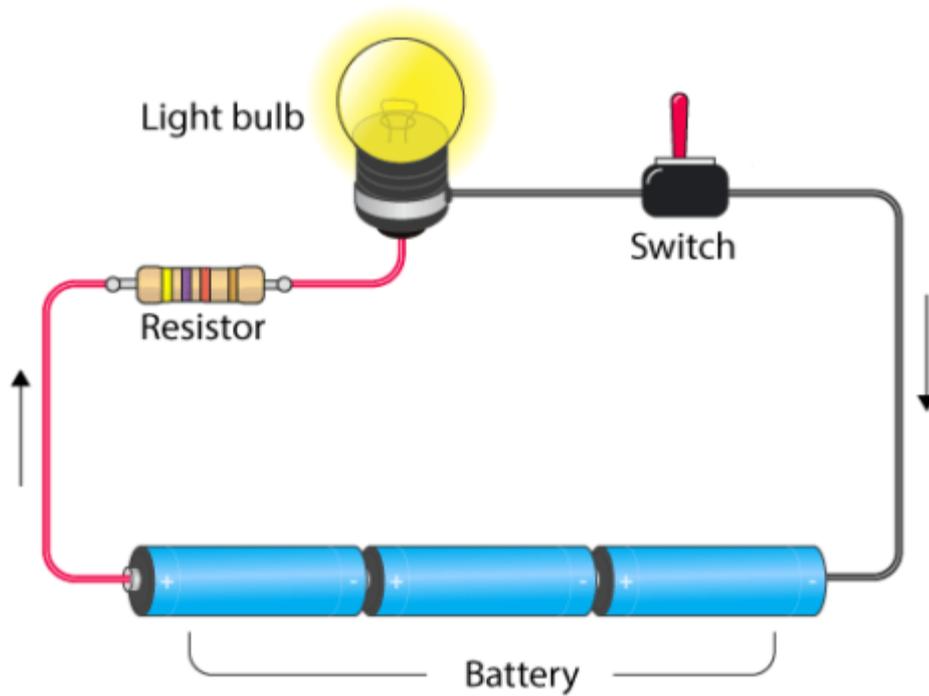
- Switch is in ON position.
- Metal strip of switch touches both the wire and the spring.
- All parts of torch are connected.
- It forms a closed path i.e. closed circuit.
- Filament gets hot and gives us light.

2. When Torch is in OFF position-

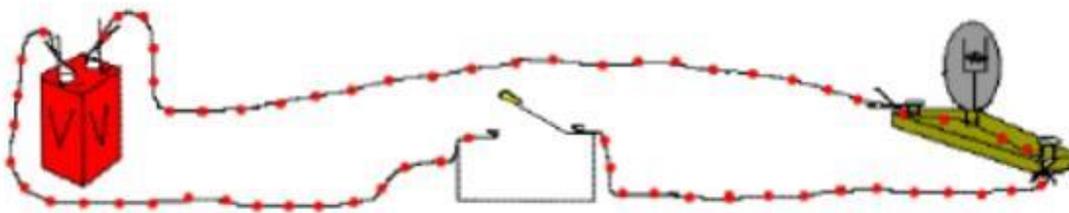
- Switch is in OFF position.
- Metal strip loses contact with one of the wires.
- Open circuit is formed.
- It breaks the flow of current.
- Bulb does not glow.

