Electronic Components and their Symbols

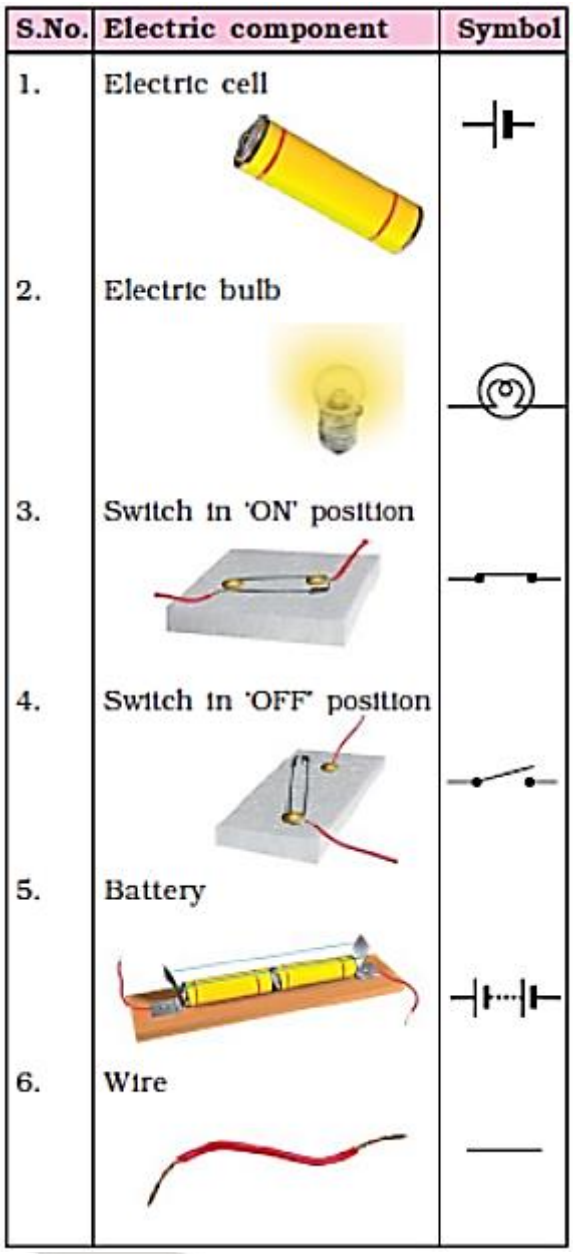

Figure 1: Symbols of different Electric Components

- An **electronic component** can be an element of an electric circuit that helps in its functioning.
- The **electric circuit** allows electricity to flow through it and is used to provide electricity for various purposes such as running electric motors, providing electricity to a bulb or a fan, generating heat.
- A **battery** is defined as a combination of two or more cells. In a battery, the negative terminal of one cell is connected to the positive terminal of the next cell and so on. .
- Batteries are used in several devices such as toys, remote control, torches and transistors.

