

Some Natural Phenomena

Check point 1

Q. 1. Explain giving examples of the concept of lightning.

Answer: A very quick electrical discharge that occurs between a cloud and the ground, between two clouds or within the clouds is called lightning. It can be seen as bright flash and is followed by the sound of the thunder.

The figure below shows the lightning between the cloud and ground.



The lightning frequency on earth is about 40-50 times a second.

The positive charges collect near the upper edge and the negative charges accumulate near the lower edge of the cloud and also near the ground. As the charge gets accumulated, its magnitude becomes very large and lightning occurs.

Q. 2. Explain, why when a plastic comb is rubbed with hair then it attracts tiny pieces of papers.

Answer: This occurs due to electrostatic charge means the charges which are at rest. When the comb is rubbed with hair it gets charged, and when the comb is brought near the neutral paper strips than within the papers strips, the electrons get either repelled or attracted according to whether the comb has a negative or a positive charge. This makes the paper strips have an unlike charge in the direction of the comb, and makes them to get attracted towards the comb as shown in the figure below.



Q. 3. Name the scientist who showed that lightning and spark are the same phenomena.

Answer: In 1752 an American scientist Benjamin Franklin was the scientist who showed that the lightning and sparks from our clothes are essentially the same phenomena. The figure below is the image of Benjamin Franklin.



Check point 2

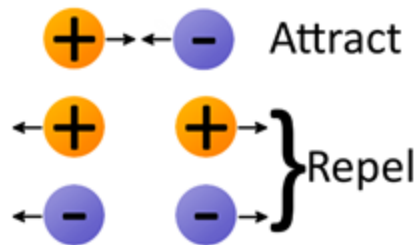
Q. 1. State how many types of charges are there. Give their names.

Answer: There are mainly two type of charges namely Positive Charge and Negative Charge

1. Positive Charge = When an electron is removed from the object it makes an object deficient of electrons and the object acquires the positive charge.

2. Negative Charge = When electrons are added to an object it gives the excess of electrons to it and makes it negatively charged.

When the number of positive and negative charges are equal than the object is said to be neutral.

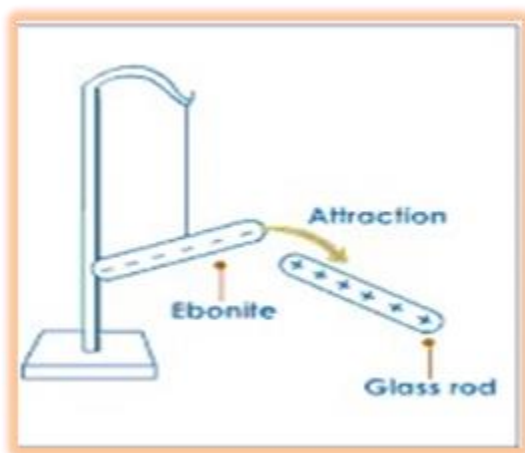


Q. 2. Explain what happens when a positive charge is kept near a negative charge?

Answer: When a positive charge is kept near a negative charge then there will be an attraction between the positive and negative charge because unlike charges attract each other.

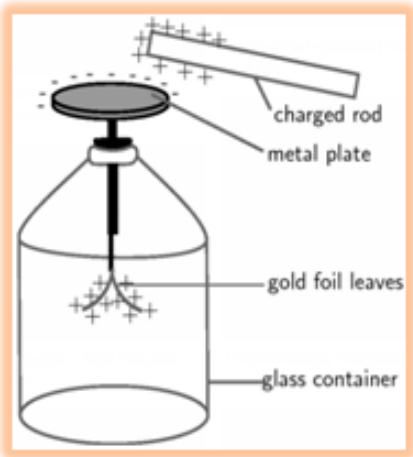
For example: When an ebonite rod and glass rod are brought close to each other there will be an attraction as shown in the figure below.

A charged glass rod attracts a charged plastic straw.



