

15

Some Natural
Phenomena

Lesson at a Glance

- **Lightning:** Lightning is an electric spark, but on a huge scale. Lightning is caused by the *accumulation of charges in the clouds*.
- Some objects can be charged by rubbing with other objects.
- The electrical charge produced by rubbing is called **static charge**.
- There are two kinds of charges—**positive charge** and **negative charge**.
It is a convention to call the charge acquired by a glass rod when it is rubbed with silk as positive. The other kind of charge is said to be negative.
- Charges of the *same kind repel each other*, while *charges of different kind attract each other*.
- When charges move, they constitute an *electric current*.
- **Electroscope:** It is a device that can be used to test whether an object is carrying charge or not. Electroscope consists of closely placed two metallic (aluminium) foils or strips.
When both the strips are charged with similar charges, they repel each other and become wide open.
- Electrical charge can be transferred from a charged object to another through a *metal conductor*.
- **Discharged:** When a body loses charge to the earth or any other body, it is said to be *discharged*.
- **Earthing:** The process of transferring of charge from a charged object to the earth is known as *earthing*.
- **The story of Lightning:**
 - Lightning occurs due to *rubbing*.
 - During a thunderstorm, the air currents move upwards while the water droplets move downward. This vigorous movements cause separation of charges. This leads to the *positive charges collect near the upper edges of the clouds*

and *the negative charge to accumulate near lower edges of the clouds.*

- There is an accumulation of **positive** charges near the ground also.
- Negative and positive charges meet, producing streaks of bright light and sound. We see streaks as **lightning**. The process is known as **electric discharge**. The process of electric discharge between different clouds or between clouds and the earth causes lightning.

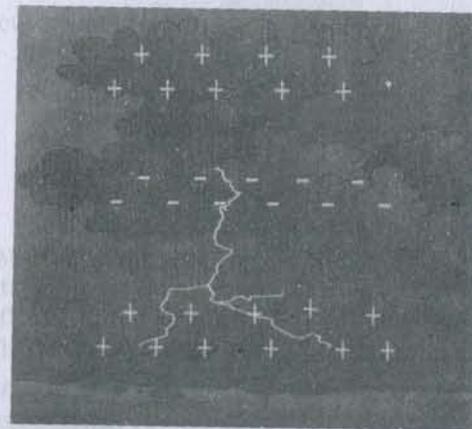


Fig. 15.1. Accumulation of charges leading to lightning.

- Lightning strike could destroy life and property. So it is necessary to take measures to protect ourselves.
- **Lightning conductors:** It is a device used to protect buildings from the effects of lightning.
Lightning conductor consists of:
 - a metallic rod, taller than the building.
 - a portion of the metal rod remains in air at the top of the building.
 - a major portion of the metal rod/wire installed in the walls during its construction.
 - the other end of the rod is connected to a copper plate placed deep into the soil.
 - the rod provides easy route for the transfer of electric charge to the ground without harming the building.

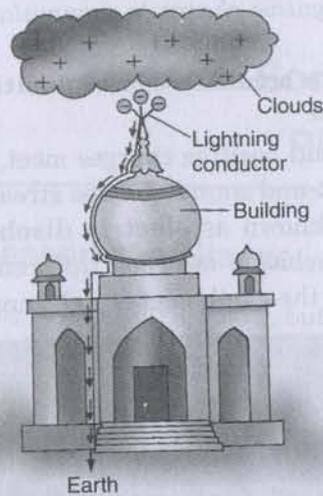


Fig. 15.2. Lightning conductor.

- **Earthquakes:** An earthquake is a *sudden shaking or trembling* of the earth which lasts for a very short time. Earthquakes can cause immense damage to buildings, dams, etc. They may also cause floods, land slides, tsunamis and loss of life.

It is caused by a *disturbance* deep inside the earth's crust. The outer layer of the earth is fragmented. Each fragment is called a **plate**.

Earth's plates are in *continual motion*. When these plates brush past one another or undergo collision, causes earthquakes.

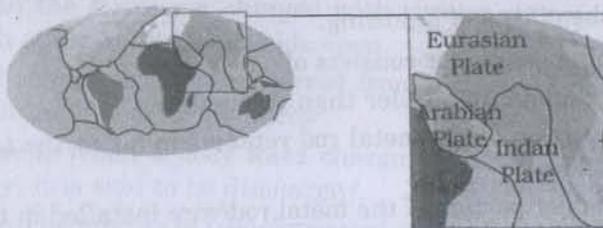


Fig. 15.3 Earth plates.

- **Seismic or fault zones:** *The boundaries of the earth's plate are the weak zones* where earthquakes are more likely to occur. These weak zones are called as **seismic or fault zones**.

- **Seismic or fault zones of India:** In India, the most of the threatened areas are:
 - Kashmir
 - Western and central Himalayas
 - The whole of North-East
 - Rann of Kutch and the Indo-Gangetic Plane.
 - Some areas of south India.
- The power of an earthquake is expressed in terms of a magnitude on a scale, known as the **Richter Scale**. Destructive earthquakes have magnitudes higher than 7 on Richter Scale.

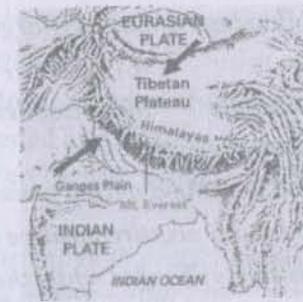


Fig. 15.4. Movements of Indian earth's plate.