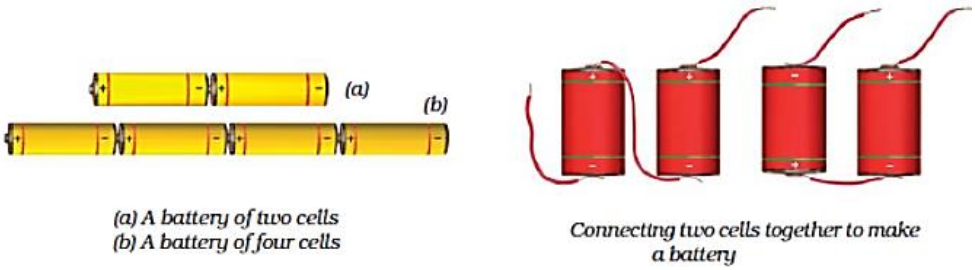

Figure 2 Batteries

Drawing an Electric Circuit Diagram

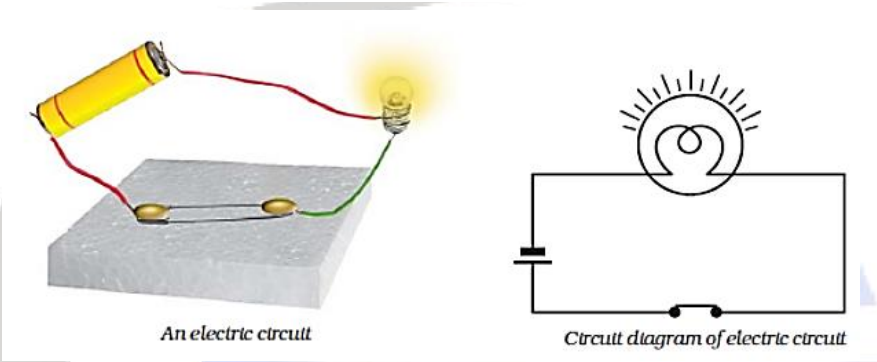

Figure 3: An electric circuit and its circuit diagram

- An **electric circuit** can be drawn on a paper with the help of the symbols that are used for representing the electronic components. Such a representation of an electric circuit using its symbols is called an **Electric Circuit Diagram**.
- The electric circuit diagram consists of a **key** that acts as a **switch** for the circuit. The key can be placed anywhere in the circuit.
- **Open Circuit** - When the key is switched off or opened the circuit is said to be an open circuit as it is incomplete.
- **Closed Circuit** - When the key is switched on or closed the circuit is said to be a closed circuit as it is complete.
- The electric circuit shown here consists of a bulb. The bulb has a wire present inside it called the **Filament.** When the electric current passes through the filament it closed. The filament breaks when the bulb gets fused.

What happens when the filament of a bulb breaks?

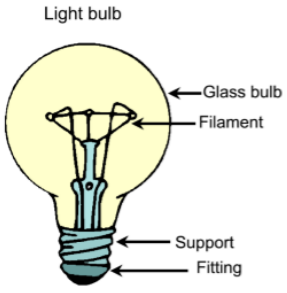

Figure 4: A light bulb

- When the filament of a bulb breaks the circuit of the bulb becomes incomplete. Hence the bulb does not glow as it does not receive any electricity.

The Heating Effect of Electric Current

When an electric current passes through a wire the wire gets heated up. This is known as the *heating effect of electric current.*

The heat that is produced in the wire depends upon the following factors:

- the material of the wire
- the length of the wire
- the thickness of the wire

Many appliances work on the heating effect of electric current such as:

- electric heater
- electric iron
- electric stove
- geysers
- electric coffee maker
- toaster
- hair dryer

Figure 5: Appliances that work on the heating effect of electric current

All these elements produce a high amount of heat when electricity passes through them. However, this amount can change depending upon the requirements of the device. This is so because they contain a coil of wire known as an **element**.

Depending upon the amount of heat required by such appliances different types, sizes and length of wire are used in them. Some virus can break down or melt as they get heated.

Production of Light in a Bulb due to the Heating Effect of Electric Current

Figure 6: Glowing filament of Electric Bulb

The filament of a bulb is a coiled wire that gets hot when electricity is passed through it. This makes the filament glow and as a result, light is produced from the bulb.

What is an electric fuse?

