Some Natural Phenomena:

Some natural Phenomena are winds, storms and cyclones. These are destructive phenomena. Here we will discuss two other destructive natural phenomena, lightning and earthquakes.

Electrically Neutral State of Matter:

(i) Most of the substances are electrically neutral states. According to the basics of atomic structure, an atom is made up of electrons, protons and neutrons. An electron has a negative charge, a proton has a positive charge, and no charge on a neutron.

(ii) In an atom, the number of electrons is equal to the number of protons. The equal numbers of negative and positive charges balance each other. Most of the matters are electrically neutral states due to this reason.

Charging by rubbing:

(i) When two objects are rubbed with each other, electrons may get transferred from one object to another. If an object loses some electron, this object becomes positively charged. If an object gains electrons, this object becomes negatively charged. The transfer of charges is responsible for static electricity in various objects. Static electricity is the main reason for lightning.

(ii) Examples:

(i) When a plastic comb is rubbed with dry hair, it acquires a small charge.

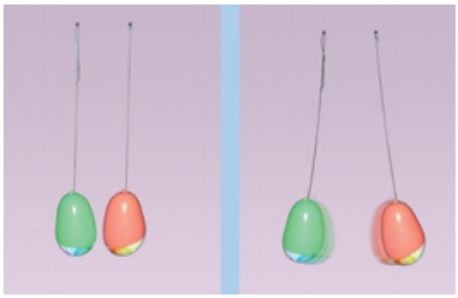
(ii) When a plastic refill is rubbed with polythene, it acquires a small electric charge.

(iii) When we rub a plastic scale on your dry hair, the scale can attract very small pieces of paper.

Types of Charges and their Interaction:

Activity (A):

(i) Two Inflated balloons hang them so that they do not touch each other. Rub both the balloons with a woollen cloth and release them.



(ii) We repeat this activity with the used pen refills. Rub one refill with polythene and place it carefully in a glass tumbler. Rub the other refill also with polythene. Bring it close to the charged refill. We should not touch the charge with your hand. In both activities, we have brought close together the charged objects that were made of the same material and rubbed the same kind.

(iii) Observation: Both the balloons repel each other. A charged refill repels another charged refill.

(iv) Conclusion: The charges of the same kind repel each other.

Activity (B):

(i) Rub a refill and place it gently in a glass tumbler. Bring an inflated charged balloon (balloon rubbed with a woollen cloth) near the refill.

(ii) Observation:

(iii) The charged balloon attracts a charged refill.

(iv) Conclusion: The charges of a different kind attract each other.

From above, we can say:

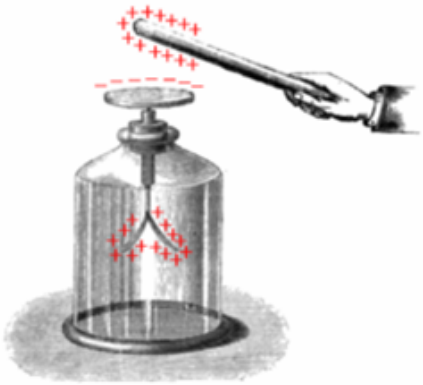
(i) There are two types of charge: positive and negative.

(ii) Same charges repel each other, and different charges attract each other.

- **Transfer of Charge and Earthing:**
- **Electroscope:**

(i) We take an empty jam bottle and a piece of cardboard that is bigger in size than the bottle's mouth. Make a hole in cardboard so that we can insert a metal paper clip. Open out paper clip. Now we cut two strips of aluminium foil of dimension 4 cm × 1 cm each. Hang them on the paper clip as shown. We insert the paper clip in the cardboard lid perpendicular.

(ii) We charge a refill by rubbing polythene and touching it with the paper clip's end. We observe that they repel each other. Now we touch other charged bodies with the end of the paper clip. The foil strips behave in the same way in all cases.



Electroscope

(iii) The aluminium foil strips receive the same charge from the charged refill through the paper clip (metals are good conductors of electricity) and repel each other and become wide open.

(iv) Such a device can be used to test whether an object is carrying a charge or not. This device is known as an electroscope.

