

## Chapter 15

### Some Natural Phenomena

#### Exercise 5(A)

##### Question 1

Which of the following cannot be charged easily by friction?

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

##### Answer

b) A copper rod.

Reason — When an object is charged by friction, charges develop on the two materials involved in friction. Copper being a good conductor, allows the charges to move easily and redistributes the excess charges quickly and doesn't retain a significant charge through friction. Therefore, it's difficult to charge a copper rod through friction.

##### Question 2

When a glass rod is rubbed with a piece of silk cloth, the rod

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

##### Answer

becomes positively charged while the cloth has a negative charge.

Reason — When two objects are rubbed against each other, electrons transfer from one material to the other. This transfer of electrons leads to one material becoming positively charged (losing electrons) and the other becoming negatively charged (gaining electrons). 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.

##### Question 3

Write T against true and F against false in the following statements.

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

##### Answer

(a) Like charges attract each other. — False

Reason — Like charges repel each other.

(b) A charged glass rod attracts a charged plastic straw. — True

(c) Lightning conductors cannot protect a building from lightning. — False

Reason — Lightning conductors protect a building from lightning.



(d) Earthquakes can be predicted in advance. — False  
Reason — Earthquakes cannot be predicted in advance.

**Question 4**

Sometimes, a crackling sound is heard while taking off a sweater during winter. Explain.

**Answer**

The crackling sound heard when removing a sweater in winter is a result of the friction between the woollen fabric and the body or the shirt worn underneath. This friction generates opposite electric charges, and the discharge of these charges produces the audible crackling sound.

**Question 5**

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

**Answer**

When we touch a charged body, the charges get conducted to the earth through our body and the conductor loses its charge. This process of transferring of charge from a charged object to the earth is called earthing.

**Question 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?

**Answer**

The destructive energy of an earthquake is measured on Richter scale. This scale has the readings from 1 to 10. An earthquake measuring 3 on Richter scale would be recorded by a seismograph. However, earthquakes of this magnitude are not likely to cause significant damage.

**Question 7**

Suggest three measures to protect ourselves from lightning.

**Answer**

Three measures to protect ourselves from lightning are:

During lightning, no open place is safe. We should be inside a house or a building. If travelling by car or bus, we should shut the doors and windows of the vehicle.

Electric wire, telephone lines, and metal surfaces should never be touched during lightning. In case no shelter is available, we should not lie on the ground. Instead, we should squat low on the ground with hands on the knees and head between the hands. This position makes us the smallest target to be struck.

**Question 8**

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

**Answer**

The repulsion between two charged balloons occurs because both balloons carry the same type of charge, resulting in like charges repelling each other. On the other hand, when a charged balloon is brought close to an uncharged balloon, due to induction, the uncharged balloon acquires opposite charge. Due to this they are attracted to each other.

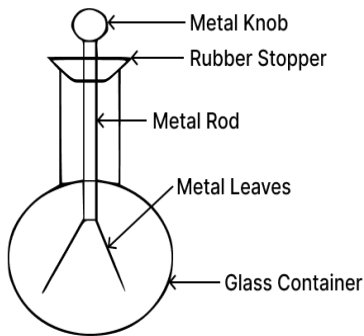


### Question 9

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

Answer

The instrument used to detect a charged body is known as electroscope.



It consists of a metal rod on which two leaves of aluminium foil are fixed to one end and a metal disc at the other end. The leaves are kept inside a conical flask, and it is corked to isolate them from the atmospheric air.

When a charged body comes in contact with the metal disc, the aluminium leaves move away from each other because some charges get transferred to aluminium leaves through the metal rod. This process is called charging by conduction. The charges on the leaves and the charged body are of the same nature, and thus, the leaves of aluminium repel each other. If the body is not charged then they would attract each other.

### Question 10

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

Answer

Three earthquake prone states in India are:

1. Kashmir
2. Gujarat
3. Assam

### Question 11

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

Answer

Precautions that I will take to protect myself in case of an earthquake while I am outside are: I will find a clear spot, away from buildings, trees and overhead power lines and then I will drop to the ground.

If I am in a car or a bus, I will not come out. I will ask the driver to drive slowly to a clear spot. I will stay inside the vehicle till the tremors stop.

### Question 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.

**Answer**

I will not carry an umbrella during a predicted thunderstorm. A thunderstorm is accompanied by lightning. The lightning might travel along the metallic rod of the umbrella and cause an electric shock to the person holding it, making it an unsafe choice in such weather conditions.

**Exercise 15(B)**

**Question 1**

What is an earthquake and what causes it?