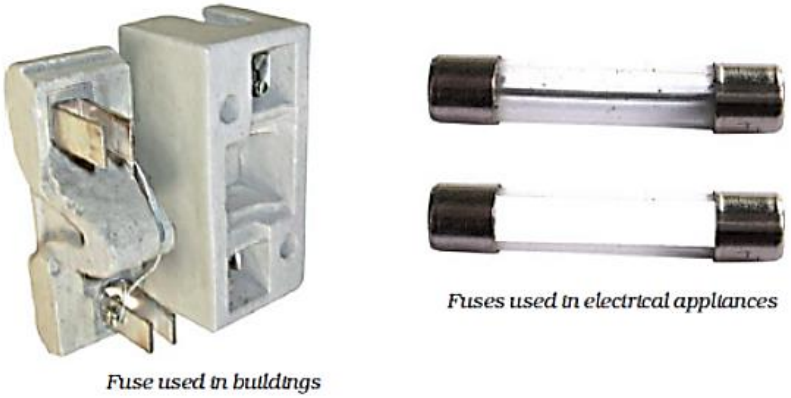

Figure 7: Different types of Fuses

- An electric fuse is a device that is used to prevent the damage that can be caused by an excess of electric current. According to the heating effect of the electric current, a wire becomes hot as current is passed through it. However, if an excess of current is passed through a wire it can melt or break.
- The electric fuse consists of a wire which is made up of a metal or an alloy which has a low melting point. As a result, the wire breaks down easily as high current passes through it. As the wire breaks the circuit of the fuse opens and hence no for the current passes through it.
- This can prevent a short circuit for fire due to high electric current.
- Different types of fuses are used for different devices and some are also available for houses as well.

How can excessive current pass through a circuit?

Reasons why excessive current can pass through a circuit:

- Sometimes we connect different devices to the same socket which results in drawing of more current from that socket. As a result, the load on the circuit increases and it can lead to a short circuit or fire.
- When the insulation of wires gets torn away, the wires can come in contact with each other which cause a spark or may lead to a fire (short circuit).

This is why fuses are used to prevent any kind of short circuit and overloading.

CFL (Compact Fluorescent Lamp)

Figure 8: CFL

- CFLs do not work on the heating effect of electric current.
- They do not have a filament inside them instead they contain two electrodes that produce light.
- These bulbs have a fluorescent coating inside them which makes the light brighter.
- CFLs thus save energy as they do not produce heat along with the light.
- Ordinary bulbs on the other hand waste energy as they get heated while lighting up.

What is an ISI mark?

- ISI stands for Indian Standards Institute which standardizes all electrical appliances.
- Hence if any appliance does not have an ISI mark over it, it means that this appliance does not conform to the standard guidelines of ISI and hence it is not safe to use.
- On the other hand, if any appliance holds such a mark, it means that it is safe to use, it is a quality product and it will not lead to wastage of electricity.

Figure 9: ISI Mark on Electric Geyser

What are miniature circuit breakers (MCB)?

Figure 10: Miniature Circuit Breaker (MCB)

- A **miniature circuit breaker** or **MCB** is generally used instead of fuses.
- A fuse breaks due to excessive current so that the circuit opens up and the damage can be prevented. However, once a fuse breaks down it cannot be used again.
- MCB, on the other hand, is a switch which turns OFF on its own when a circuit overloads. Once the problem the circuit is rectified we can switch ON the MCB once again.

Magnetic Effect of Electric Current

When an electric current is passed through a wire it behaves like a magnet. This is called the magnetic effect of the electric current which was discovered by a scientist, Hans Christian Oersted.

He discovered that the needle of a compass deflects when an electric current is passed through a wire placed near the compass. This indicates that a magnetic field is created near the wire that deflects the needle.

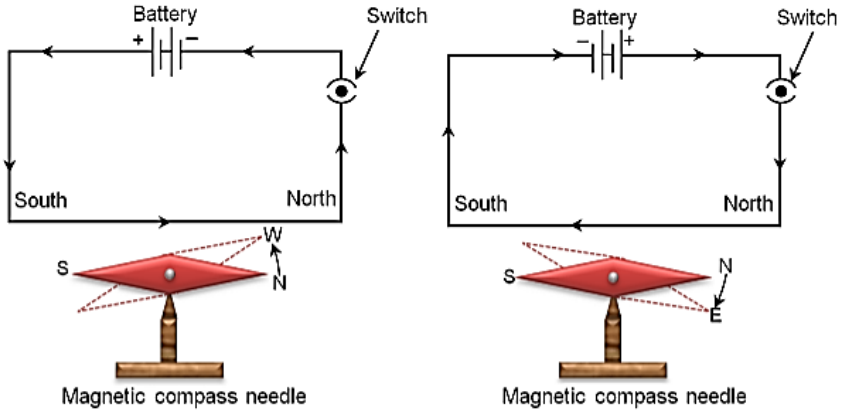

Figure 11: Deflection in Compass Needle due to Electric Current

Electromagnet

- Every magnetic material has a magnetic field up to which the influence of its magnetism can be experienced.
- A magnet whose magnetic field is generated with the help of electric current is called an **Electromagnet**.
- The Electromagnet is formed because of the magnetic effect of the electric current.