- **Earthing:**

(i) Electrical charge can be transferred from a charged object to another through a metal conductor.

When we touch the end of the paper clip gently with hand, we will find that the foil strips of the electroscope come back to their original state.

(ii) We repeat charging of foil strips and touching the paper clip. As we touch the paper clip with hand, the foil strips will meet each other. The reason is that the foil strips lose charge to the Earth through your body, and the foil strip becomes discharged.

The process of transferring charge from a charged object to the Earth is called earthing.

Earthing is provided in buildings to protect us from electrical shocks due to any leakage of electrical current.

Lightning:

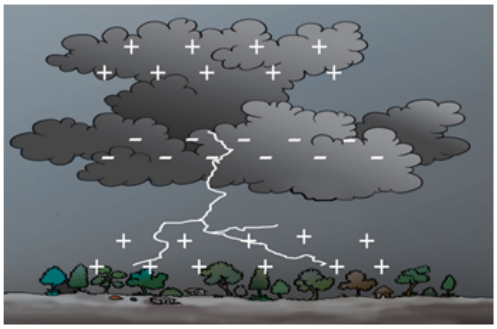
Lightning is a bright streak of light during a thunderstorm with the sound of thunder. The transfer of charge from clouds to clouds or from clouds to the Earth is called lightning. In simple words, lightning is an electric spark that happens on a large scale in the sky by vigorous air currents (upward) and water droplets (downward).

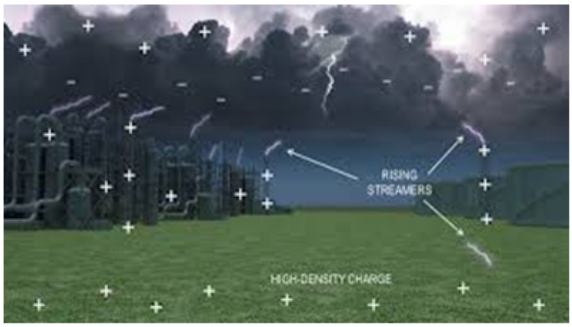
- **The Story of Lightning:**

(i) During a thunderstorm, the air currents move upward, and water droplets move downward. These vigorous movements result in the separation of charges in the clouds.

(ii) From these generated charges, the positive charges accumulate near the upper edges of the clouds, and the negative charges accumulate near the lower edges of the clouds. Scientists are yet to understand the exact reason for this. There is an accumulation of positive charges near the ground also.

(iii) When an accumulation of charges becomes very heavy, air, which is a very bad conductor of electricity under a normal environment, can no longer resist their flow. As a result, the electric charges transfer to the ground and produce bright light and sound streaks across the sky. The process is called an electric discharge.





Dangers of Lightning:

Lightning can damage houses, buildings and trees. It can also kill human life, property and animals.

- **Lightning Safety:**

(i) During lightning and thunderstorm, no open place is safe. A house or a building is a safe place.

(ii) First sound of thunder is an alert to rush to a safer place. After hearing the last thunder, we should wait before coming out of the safe place.

- **Do's and Don'ts during a Thunderstorm**

1. Outside the Home:

(i) Open vehicles, like motorbikes, tractors, construction machinery and open cars are not safe during the lighting.

(ii) In open fields, tall trees, shelters in parks, elevated places do not protect us from lightning strokes. We should take shelter under shorter trees.

(iii) Carrying an umbrella (with a metallic handle) is not a good idea at all during thunderstorms.

(iv) Stay away from poles or other metal objects.

(v) In an open area, if you do not find a place to hide. Do not lie on the ground. Instead, Place your hands on your knees with your head between the hands. This position will make you the smallest target to be struck.

2. Inside the House:

(i) Lightning can strike telephone cords, electrical wires and metal pipes. During a thunderstorm, contact with these should be avoided.