Answer

An earthquake is the shaking of the Earth's surface caused by disturbances within the Earth's crust. These disturbances are primarily due to the movement of tectonic plates. When these plates collide, slide past each other, or one goes under another, it creates friction and pressure, which is released as seismic waves, causing the earthquake. Volcanic eruptions can also trigger tremors.

**Question 2**

How is the strength of an earthquake measured?

Answer

The strength of an earthquake is measured on the Richter scale. The scale ranges from 1 to 10, with higher numbers indicating stronger and more destructive earthquakes. Earthquakes with a magnitude greater than 7 are generally considered destructive.

**Question 3**

What is a seismograph?

Answer

A seismograph is an instrument used to detect and record seismic waves produced by earthquakes. These waves are recorded on a paper or digital display, providing information about the earthquake's magnitude and location.

**Question 4**

What are seismic zones?

Answer

Seismic zones, also known as fault zones, are areas where earthquakes are more likely to occur. They are typically located along the boundaries of tectonic plates where these plates interact.

**Question 5**

How does lightning occur?

Answer

Lightning is a natural phenomenon caused by an electric discharge between oppositely charged regions, either within a cloud, between clouds, or between a cloud and the ground. The separation of positive and negative charges within clouds creates a potential difference, and when the charge becomes strong enough, it discharges, creating a bright flash of light (lightning).



### Question 6

What precautions should be taken during a thunderstorm?

Answer

During a thunderstorm, it's crucial to avoid being outside, especially in open areas. If you are outside, seek shelter in a sturdy building or a car (with the windows closed). Avoid standing near tall objects like trees or power lines, and do not touch metal objects or electrical appliances. If you are indoors, stay away from windows and electrical outlets.

### Question 7

Why is it dangerous to use an umbrella during a thunderstorm?

Answer

Umbrellas, especially those with metal components, can conduct electricity. If lightning strikes nearby, the charge could travel down the umbrella's metal parts, potentially causing an electric shock.

### Question 8

How can you detect if an object is charged?

Answer

An electroscope is an instrument used to detect the presence of an electric charge on an object. When a charged object is brought near the electroscope, it causes the leaves of the electroscope to either diverge (if the charge is similar) or come together (if the charge is opposite), indicating the presence of a charge.

## Exercise 15(C)

### Question 1

What is an electroscope?

Answer

An electroscope is a device for detecting and determining the presence of electric charges using electrostatic attraction and repulsion.

### Question 2

Define earthing.

Answer

The process of transferring the charge from a charged object to the ground or earth is called earthing.

### Question 3

What is the primary purpose of providing earthing in buildings?

Answer

There may be an accidental leakage of electric current in the buildings. Besides, during monsoons, a live wire can come in contact with the building wall. In such cases, earthing helps divert the current's path to earth to protect us from an electric shock. Therefore, the primary purpose of providing earthing in buildings is to protect ourselves from electrical shocks due to any electrical current leakage.



**Question 4**

What happens when a plastic comb rubbed with dry hair attracts small pieces of paper?

Explain.

Answer

A plastic comb gets electrically charged due to rubbing, & therefore, it attracts small pieces of paper that are neutral, as a charged body can attract an uncharged body.

**Question 5**

What causes an earthquake?

Answer

The tectonic plates are in continuous motion. When they brush with each other, a plate goes under another because of collision, and that causes a disturbance in the earth's crust. This disturbance is shown up as an earthquake on the earth's surface. Volcanic eruptions are also a cause of tremors on the earth's surface.

**Question 6**

How is an earthquake measured?

Answer

The magnitude of an earthquake is measured in terms of a magnitude on a scale known as the Richter scale. Destructive earthquakes have an intensity higher than 7 on the Richter scale.

**Question 7**

What is a seismograph?

Answer

An earthquake produces some waves on the surface of the earth. These waves are called Seismic Waves. These waves are recorded by a device known as the seismograph.

**Question 8**

What are fault zones?

Answer

The movement of tectonic plates causes earthquakes. The boundaries of these plates are the vulnerable zones where earthquakes are more likely to occur. These vulnerable zones are also known as seismic or fault zones.

**Question 9**

Why can a copper rod not be charged by friction if held by hand?

Answer

Copper is a conducting metal, and the electric charge is created on its surface by rubbing with another substance. It flows through our fingers and body into the soil while left uncharged.

**Question 10**

If a glass rod is rubbed against a silk cloth, the rod

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

Answer

The answer is (b) becomes positively charged while the cloth has a negative charge.



Explanation- When two objects are rubbed, they generate opposite charges. According to the law of convention, it is known that the rod acquires a positive charge(+) and the cloth acquires a negative charge(-).