Q. 3. Briefly, explain how the charge can be detected with the help of an electroscope.

Answer: An Electroscope is an instrument which can be used to detect whether a body is charged or not. The following figure shows the simple Electroscope.



Construction: An electroscope has a brass rod passing through a tight fitting cork in a glass bottle. A pair of thin gold leaves is attached to the lower end of the brass rod. To protect the gold leaves from an external electric charge the lower half of the bottle is lined with tin foil which is 'earthed' by connecting it to the table.

Working: When a charged rod is touched to the metal disc, the charge is transferred to the gold leaves and they diverge.

Q. 4. Give an application for earthing.

Answer: Earthing is the proper connection of the exposed metal parts of an electric circuit to the ground. It is accomplished by thick copper wires its application is as follows.

1. It protects the appliances and the human beings in case of insulation fail or accidental short circuit.
2. It acts as the circuit breaker when the live wire touches the earth wire, and a large current flows through it.
3. Lightning conductor uses Earthing During lightning metal rod is connected to the heavy metal plate to protect the building and people inside it from the electric discharge as shown in the figure below.



Check point 3

Q. 1. Briefly, explain how lightning occurs.

Answer: The formation of clouds involves friction between water droplets in the atmosphere. The friction charges the particles in the atmosphere. Among the positive and negative charges, the negative charges accumulate at the bottom of the cloud and the positive charges at the top.

As the accumulation of the charges increases, the cloud will induce positive charges on the ground nearby. As the number of charge increases, the negative charges on the cloud tend to make a path towards the ground, and it results in a narrow streak of electrical discharge, which we call lightning. The figure below shows the lightning.



Q. 2. We should avoid carrying an umbrella during lightning. Explain why.

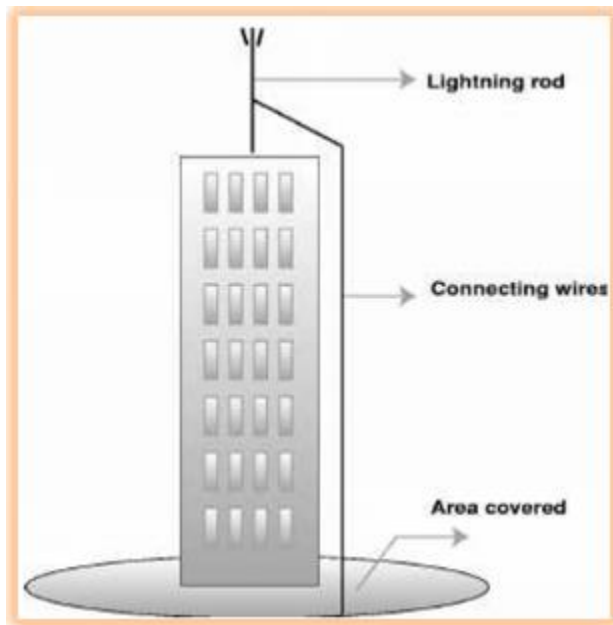
Answer: An umbrella can increase your chances of being hit by lightning due to the following reasons

1. It makes you the tallest object in the area which will make you prone to lightning.
2. A metal rod is the good conductor of electricity hence it will direct electric current into the body and hence the person carrying the umbrella will get a severe electric shock.

Q. 3. For what purpose lightning conductor is used in the buildings.

Answer: A lightning rod, also known as a lightning conductor, is a building safety device designed for the sole purpose of stopping lightning from hitting a building.

It is made of good conductors like copper and permits the lightning bolt's electrical energy to go harmlessly to ground where it belongs. All tall buildings now have lightning conductors. The figure below shows the lightning conductor.

