8. Static Electricity

1. Choose the correct option and fill in the blanks.

(Always repulsion, Always attraction, Neutral, displacement of negative charge, Displacement of positive charge, Benjamin Franklin, Atom, Molecule, Steel, Electron, Copper, Plastic, inflated balloon, Charged object, Gold)

(i) There is .....between like charges.

Ans: Always repulsion

(ii) ..... is responsible for generation of electric charge in an object.

Ans: Displacement of negative charge

(iii) A lightning conductor is made of a .....strip.

Ans: Copper

(iv) .....does not get electrically charged easily by rubbing.

Ans: Plastic

(v) There is ..... when opposite electric charges come near each other.

Ans: Always attraction

(vi) A ..... can be detected with an electroscope.

Ans: Charged object.

(vii)..... named the electric charges positive charge and negative charge.

Ans: Benjamin Franklin

(viii) Each atom is electrically..... .

Ans: Neutral

(ix) Amber is called..... in the Greek language.

Ans: Electron

Q.2 Whether the following statements are true or false.

(i) Repulsion is used as a test for identifying an electrically charged object.

Ans: True

(ii) If a plastic rod is rubbed on a woolen cloth, it becomes negatively charged.

Ans: False

(iii) The lightning conductor is used to protect from electric current.

Ans: False

(iv) The static electric charge is of short duration.

Ans: True

(v) Electroscope is used to detect the electric charge on a body.

Ans: True

Q.3. Explain why it is not safe to go out with an umbrella when there is heavy rain, lightning or thunder.

Ans : The central rod of an umbrella is metallic with a pointed tip at the upper extremity. Mostly, the ribs of umbrella are also made up of metals. If there is heavy rain along with lightning and thunder then the lightning strike can be attracted towards the umbrella. This attraction is produced between the opposite charges on the cloud and the umbrella. Since our body is a good conductor of electricity, we may get a forceful shock. So it is not safe to go out with an umbrella when there is heavy rain.

Q.4 Answer in your own words.

(a) How will you protect yourself from lightning ?

Ans: In order to protect oneself, The lightning conductor is used for protection from a lightning strike.

(b) How are charges generated ?

Ans: When two objects are rubbed against each other, the negative charge on one of the object is go to other object. The

second object becomes negative charge due to an excess of negative charge. Similarly the first object becomes positively charged due to loss of negative charge.

(c) In the lightning conductor, what provisionis made for spreading the electricity into the ground?

Ans: Lightning conductor consists of a long copper strip with one end forked. This end is at the highest part of the building. The other end of the strip is connected to a plate of cast iron. A pit is dug in the ground, coal and salt are filled into the pit and the iron plate is placed upright in the pit. Also there is a provision for pouring water into it. This helps to spread the electric charge quickly into the ground and prevent damage.

(d) Why do farmers stick an iron staff into the ground while working in the field in rainy conditions ?

Ans : Iron staff acts as lightning conductor . If lightning strikes, it will hit the top of iron staff. The electrical energy passes through the metal strip and gets discharged safely into the ground through buried metal plate. Hence farmer stick an iron staff into the ground while working in the field in rainy conditions .

(e) Why is lightning not seen every day during the rainy season ?

Ans : When there is electric charge is produced in a very large amount, then there is only possibility of lightning. Such

condition may not be there in rest of the times. So, lightning is not seen every day during the rainy season.

Q. 5 What are the characteristics of a static electric charge ?

Ans : Characteristics of static electric charge : (1) The charge is produced only at the place of friction. (2) When the positive charge and negative charge on an object are equal the object is neutral, i.e. there is zero charge on the object. (3) When the positive charge and negative charge are different the object is said to be charged. (4) The static electric charge is of short duration.

Q. 6 What is the damage caused by lightning ? How will you create awareness to prevent it?

Ans : (1) Damage caused by lightning : There is huge damage to the building, trees, etc. The property is destroyed and the trees burn. The electrical equipments in the house become useless. (2) Awareness to prevent damage : Anyone should not move out of the house when there is thunder and lightning. During such times the people should be made aware about the safety. They should not go into the water. Anyone should not go to the open spaces or stand under a tree. The lightning conductors should be used in all buildings. The disaster management should be known to people.