### Question 11

Write T for true and F for false in the following statements-

- (a) Like charges attract each other. (T/F)
- (b) A charged glass rod gets attracted to a charged plastic straw. (T/F)
- (c) Lightning conductors cannot protect a building from lightning. (T/F)
- (d) Earthquakes can be predicted in advance. (T/F)

Answer

- a) False- Unlike charges attract each other while the like charges repel each other.
- b) True- A charged plastic straw has a negative charge on its surface, while the glass rod has positive charges on its surface. Unlike charges that attract each other, they both attract each other.
- c) False – When lightning occurs, the atmospheric charges are transferred to the earth directly by a lightning conductor. Therefore the building is protected from lightning.
- d) False- Even though the earthquake's causes are known, there are no instruments that are invented to detect them in advance. Therefore earthquakes cannot be predicted in advance.

### Question 12

Sometimes, a crackling sound is heard while wearing a sweater during winter. Explain.

Answer

When we take out the sweater, the woollen sweater gets charged due to friction between the sweater and the body. This results in a crackling sound.

### Question 13

Why does a charged body lose its charge when we touch it with our hand? Explain.

Answer

The charges get conducted to the earth by our body when we touch them, and the conductor loses its charge. This phenomenon is known as electric discharge.

### Question 14

What is the name of the scale on which the destructive energy of an earthquake is measured? An earthquake measures 3 on this scale. Would a seismograph record it? Is it likely to cause a lot of damage?

Answer

The Richter scale is a device used to measure an earthquake's destructive energy. The scale has a reading range from 1 to 10. A seismograph would record an earthquake measuring 3. The magnitude of a scale up to 3 would not be considered destructive and does not cause much damage. An Earthquake of magnitude 5 is deemed harmful to nature.

### Question 15

Suggest three safety measures to protect ourselves from lightning.

Answer

There are various ways to protect ourselves from lightning are-



- (i) Always remain in a closed place; if you are in a car, stay there until the lightning is over and keep all the windows closed.
- (ii) Never touch electrical wires, telephone cables or metal pipes.
- (iii) Do not bathe in running water; this may cause an electric shock.

**Question 16**

Why is a charged balloon repelled by another charged balloon, whereas another charged balloon attracts an uncharged balloon?

Answer

The surface charge of the balloons is similar; hence, they get repelled. When a charged balloon is kept close to an uncharged balloon due to the induction of charges, it acquires charges which are opposite to that of a charged balloon. As those charges attract each other, the uncharged balloon gets attracted by the charged balloon.

**Question 17**

Suppose you are out of your home, and an earthquake occurs. What precautions are to be taken to protect from an earthquake?

Answer

The following precautions should be taken when the earthquake strikes-

- (a) Find an open field and stay away from buildings, trees, electric wires and poles.
- (b) If you are driving a car, then go to an open field and do not come out of your car.

**Question 18**

The weather forecasting department has predicted that a thunderstorm will likely occur on a day. Suppose you are going out on that day. Would you carry an umbrella?

Answer

No, it is not safe. One should not carry an umbrella when it is a thunderstorm. The thunderstorm occurs along with lightning, and the charges might travel from the cloud to the metal rod of the umbrella and might cause you to have an electric shock if you are carrying it.

**Question 19**

Electric current has to be passed from one body to another. For this purpose, the bodies must be joined-

- (a) cotton thread.
- (b) plastic string.
- (c) copper wire
- (d) rubber band

Answer

The answer is (c) copper wire

Explanation- Copper is a good conductor of electricity. Plastic, rubber and cotton are insulators of electricity.

**Question 20**

The movement of the earth's plates causes-

- (a) cyclones
- (b) lightning
- (c) earthquakes



(d) thunderstorms

Answer

The answer is (c) earthquakes

Explanation- Earthquakes occur when the earth's plates brush past one another. Earthquakes can cause damage to buildings and dams.

**Question 21**

State whether the following statements are True or False-

- (a) Earthquakes occur all time all over the world.
- (b) The earth's outer layer plates are always in continuous motion.
- (c) Earthquakes on the earth can also be caused by the eruption of a volcano.
- (d) The electric discharge process cannot occur between cloud and the earth.
- (e) Bathing outside should be avoided during a thunderstorm.

Answer

- a) True.
- b) True.
- c) True.
- d) False- The process of electric current discharge occurs between the clouds and the earth.
- e) True

**Question 22**

Is it possible to predict the occurrence of an earthquake?

Answer

No, it is impossible to predict the occurrence of an earthquake.

**Question 23**

What will happen if a charged straw is brought close to another uncharged straw?

Answer

The two straws will attract each other

**Question 24**

Explain how lightning takes place.