- The tremors caused by the earthquake produce waves on the surface of the earth. These waves are called *seismic waves*.
- **Seismograph:** It is an instrument to record seismic waves.
- Richter scale is not linear. This means that an earthquake of magnitude 6 does not have one and a half times the destructive energy of an earthquake of magnitude 4. Actually, an increase of 2 in magnitude means 1000 times more destructive energy.
- **Protection Against Earthquakes**
Earthquakes cannot be predicted. So, the buildings in fault zones/seismic zones should be designed so that they can withstand major tremors.
- Take the following steps to protect yourselves in the event of the earthquake:
 - **If you are at home**
 - Hide under a table till the shaking stops.
 - Do not stand or sit near tall and heavy objects.

– If you are in bed, do not get up. Protect your head with a pillow.

— **If you are at outdoor**

– Drop down away from buildings, trees and overhead power lines.

– If you are in a bus, a car or any other covered vehicle, do not come out till the tremors stop. Ask the driver to drive slowly to a safe place.

■ **TEXTBOOK QUESTIONS SOLVED** ■

Select the correct option in questions 1 and 2.

Q. 1. Which of the following cannot be charged easily by friction?

- (a) A plastic scale (b) A copper rod
(c) A inflated balloon (d) A woollen cloth.

Ans. (b) A copper rod.

Q. 2. When a glass rod is rubbed with a piece of silk cloth the rod:

- (a) and the cloth both acquire positive charge.
(b) becomes positively charged while the cloth has a negative charge.
(c) and the cloth both acquire negative charge.
(d) becomes negatively charged while the cloth has a positive charge.

Ans. (b) becomes positively charged while the cloth has a negative charge.

Q. 3. Write 'T' against true and 'F' against false in the following statements:

- (a) Like charges attract each other.
(b) A charged glass rod attracts a charged plastic straw.
(c) Lightning conductor cannot protect a building from lightning.
(d) Earthquakes can be predicted in advance.

Ans. (a) False (b) True (c) False
(d) False

Q. 4. Sometimes a crackling sound is heard while taking off sweater during winters. Explain.

Ans. The electric discharge takes place between body and sweater. At the time of electric discharge some energy is released. In this case energy is released in the form of crackling sound.

Q. 5. Explain why a charged body loses its charge if we touch it with our hand.

Ans. When we touch a charged body, it loses its charge, due to the process of earthing. Our body is a good conductor of electricity. It transfers the charges to the earth.

Q. 6. Name the scale on which the destructive energy of an earthquake is measured. An earthquake measures 3 on this scale. Would it be recorded by a seismograph? Is it likely to cause much damage?

Ans. The scale used to measure earthquake is Richter Scale. Yes, it would be recorded by a seismograph. The earthquake with magnitude of 3 on Richter Scale is not likely to cause much damage.

Q. 7. Suggest three measures to protect ourselves from lightning.

Ans. Three measures of protection are:

- (i) Stay under covered area or inside the room.
(ii) We should not use TV or phone during lightning.
(iii) We should not take bath during lightning.

Q. 8. Explain why a charged balloon is repelled by another charged balloon whereas an uncharged balloon is attracted by another charged balloon.

Ans. A charged balloon is repelled by another charged balloon because both the balloons contain same type of charges. We know that like charges repel each other. A balloon is charged while other is uncharged so they have no same charge. Therefore charged balloon attracts uncharged balloon.

Q. 9. Describe with the help of a diagram an instrument which can be used to detect a charged body.

Ans. An electroscope is used to detect that a body is charged or not. It works on the principle that like charges repel while unlike charges attract each other.

When the metal strips repel each other proves that the body is charged because repulsion is the sure test to detect that a body is charged or not.

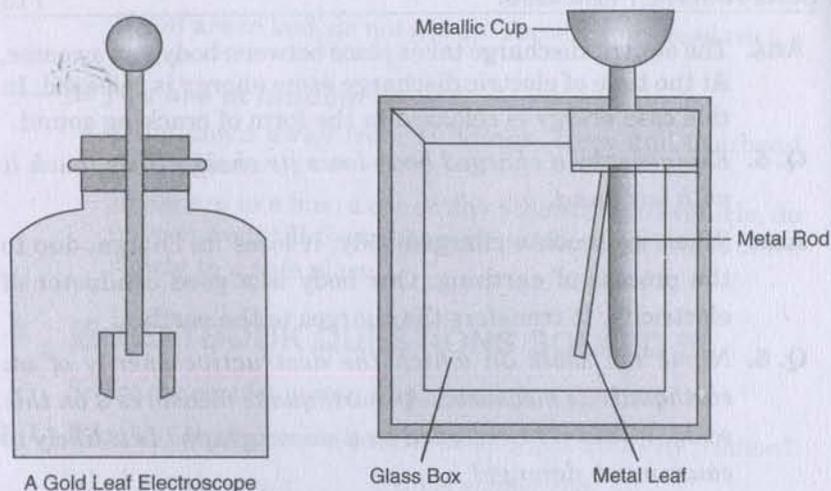


Fig. 15.5. A simple electroscope.

Q. 10. List three states in India where earthquakes are more likely to strike.

Ans. (i) Kashmir (ii) Rajasthan (iii) Gujarat
(iv) Punjab

Q. 11. Suppose you are outside your home and earthquake strikes. What precautions would you take to protect yourself?

Ans. (i) We should move to an open space.
(ii) We should not take shelter under trees or buildings.
(iii) If we are driving, we should slow down the vehicle and move slowly away that area to a clear spot.

Q. 12. The weather department has predicted that a thunderstorm is likely to occur on a certain day. Suppose you have to go out on that day. Would you carry an umbrella? Explain.

Ans. No, we will not take an umbrella at the time of thunderstorm. The taking umbrella will increase the risk of lightning. The wide objects are more prone to lightning strike.