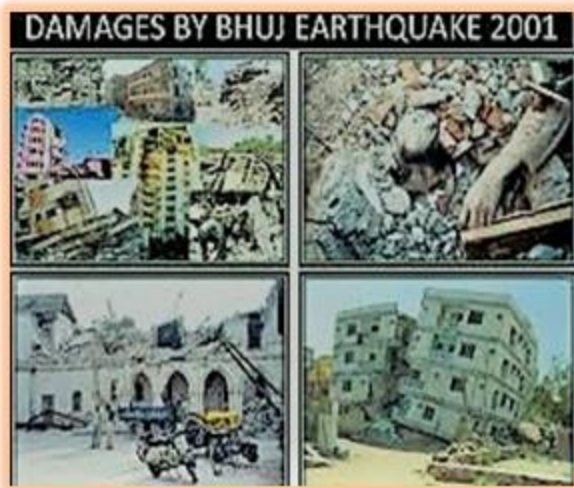


Check point 4

Q. 1. Give the name of two places in India where the earthquake causes the large destruction to life and property.

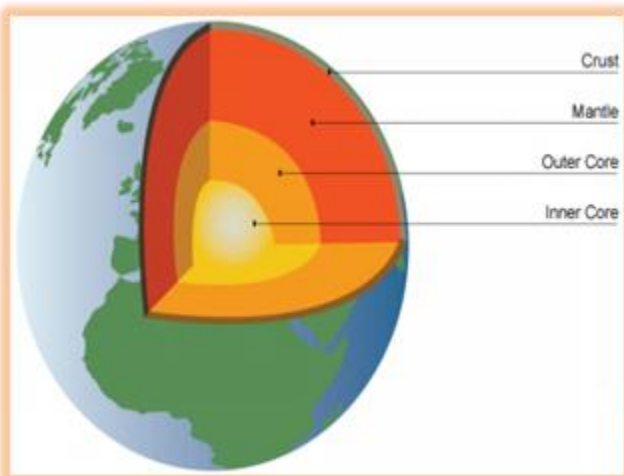
Answer: The places in India where the earthquake causes the large destruction to life and property are as follows.

1. Jammu and Kashmir =>Major earthquake occurred on 8th October 2005 in Uri and Tangdhar towns of North Kashmir.
2. Gujarat =>Major earthquake occurred on 26th January 2001. In Bhuj District of Gujarat.



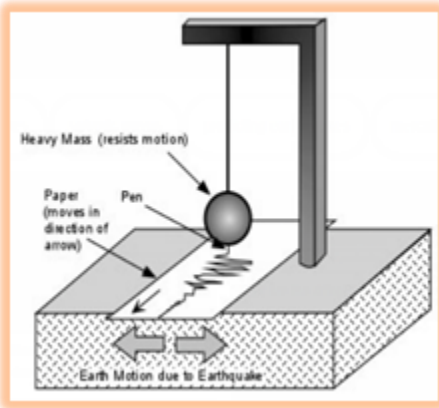
Q. 2. Mention how many layers the earth made of.

Answer: Earth has four layers: the solid crust on the outside, the mantle and the core — split between the outer core and the inner core. The figure below shows the diagram for the layers of the earth.



Q. 3. Name the device that is used to measure the strength of an earthquake.

Answer: The seismograph is an instrument that measures seismic waves caused by an earthquake. It consists of a vibrating rod, or a pendulum, which starts vibrating when tremors occur and A pen (stylus) which records the seismic waves on a paper. The figure below shows the typical seismograph.



The strength, or magnitude, of an earthquake, is measured using the Richter scale. The Richter scale is numbered 0-10.

Q. 4. Explaining briefly about seismic zones.

Answer: The Geological Survey of India (G.S.I) first published the seismic zoning map of India in the year 1935. This map tells us about the earthquake-prone areas in India. The Map is colour coded in a different colour which shows four different seismic zones of India. They are as follows:

1. Zone – II: This is the least active seismic zone.
2. Zone – III: It is included in the moderate seismic zone.
3. Zone – IV: This is considered to be high seismic zone.
4. Zone – V: It is the highest seismic zone.

The Map Below shows the Seismic Zones of India.