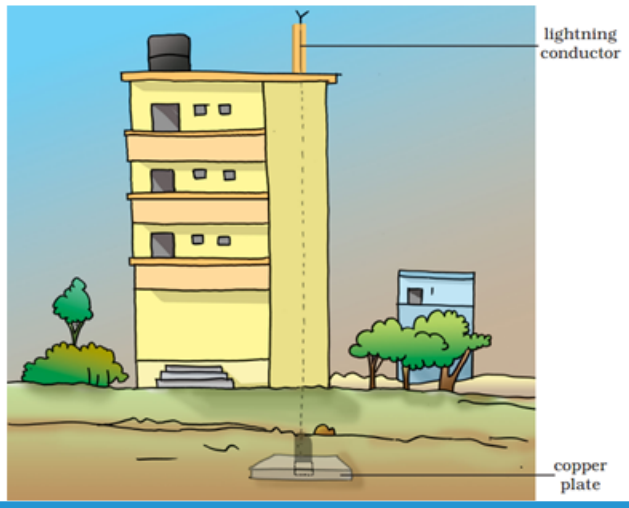
(ii) Bathing should be avoided during thunderstorms to avoid contact with running water.

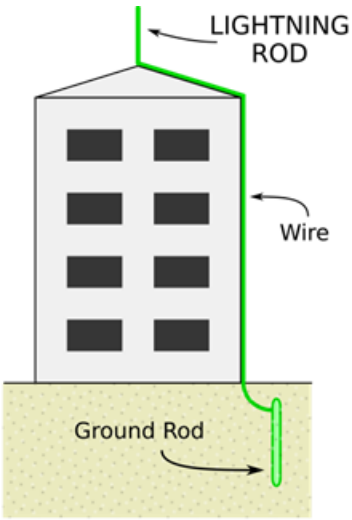
(iii) Electrical appliances like computers, TVs, etc., should be unplugged. Electrical lights can remain on. They do not cause any harm.

- **Lightning Conductor:**

(i) This is a device that protects a building from lightning damage. It is composed of a vertical metallic rod that is taller than the building, is installed in the walls of the building. The base of the metallic rod is attached to the thick metallic wire, which goes very deep inside the Earth.

(ii) When lightning strikes, an electric charge goes to the lightning conductor and goes to Earth. The vertical metallic rod provides an easy route for the transfer of electric charge to the ground.





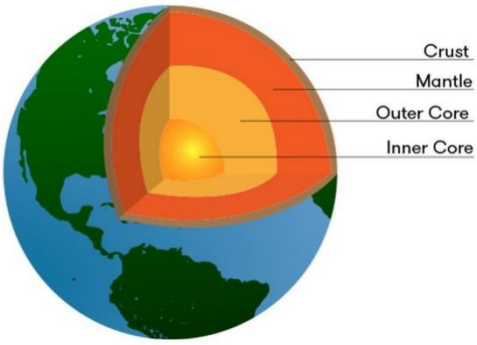
Earthquakes:

(i) Sudden shaking or trembling of the Earth, which lasts for a very short period, is called an earthquake.

(ii) It is caused by a disturbance deep inside the Earth's crust.

Causes of Earthquake:

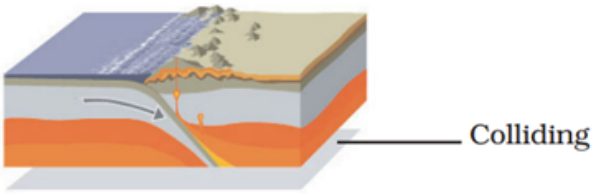
Earth's surface is divided into several layers the crust, mantle, inner core and outer core. The outermost layer of the Earth is divided into several plates. These plates are always moving. As they move past each other or collide, disturbances are caused in the Earth's crust. These disturbances are called earthquakes or tremors.

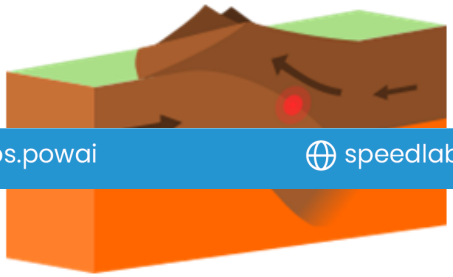


Layers of Earth Surface

(i) The tremors are caused by the disturbance deep down inside the uppermost layer of the Earth called the crust.