### **\*Electric Circuit-**

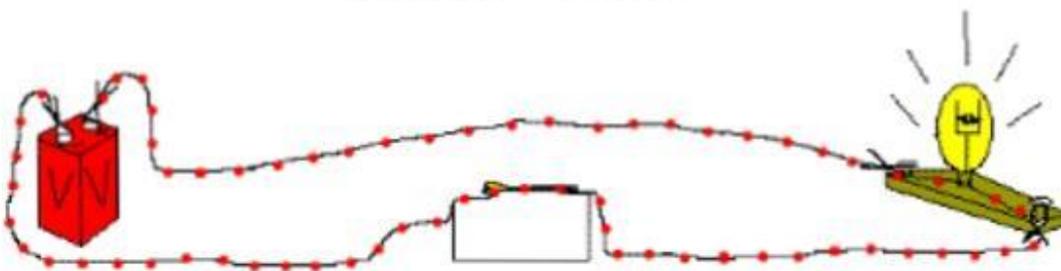
- A closed-loop path which the current takes is known as an electric circuit.
- When the path of the circuit is closed, current flows through it.
- When there is a break in the path (switch is open) then, the circuit is open and not conducting so the current does not flow.



### OPEN CIRCUIT



### CLOSED CIRCUIT



### \*Assignments-

1. Explain the working of a torch when switch is in ON position.
2. What are the different components of a circuit?

## \*Video Link-

[https://youtu.be/9LRHMw\\_inao](https://youtu.be/9LRHMw_inao)

## \*PPT Link-

<https://youtu.be/oT5krVq9TsU>

# DAY-4

## \*Topic- Conductor and Insulator-

## CONDUCTORS

In simple terms, an electrical conductor is defined as materials that allow electricity to flow through them easily. This property of conductors that allow them to conduct electricity is known as *conductivity*.

Metals, humans and Earth are all conductors. This is the reason why we get electric shocks!

### Examples of conductor

*Graphite, the human body and the earth are good conductors of electricity. Some of the common conductor examples include metals such as:*

- Copper
- Gold
- Iron



## Insulators

Insulators are materials that hinder the free flow of electrons from one particle of the element to another. If we transfer some amount of charge to such an element at any point, the charge remains at the initial location and does not get distributed across the surface. The common process of charging of such elements includes charging by rubbing (for some elements, with the help of suitable materials) and charging by induction.

### Examples of insulators

*Some of the common insulator examples are given below:*

- Plastic
- Wood
- Glass

## Differences Between Conductor and Insulators

*Some key conductor and insulator differences are given in the table below.*

Conductor	Insulator
-----------	-----------

Materials that permit electricity or heat to pass through it	Materials that do not permit heat and electricity to pass through it
A few examples of a conductor are silver, aluminium and iron	A few examples of an insulator are paper, wood and rubber
The electrons move freely within the conductor	The electrons do not move freely within the insulator
The electric field exists on the surface but remains zero on the inside	The electric field doesn't exist

### **\*Assignments-**

1. What are the differences between conductor and insulator?
2. Give few examples of insulators.

### **\*Video Link-**

[https://youtu.be/9LRHMw\\_inao](https://youtu.be/9LRHMw_inao)

<https://youtu.be/PafSqL1riS4>

### **\*PPT Link-**

<https://www.slideshare.net/mobile/Melodia/conductors-and-insulator>

## **DAY-5**

### **\*Topic-Uses of Conductor and Insulator.**

### **Applications of Conductors**

Conductors are quite useful in many ways. They find use in many real-life applications. For example,

- ❖ Mercury is a common material in thermometer to check the **temperature** of the body.
- ❖ Aluminium finds its use in making foils to store **food**. It is also used in the **production** of fry pans to store heat quickly.
- ❖ Iron is a common material used in vehicle engine manufacturing to conduct heat.
- ❖ The plate of iron is made up of steel to absorb heat briskly.
- ❖ Conductors find their use in car radiators to eradicate heat away from the engine.

### Applications of Insulators

As insulators resist the flow of electron, they find worldwide applications. Some of the common uses include:

- ❖ Thermal insulators, disallow heat to move from one place to another. Hence, we use them in making thermoplastic bottles. They are also used in fireproofing ceilings and walls.
- ❖ Sound insulators help in **controlling** noise level, as they are good in absorbance of sound. Thus, we use them in buildings and conference halls to make them noise-free.
- ❖ Electrical insulators hinder the flow of electron or passage of current through them. So, we use them extensively in circuit boards and high-voltage systems. They are also used in coating electric wire and cables.