Chapter Test

Q. 1. Plastic straws A and B are rubbed with a dry cotton cloth. What will happen, if they are brought near each other?

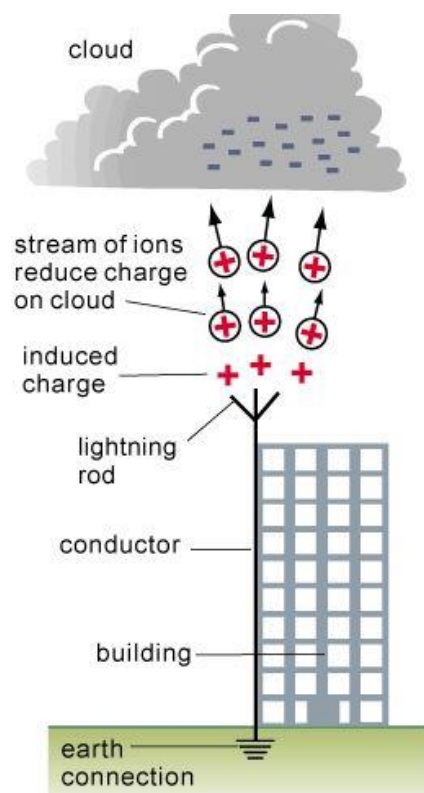
Answer: They will repel each other because when the plastic straws are rubbed with the cotton cloth they both will acquire the similar charge and the like charges repel each other. Hence both the straw will repel each other.

Q. 2. Will the lightning conductor be still required to be installed in the building?

Answer: The lightning conductor protects buildings from lightning.

The negative charges that are attracted to the conductor travels down to the earth. Thereby preventing the lightning stroke from the damage of the building.

The diagram is given below:



Q. 3. Explain why should a person not stand under a tree during a thunderstorm.

Answer: Due to the following reasons the person should not stand under a tree during a thunderstorm.

1. The tree may fall on the person and he may get injured.
2. The chances of lightning striking the person under the tree are more because there is no conductor to transfer the charges to the ground.

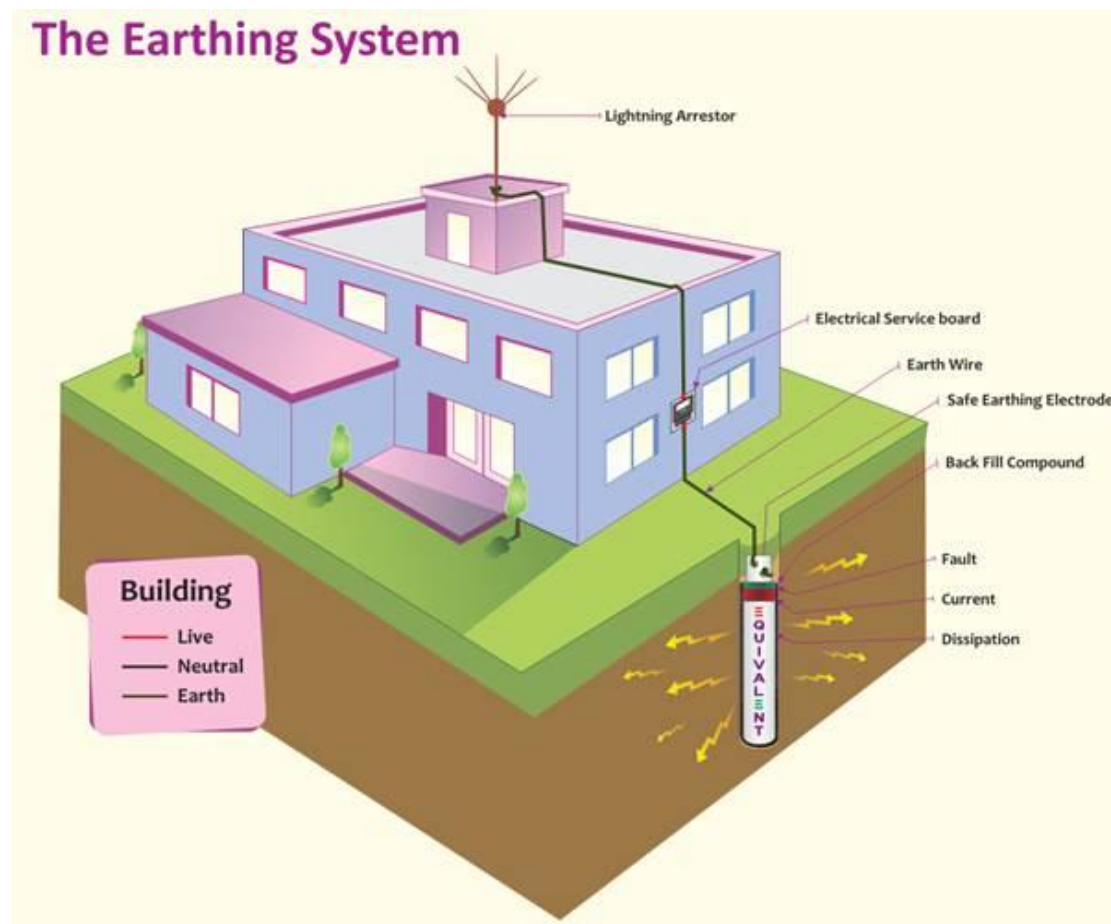
Q. 4. In an electroscope, if a negatively charged body is brought in contact with the metal clip, the strips of the electroscope diverge. If now another charged object carrying an equal amount of positive charge is brought in contact with the clip, what will happen?