Q. 7 Give difination

1) Frictional electricity -

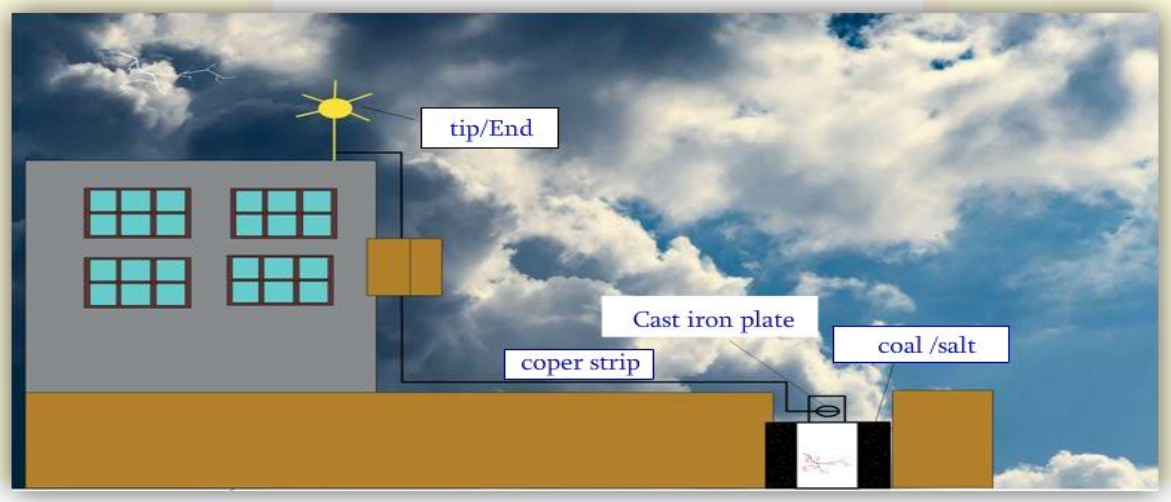
Ans : The electric charge generated by friction is called frictional electricity.

2) Static electricity -

Ans : The electric charge is produced only at the place of friction is called static electricity.

Q. 8 Explain briefly the construction and working of lightning conductor.

Ans :



(1) Construction of lightning conductor : (1) Lightning conductor consists of a long copper strip with one end forked. This end is placed at the highest part of the building. (2) The

other end of the strip is connected to a plate of cast iron. (3) A pit is dug in the ground, coal and salt are filled into the pit. The iron plate is placed upright in the pit. (4) Some provision is also done to pour water into it. This is to help in spreading the electric charge quickly into the ground and prevent damage.

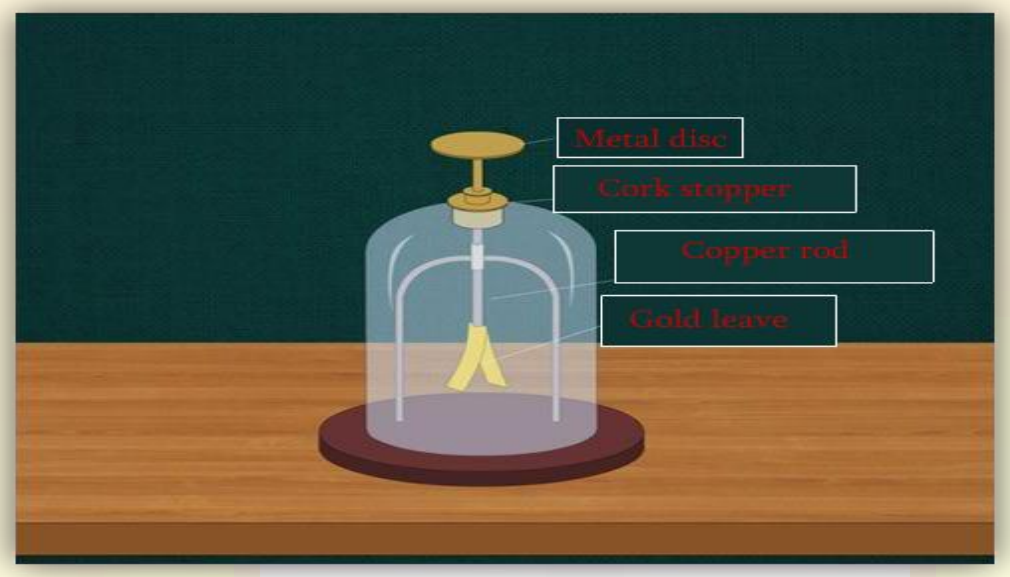
(2) Working of the lightning conductor: (1) The lightning conductor is a device used for protection from a lightning strike. (2) Whenever an electrically charged cloud passes over the building, the electric charges flowing towards the building has a positive charge. (3) The force of attraction thus acts and the lightning may fall down on the building. (4) But these currents are conducted into the ground through the copper strip of lightning conductor. The damage to the building is thus prevented. (5) When such a lightning conductor earthling is fixed on a tall building, the surrounding area is also protected from lightning.