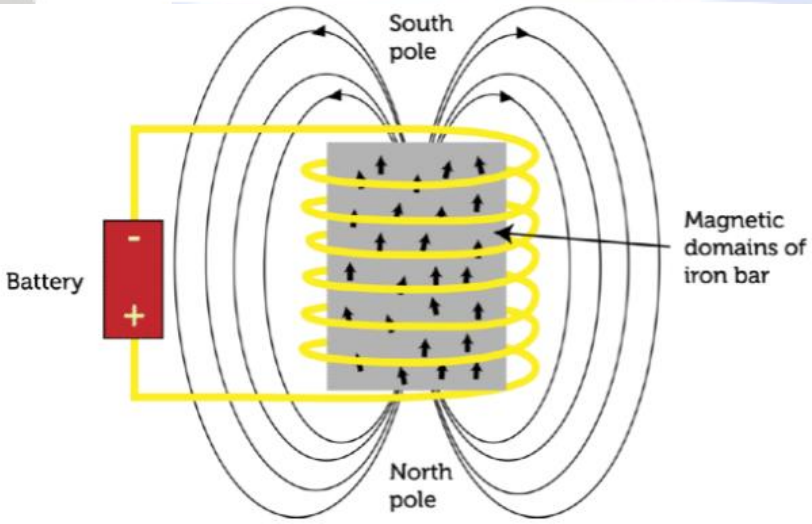

Figure 12: Electromagnet

Applications of Electromagnets

- Electromagnets are used in domestic appliances such as electric bells.
- They are used in toys.

- They are used in all kinds of telecommunication equipment.
- They are used in cranes to separate magnetic materials from junk and to lift heavy objects.
- They are used by doctors to remove any magnetic materials that we have fallen in the eye.

Electric Bell

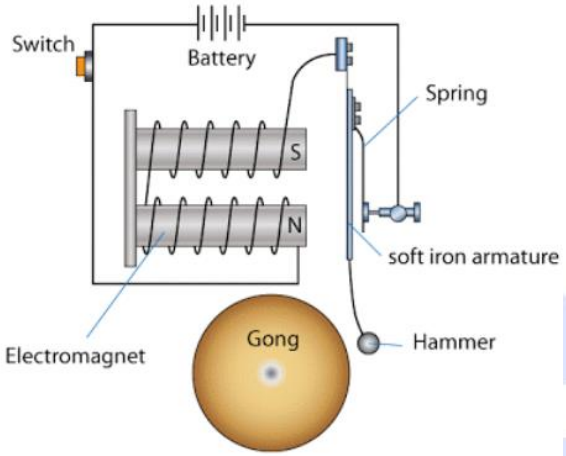

Figure 13: Electric Bell

Components of an Electric Bell

- A coil of wire wound over an iron piece that forms the Electromagnet.
- An iron strip (soft iron armature) which has a hammer attached to it which is joined to the wire coil.
- A contact screw through which is attached to the iron strip.
- A battery which connects the wire coil and the contact screw.
- A switch in the middle of the circuit.

Working of an Electric Bell

- When the switch of the Bell is ON, an electric current flows through the coil of wire which makes the iron piece attached to it act as an Electromagnet.
- As a result, the iron piece attracts the hammer towards itself. The hammer thus hits the bell and a sound is produced.
- As the hammer move towards the iron piece, it moves away from the contact screw which breaks down the circuit.
- As the circuit breaks the wire coil stops receiving any current which makes the electromagnet lose its magnetic effect.
- As a result, the hammer falls back to its original position.
- Then as the hammer falls back the iron strip again comes in contact with the contact screw and the circuit gets completed.
- This again turns the iron piece into an electromagnet and the whole process continues until the bell is switched OFF. This results in the continuous ringing of the bell.