Answer: If a positively charged object is brought in contact with the clip of an electroscope, the negative charge which was given earlier will be neutralized and the strips will collapse.

Q. 5. Define earthing.

Answer: Earthing is the process of connecting the exposed metal parts of an electrical circuit to the ground. This is done to avoid accidental shock. If the earth wire is properly connected to the metallic body it protects us from an electric shock.

The earthing system is given below:



Q. 6. How is thunderstorm produced?

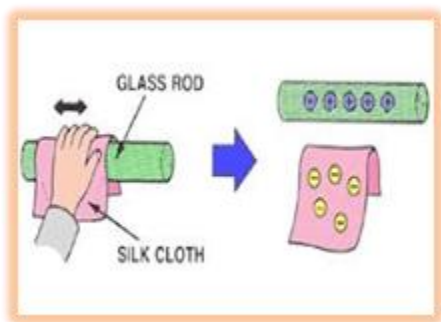
Answer: Thunderstorms develop in hot and humid areas like India. The rising temperature produces strong upward rising winds. These winds carry water droplets upwards where they freeze and fall again. This slow movement of the falling water droplets along with the rising air create lightning and sound. This is a thunderstorm.

Thunderstorms are dangerous and cause heavy destruction to life and property.

Q. 7. Define electrification by friction.

Answer: In normal condition the number of protons and electrons in any atom is equal. But every atom has got an affinity for getting excess electrons. Due to it when two bodies are brought in contact with each other, the body which has a greater affinity for electron collect electrons from other body and gets charged negatively this is called as electrification by friction.

Example = When a glass rod is rubbed with silk, Silk gets negatively charged and glass rod gets positively charged. As shown in the figure below.



Q. 8. Write the range of a very strong earthquake on the Richter scale.

Answer: The destructive energy of an earthquake is measured on the Richter scale, and it has readings from 1 to 10. Generally, the earthquake of measure higher than 5 (between 5-10) is considered to be very destructive and strong earthquake.

Q. 9. If the materials used for constructing a building were good conductors, do you think lightning will strike the building?

Answer: Lightning will not strike the building because charge separation cannot take place in conductors and so, all the lightning falling on the building will reside on the surface of the building and will pass to the ground through the conductor.

So, there is no need of installing any lightning conductor because all the work of a lightning conductor is done by the conducting material itself.