Answer

During the formation of a thunderstorm, the air currents move upwards while the water drops move downwards. These vigorous movements of air currents cause the separation of charges. The positive charges accumulate near the upper part of the clouds, and the negative charges get near the lower regions. There is an accumulation of positive charge near the ground as well. When the intensity of the accumulated charges becomes large, the air cannot resist the charge flow. As a result, negative & positive charges meet, creating a streak of bright light and sound called lightning and thunder.

**Question 25**

Mention three safety measures that you will take to protect yourself if an earthquake strikes when you are inside the house.

Answer

Take the shelter under a table and stay there till the shaking stops.



Stay away from the tall and heavy objects that can fall on you.

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

**Question 26**

Explain why a wireless telephone is safer than a landline telephone during lightning.

Answer

Lightening is a process of electrical discharge. During lightning, electric charge can pass through landline telephone wires which can be dangerous. So, it is comparatively safer to use a wireless phone in place of a landline telephone during Lightning.

**Question 27**

What precautions would you take when lightning occurs?

Answer

1. Stay away from open vehicles, like motorcycles, tractors, construction machinery, etc.
2. Do not take shelter in the open fields, tall trees, parks and high places.
3. Do not carry an umbrella when lightning strikes.
4. Stay away from poles and other metal objects.
5. Squat down on the ground. Put your hands on your knees and your head between the hands.

**Question 28**

If the metal clip used in an electroscope is changed by an ebonite rod and a charged body is brought in touch with it, will there be any effect on the aluminium strips? Explain.

Answer

If a metal clip used in the electroscope is changed by an ebonite rod, and when a charged body is kept in touch with it, aluminium strips will show no repulsion. No charge gets transferred to the ebonite rod as it is a bad conductor of electricity.

**Question 29**

State any two precautions people living in seismic zones should observe to protect against earthquakes.

Answer

The buildings in these zones should be made so that they can withstand earthquakes. Modern building technology is making it possible.

Mud and timber should be used instead of heavy construction materials. The roof should be kept as light as possible.

The cupboards and shelves should be fixed to the walls, so they do not fall easily.

**Question 30**

What happens when two moving plates of the earth's crust collide head-on?

Answer

When two tectonic plates collide head-on, they push each other up and form mountains. This process created the Himalayas and other great mountain ranges.

**Question 31**

Why does a charged body loses its charge when we touch it with our hand?

Answer

The process of transfer of a charge from a charged body to the earth is called Earthing.



**Question 32**

Explain how you will charge a ballpoint pen refill by the method of friction.

Answer

To charge a ballpoint pen refill, rub it with a wool cloth. It becomes negatively charged.

**Question 33**

Explain the process of occurrence of lightning.

Answer

During a thunderstorm, the air current moves upwards and the water drops move downwards. These movements cause the separation of charges. The positive charge is collected near the upper edges of the clouds, while the negative charge accumulates near the lower edge. There is an accumulation of positive charge near the ground also. When the magnitude of the accumulated charge becomes very large, the air, which is usually a poor conductor of electricity, can no longer resist its flow. Positive and negative charges meet, producing streaks of bright light and sound. We see streaks as lightning. This process is called an electric discharge. The electric discharge method can occur between two or more clouds or between clouds and the earth.

**Question 34**

Explain the precautions to be taken during lightning or thunderstorms.

Answer

Precautions to be taken during lightning or thunderstorms are-to find a safe place indoors- Outdoor places are not safe during Lightning or thunderstorms. A house or building is a safe place. If we travel by car or bus, we are safe inside with the windows and doors of the vehicle closed.

Carrying an umbrella is not a good idea during thunderstorms. If you are in a forest, take shelter under shorter trees, not tall ones. If no shelter is available, stay far away from all trees. Stay away from poles or any other metal objects.

We should not lie directly on the ground. Instead, squat low on the ground. Place hands on your knees with your head in between your hands. Such a position will make us the smallest target to be affected.

Lightning can strike telephone cords, electrical wires and metal pipes inside the house. During a thunderstorm, contact with these must be avoided. It is safer to use mobiles and cordless phones. However, it is not good to call a person who is receiving your phone through a wired phone.

Bathing outside should be avoided during thunderstorms to avoid contact with running water. Electrical appliances like computers, television, etc., should be unplugged. Electrical lights can remain on. They do not cause any harm.

**Question 35**

What are the precautions to be taken during an earthquake?

Answer

The following precautions to be taken during an earthquake are-

**If you are at home-**

1. Take shelter under a table and be there until the shaking stops.



2. Stay away from all the tall and heavy objects because they may fall on you.
3. If you are in a bed, do not get up. Protect your head with a cushion or pillow.