### \*Video Link-

<https://youtu.be/PafSqL1riS4>

### \*PPT Link-

<https://www.slideshare.net/mobile/Melodia/conductors-and-insulators>

## **Exercise Questions-**

### **Question 1:**

What is an electric circuit?

### **ANSWER:**

An electric circuit is an arrangement which provides a way for the flow of electric current in it. It is a device which comprises of components such as electric cell, switches, bulbs and wires.

### **Page No 159:**

### **Question 2:**

When is an electric circuit said to be closed?

### **ANSWER:**

An electric circuit is said to be closed or complete when there is flow of electricity through the circuit. When the two ends of a cell are connected to a bulb using metal wires, the bulb emits light. The bulb glows due to flow of electric current from the positive terminal to the negative terminal through the filament of the bulb. Such a circuit is called a closed circuit.

### **Page No 159:**

### **Question 3:**

Why can electricity not flow in an open circuit?

### **ANSWER:**

An open circuit is one in which one of the metal wires is disconnected from the cell. When the metal wire is disconnected, there is no path for the current to flow. Hence, electricity cannot flow in an open circuit.

### **Page No 159:**

**Question 4:**

Why is an electric cell needed in an electric circuit?

**ANSWER:**

An electric cell is needed in an electric circuit because it is the source of electrical energy in a circuit. The energy provided by the cell drives an electric current in the circuit.

**Page No 159:****Question 5:**

What is the function of the switch in an electric circuit?

**ANSWER:**

The function of switch in an electric circuit is to either make or break the electric circuit. A switch is used to turn current to an electrical appliance either on or off.

**Page No 159:****Question 6:**

How are chargeable cells different from ordinary dry cells?

**ANSWER:**

No.	Chargeable Cells	Ordinary Dry Cells
1.	Chargeable cells can be charged repeatedly.	An ordinary dry cell cannot be charged again once it is used up.
2.	Chargeable cells are usually more expensive.	Ordinary dry cells are usually cheaper than dry cells.

**Page No 159:****Question 1:**

Draw the symbols for the following:

- (a) a bulb
- (b) an electric cell
- (c) a switch
- (d) a battery of electric cells

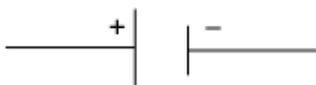
**ANSWER:**

(a) A bulb:



Symbolic representation

(b) An electric cell:



Symbolic representation

(c) A switch:

OFF position



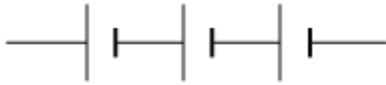
Symbolic representation

ON position:



Symbolic representation

(d) A battery of electric cells:



Symbolic representation

**Page No 159:**

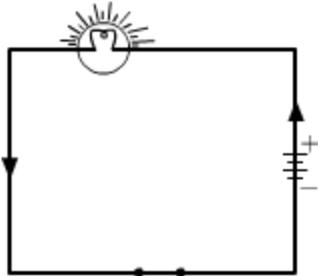
**Question 2:**

Draw an electric circuit in which a cell is used to light a bulb, using components b, c and d of Question 1. Mark the direction of current in the circuit.

**ANSWER:**

Diagram of a closed electric circuit with a battery cell, bulb and switch is shown below along with the direction of current in the circuit is shown below:

Circuit diagram



**Page No 159:**

**Question 3:**

Differentiate between conductors and insulators. Give three examples of each, one of them being a liquid.

**ANSWER:**

S.No.	Conductors	Insulators
1.	Materials which allow current to pass through	Materials which do not allow current to pass

	them are known as conductors.	through them are known as insulators.
2.	Conductors consist of free electrons as charge carriers.	Insulators do not possess charge carriers.
3.	Examples of conductors are: copper, silver and mercury. Mercury is a liquid metal.	Examples of insulators are: plastic, wood and oil. Oil is a liquid insulator.