(ii) The Earth's crust is made up of several pieces of landmass. These are called tectonic plates. These plates are in continual motion. When they brush past one another, or a plate goes under another due to collision. They cause vibrations in the Earth's crust. These vibrations show us as an earthquake on the surface of the Earth.



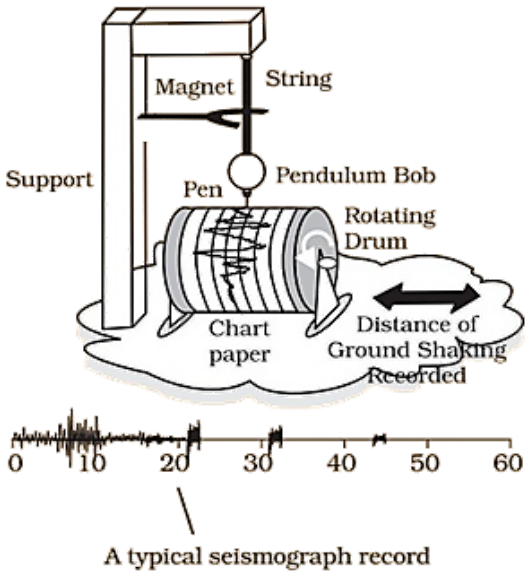


(iii) The boundaries of the tectonic plates, earthquakes are more likely to occur. These boundaries or weak zones are called seismic zones or fault zones. In India, Kashmir, western and central Himalayas, the whole of the north-east, Runn of Kutch, Rajasthan and Indo-Gangetic Plain are at high risk of getting vibrations by an earthquake. Some areas of South India also fall in the danger zone and under the seismic zone.

- **Seismograph:**

(i) Seismograph is a device that records the seismic waves produced by tremors. It is composed of an oscillator (a vibrating rod or a pendulum), a writing device, and a paper roll. The writing device is attached to the oscillator.

(ii) In case of an earthquake, the oscillator begins to vibrate. This creates vibrations in the writing device and starts plotting wave-like patterns on the paper. Scientists then analyze the wave-like pattern to construct a complete map of the earthquake.



Seismograph:

- **Richter Scale:**

(i) The power of an earthquake is expressed in terms of a magnitude on a scale called Richter scale.

(ii) The Richter Scale was developed in 1935 by Charles Richter and Beno Gutenberg of the California Institute of Technology.

(iii) This shows the intensity of an earthquake. The intensity of an earthquake is measured on a logarithmic scale of zero to 10.

(iv) Richter scale is not linear. On the Richter scale, an increase of 2 in magnitude means 1000 times more destructive energy. For example, an earthquake of magnitude 6 has thousand times more destructive energy than magnitude 4.

- **Damages Due to Earthquake:**

(i) Earthquake can cause immense damage to buildings, bridges dams and people.

(ii) The earthquakes can cause floods, landslides and tsunamis.

Kashmir earthquake

Protection Against Earthquake:

Some of the preventive measures are as follows for avoiding or minimizing the damage due to earthquake:

(i) The buildings should be designed so that they can withstand major tremors. Consult qualified architects and structural engineers for making quake-proof buildings.

(ii) The use of mud or timber is better than the heavy construction materials for making the buildings in earthquake-prone areas.

(iii) Cupboards and shelves should be fixed to the walls, so they do not easily fall on someone during an earthquake.

(iv) People should be careful where you hang wall clocks, photo-frames, water heaters etc. so that during an earthquake, they do not fall on people.

- **During the earthquake, take the following steps to protect yourself:**

1. At home:

(i) During an earthquake, we should hide under a table. If you are in bed, keep a pillow over your head and do not move out of the bed.

(ii) We should stay away from tall and heavy objects that may fall on us due to tremors.

2. At outdoors:

(i) In an open area, we should try to move away from buildings, trees, overhead power lines, and other structures.

(ii) If you are in a car or a bus, do not come out. Ask the driver to drive slowly to a clear spot. Do not come out till the tremors stop.