Q. 9 Answer the following questions with neat and well-labelled diagrams :

(1) Describe the construction and the working of an electroscope.

Ans : (1) Construction of an electroscope : (1) An electroscope is a simple device to detect the electric charge on an object. (2) It consists of a copper rod which has a metal disc at the upper end. (3) To the other end of the rod are attached two thin gold

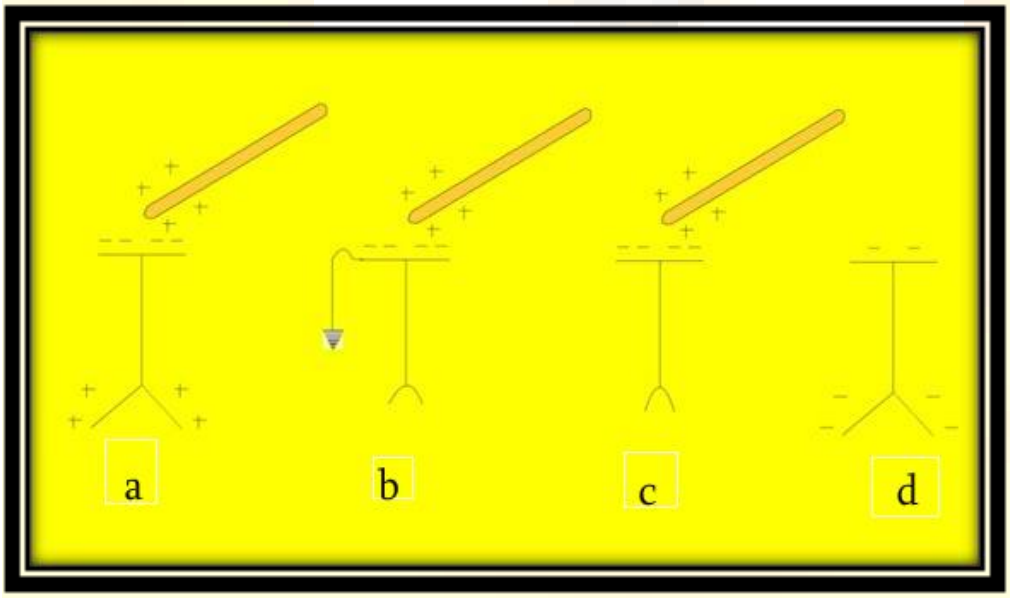
leaves. (4) The end of the copper rod with the leaves is inside the flask, while the end with a metal disc is on the outer side of the flask The cork is fitted on the mouth of the flask which is a bad conductor.



(2) Working of an electroscope : (1) If the glass rod or ebonite rod is not rubbed against anything there is no charge. If the glass or ebonite rods do not have any charge and are made to touch the metal disc of electroscope, the gold leaves inside the electroscope remain closed. (2) When the glass rod is rubbed over the silk cloth and comes in contact with metal disc, the gold leaves fly apart. (3) When the ebonite rod is rubbed over the wool cloth comes in contact with the metal disc, the gold leaves fly apart. Because it develops a negative charge .(4) When the glass rod is rubbed against silk cloth it develops a

positive charge. If these charged bodies, are touched with the metal disc of the electroscope, the like charges develop on the leaves and they repel each other. Due to this repulsion, they fly apart.(5) If the metal disc is touched with the finger when the leaves are apart, the charge on the disk passes through the fingers into the earth and they close once again. (6) In this way moving apart of the leaves of the electroscope is the test for finding out if the body is charged.

(2) With a neat diagram, explain the method of charging a gold leaf electroscope with a negative charge .



Ans : Hold a charged glass rod near the disc of an uncharged golf leaf electroscope. Take due care to see that the rod does not touch the disc.

As shown in the figure (a) a bound negative charge is induced on the disc and a free positive charge is developed on the leaves. Due to this leaves diverge.

(b) Holding the glass red in the same position, the disc of the electroscope is earthed. The free positive charge from the leaves passes to the earth and the leaves collapse. (c) The glass rod is taken away. (d) The bound negative charge of the disc spreads to the leaves through the metal rod of the electroscope and once again the leaves diverge. Thus, the electroscope is charged with a negative charge by induction.

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