**Page No 159:**

**Question 4:**

Instead of plastic, can the electric wires at home be covered with aluminium foil? Justify your answer.

**ANSWER:**

The covering of an electric wire is made of plastic because plastic is an insulator, which does not allow current to flow through it. As a result, a person touching the wire is saved from getting shocked. If instead of plastic the wire is covered with aluminium foil, it can be dangerous as the aluminium foil is a conductor and can conduct electricity and lead to shocks.

**Page No 159:**

**Question 5:**

What is a solar cell? Give two uses of solar cells.

**ANSWER:**

A cell which directly converts the light coming from the sun into electrical energy is known as a solar cell.

Uses:

(1) A collection of solar cells is used as a source of power for satellites launched into space.

(2) In isolated places where there is no electricity, solar cells supply power to the street lights and water pumps.

**Page No 159:**

**Question 6:**

Where is the electricity used at home generated? How does it reach out houses?

**ANSWER:**

Electricity used at home is generated from large power generating stations. Electric current produced from these stations flows to the substations and then reaches our homes through thick wires on poles known as overhead wires (power lines). In some countries, the power lines can also run underground.

**Page No 159:**

**Question 1:**

A student, while making a circuit to make a bulb glow using a dry cell, connected the plastic covering of the wire to the cell, instead of the metal wire inside it. Will current flow in the circuit? Why?

**ANSWER:**

No, the current will not flow in the circuit. For the current to flow in the circuit, the metal wires should be connected to the cell and not the plastic covering. Plastic is an insulator which obstructs the current flow. Therefore, it should be ensured that only the metal portions of wires are connected to the cell because metals are good conductors, which allow the easy flow of current in the circuit.

**Page No 159:**

**Question 2:**

Why do you think electric wires are made out of copper or aluminium though silver is a better conductor of electricity?

**ANSWER:**

We know that silver is a very good conductor of electricity but it is a very expensive metal. Aluminium and copper are nearly as good conductors of electricity as silver but they are much cheaper. Therefore, electric wires are made of copper or aluminium.

**Page No 159:****Question 3:**

A bare wire carrying an electric current can give you an electric shock. Based on this, can you say if your body is a conductor or an insulator?

**ANSWER:**

The human body is made up of more than 70% water, and is a good conductor of electricity. As a result, you will get a shock when you come into contact with a bare, current carrying wire.

**Page No 160:****Question 4:**

As a safety measure, you are advised to wear rubber slippers or shoes when handling electrical appliances. Why?

**ANSWER:**

Electrical appliances carry large amounts of electrical current. Human body is a good conductor of electricity and current can easily pass through the body to the ground leading to electric shocks. Hence, it is advised to wear rubber gloves, slippers or shoes when dealing with electrical appliances as rubber acts as an insulator and breaks the circuit to the ground. This prevents current from flowing through the body.

**Page No 160:**

**Question 5:**

Current in a circuit flows from the positive terminal of a cell to the negative terminal. In which direction does the current flow inside the cell?

**ANSWER:**

In a circuit, electric conventional current flows from the positive terminal of the cell to the negative terminal. You can think of this as a positive charge moving from the positive terminal of the cell to the negative terminal. Once the positive charge reaches the negative terminal, it moves inside the cell from the negative terminal, back to the positive terminal.

Therefore, conventional current is assumed to flow from the negative terminal to the positive terminal inside the cell.

**Page No 160:**

**Question 6:**

Why are only solar cells used as a source of power in satellites?

**ANSWER:**

Satellites are artificial machines which orbit around celestial bodies to gather information or for communication. Satellites get their power from solar panels. A solar panel is a collection of solar cells which generates electricity directly from the light of the sun. As long as a satellite gets sufficient sunlight, it will keep producing enough electricity to power its onboard systems and there is no need to replenish batteries, which cannot be done easily once the satellite is launched.