**If you are outdoors-**

1. Find a clear place, away from buildings, trees and overhead electric lines.
2. If you travel in a car or a bus, do not come out. Ask the driver to drive slowly to a safe place. Do not come out till the tremors stop.

**Exercise 5(D) Practice**

**MCQ**

1. An electroscope is a device which is used to find if an object is  
(a) charged (c) free of cracks  
(b) magnetic (d) hot
2. Electric current is to be passed from one body to another. For this purpose the two bodies must be joined by  
(a) cotton thread (c) copper wire  
(b) plastic string (d) rubber band
3. The movement of the earth's plates causes  
(a) cyclones (c) earthquakes  
(b) lightning (d) thunderstorms
4. Two charged objects are brought close to each other. Choose the most appropriate statement from the following options:  
(a) they may attract  
(b) they may repel  
(c) they may attract or repel depending on the type of charges they carry  
(d) there will be no effect
5. Which of the following is not likely to cause Tsunami?  
(a) A major nuclear explosion under sea  
(b) Earthquake  
(c) Volcanic eruption  
(d) Lightning
6. The earth's plate responsible for causing earthquakes is  
(a) the crust of the earth  
(b) the mantle of the earth  
(c) the inner core of the earth  
(d) the outer core of the earth



7. Consider the list of terms given below:

(i) Seismic Zone (iii) Mantle

(ii) Fault Zone (iv) Inner Core

The boundaries of the earth's plate are known as

(a) (i) & (ii) (c) (iii) & (iv)

(b) (i) & (iii) (d) (ii), (iii) & (iv)

8. The outermost layer of earth is called

(a) mantle (c) crust

(b) outer core (d) inner core

9. Major earthquakes are less likely to occur in

(a) North East India (c) Rann of Kutch

(b) Rajasthan (d) Orissa

10. Consider the list of terms given below

(i) Tsunami (iii) Floods

(ii) Landslide (iv) Lightning

Earthquakes can cause

(a) (i), (ii) & (iii) (c) (ii), (iii) & (iv)

(b) (ii) & (iv) (d) (iii) & (iv)

### VERY SHORT ANSWER QUESTIONS

11. State whether the following are True or False.

(a) Earthquakes occur all the time all over the world.

(b) The plates of the outermost layer of the earth are always in continuous motion.

(c) Tremors on the earth can also be caused by the eruption of a volcano.

(d) The process of electric discharge cannot occur between clouds and the earth.

(e) Bathing outdoors should be avoided during thunderstorm.

12. Is it possible to predict the occurrence of an earthquake?

13. If a charged plastic straw is brought near another uncharged plastic straw, what will happen?

14. The aluminium strips in an electroscope are replaced by plastic strips and a charged body is brought in contact with the metal clip. What will happen



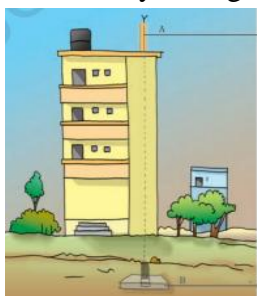
15. Plastic straws A and B are rubbed with dry cotton cloth. What will happen if they are brought near each other?

### SHORT ANSWER QUESTIONS

16. During the construction of a building the lightning conductor was left hanging in the air by mistake. Would the lightning conductor be still effective? Explain.

17. If air and cloud were good conductors of electricity, do you think lightning could occur? Explain.

18. Identify the lightning conductor and the copper plate in Fig. 15.2.



19. If the materials used for constructing a building were good conductors, do you think lightning will strike the building. Will the lightning conductor be still required to be installed in the building?

20. You might have observed on a dry day that when you touch the screen of a television or computer monitor (with picture tube), you get a slight shock. Why does it happen?

21. Explain how does lightning conductor protects a building from getting struck by lightning.

22. In an electroscope if a negatively charged body is brought in contact with the metal clip, the strips of the electroscope diverge. If now another charged object carrying equal amount of positive charge is brought in contact with the clip, what will happen?

23. The strips of an electroscope diverge when a charged body is brought in contact with the metal clip. Now the clip is touched gently by our hand. What will happen to the strips? Explain.

### LONG ANSWER QUESTIONS

24. Explain how lightning takes place?

25. Mention three precautions that you will take to protect yourself if earthquake strikes when you are inside the house.

26. Explain why it is safer to use a wireless telephone instead of a landline telephone during lightning.

27. What precautions would you take if lightning occurs while you are outside the house?

28. If the metal clip used in the electroscope is replaced by an ebonite rod and a charged body is brought in contact with it, will there be any effect on the aluminium strips? Explain.