Q. 10. An earthquake measures 2 on the Richter scale, would it be recorded by seismograph?

Answer: The Richter scale measures the intensity of the earthquake on the scale of 1-10. A measure of 2 means that the earthquake is very minor and almost no loss has been there. It will not be recorded by the seismograph because the intensity or tectonic movements of plates is very less.

Q. 11. Explain why, sometimes when we take off the woolen sweater in a dark room, we can see tiny sparks of light and hear a cracking sound.

Answer: The crackling sound and the tiny sparks of light re-noticed due to electric discharge between sweater and body. The sweater is made up of wool and the shirt we wear is made up of cotton blended with some synthetic fibres. When we take out the sweater the friction is developed and the transfer of electrons take place from shirt to sweater, this results in the building of electric potential.

When enough potential has been accumulated while taking off the sweater it discharges and transfer of electrons take place. This transfer of electrons forms spark and let out sound energy and heat energy. Thus we hear the crackling sound and see the tiny sparks of light in the dark room

Q. 12. State what happens actually, when we touch the metal top of a charged electroscope with our fingers? What is this process known as?

Answer: When we touch the metal top of the charged electroscope than all charge will move to the earth through our body because our body is the conductor of the electricity, this will make the electroscope uncharged. This process is known as Earthing in which the charge is transferred into the ground/earth through a conductor.

Q. 13. How does lightning take place in the clouds?

Answer: During a thunderstorm, the air currents move upwards and the water droplets move downwards. And this caused the separation of charge due to this vigorous motion.

As a result of this process, the positive charges collect near the upper edge and the negative charges accumulate near the lower edge of the cloud and also near the ground. As the charge gets accumulated, its magnitude becomes very large. Water droplets in the air act as a conductor of this charge.

These charges flow to meet, thus producing strikes of lightning as shown in the figure below.



Q. 14. What do you understand by the process of electric discharge?

Answer: The process of transmission of positive and negative charge to release the huge amount of energy is called the electric discharge.

Electric discharge can happen through any medium like solid, liquid or gas. For Example, Lightning is the one type of electric discharge through the gas (atmosphere).

Q. 15. What precautions should we take during an earthquake if we are outside?

Answer: Some of the precautions that we will take to protect ourselves are as follows:



1. Move to an open area away from tall buildings, tall trees, electric wires and poles. As shown in the figure below.

2. If you are travelling in a bus or car than ask the driver to drive in an open field away from bridges and tall trees. The figure below depicts the same. As shown in the figure below.



3. If you are travelling in a vehicle than remain inside the vehicle.
4. Do not go to the crowded place.

Q. 16. How is tsunami affect the people?

Answer: Following are the problems faced by victims of Tsunami:

1. It causes massive damage to the infrastructure of the place due to which homes of people are destroyed as shown in the figure below.



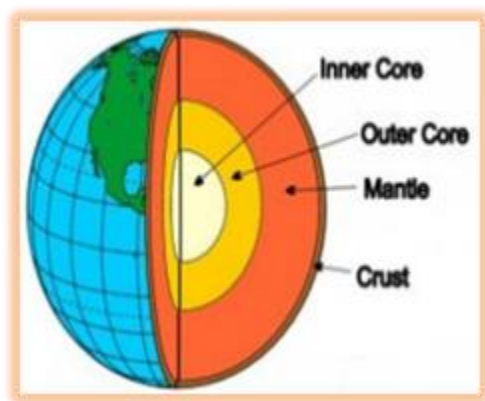
2. Lots of injuries occur due to cuts and falling of trees, electric poles, and buildings on victims.
3. The scarcity of food due to the destruction of crops and vegetables in the fields of farmers.
4. Lack of money due to shut down of Banks and ATM.
5. Loss of study due to the closing of colleges and schools.

Q. 17. Name the three layers of earth. Draw a labelled diagram to show the structure of the earth.

Answer: The earth consists of three concentric layers namely Crust, Mantle, and Core. Below is the description of each layer individually.

1. Crust = It is the outer layer of the earth. It is a thin layer between 0-60 km thick. The crust is the solid rock layer upon which we live.
2. Mantle = It is the widest section of the Earth. It has a thickness of approximately 2,900 km. The mantle is made up of semi-molten rock called magma. In the upper parts of the mantle, the rock is hard, but lower down the rock is soft and beginning to melt.
3. Core = It is in the center and is the hottest part of the Earth. It consists of two parts namely the inner core (made up of iron, steel etc) and the outer core (liquid layer).

The figure below shows the labelled diagram of the structure of the earth.

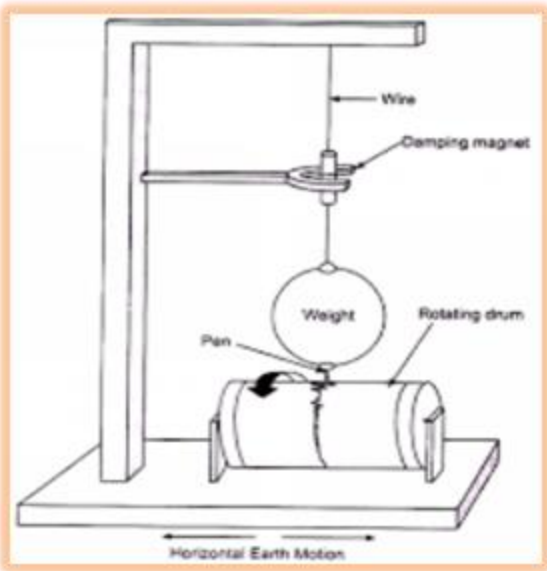


Q. 18. Explain in brief about seismograph. Also, draw a labelled diagram of a seismograph.

Answer: Definition = A seismograph is an instrument that measures and records seismic waves that move through the earth as the result of an earthquake.

Working = A basic seismograph includes a solid base and a heavy weight suspended from a spring over the base. A pen hangs from the weight and a rotating drum with paper sits below it on the base. The tip of the pen touches the drum. When the earth shakes from an earthquake, the drum rotates, and the weighted pen moves back and forth due to the motion of seismic waves. The pen records the movement on the drum. The paper recording of an earthquake is called a seismogram

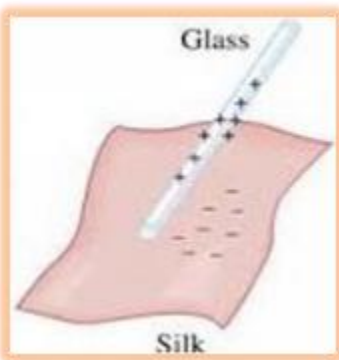
The figure below shows the typical seismograph.



Q. 19. A glass rod is rubbed with a silk cloth and an inflated rubber balloon is rubbed with a woolen cloth. Out of glass rod, inflated rubber, silk cloth and woolen cloth:

- (a) Mention the name of two objects acquires a negative charge. Why?**
- (b) Mention the name of two objects acquires a positive charge. Why?**

Answer: (a) The silk cloth and woolen cloth becomes negatively charged because when an object is charged by rubbing against another object the two objects gets oppositely charged. And by convention, it is considered that charge acquired by cloth is negative. The figure below illustrates more.



(b) The glass rod and balloon becomes positively charged due to this when two balloons rubbed with the woolen cloth are brought close to each other repel each other as shown in the figure below.



Q. 20. We should use mobile phones rather than landline phones during a thunderstorm. Give reasons.

Answer: Following are the reasons due to which we should use mobile phones rather than landlines during the storm.

1. The cables used in landline connection are the good conductors of electricity, hence the charge may flow through it and we may get an electric shock.
2. The mobile phones send signals through the air which prevents the charges to flow through our body.
3. Also during a thunderstorm the telephones lines may get destroyed due to which there will be an interruption in communicating with the person.