

Board – ICSE

Class – 8th

Topic – Static electricity

1. Give reasons for the following
 1. When you touch the metal disc of an electroscope with a charged glass rod the metal leaves diverge.
 2. One should not use an umbrella while crossing an open field in a thunderstorm.
 3. In an electroscope the disc, the connecting rod and the leaves are all made of metal.

Answer:

1. When we touch the metal disc of an electroscope with a charged glass rod the metal leaves diverge because of the transfer of free electrons.
 2. One should not use an umbrella while crossing an open field in a thunderstorm because when a charged cloud passes over an umbrella, it induces a charge in it, and there is an electrical discharge between an umbrella and the cloud. Which may be very dangerous.
 3. In an electroscope the disc, the connecting rod and the leaves are all made up of metals because metals are good conductors of electricity.
2. State the difference between the following.
 1. Proton and electron.
 2. The charge carried by a glass rod rubbed with silk and charge carried by ebonite rod rubbed with fur.
 3. Like charges and unlike charges.

Answer:

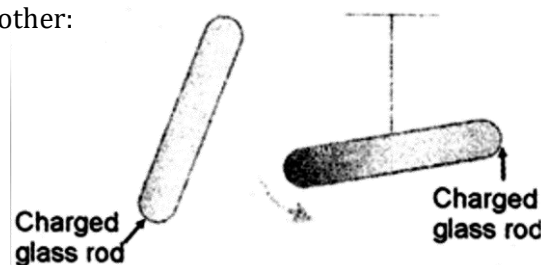
1. Proton is a positively charged particle having one unit positive charge and has a mass almost equal to mass of one atom of hydrogen.
While electron is a negatively charged particle having one unit negative charge and has a mass of $1/1837$ times the mass of one atom of hydrogen.
2. When a glass rod is rubbed with silk, a positive charge develops on the glass rod and a negative charge is developed on silk. When an ebonite rod is rubbed with fur, a negative charge develops on ebonite rod and a positive charge develops on fur.
3. Like charges repel each other while unlike charges attract each other.

3. Describe an experiment to show:
 - a. Like charges repel each other.
 - b. Unlike charges attract each other.

Answer:

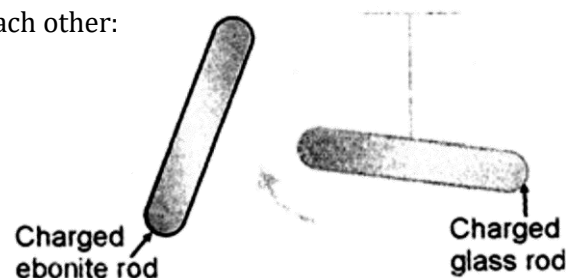
- (a) Experiment to show that like charges repel each other:

Take a glass rod and rub it with silk and suspend it freely by a silk thread. Near this suspended rod, bring another glass rod which is rubbed with silk. It is observed that suspended glass rod gets repelled.



- (b) Experiment to show that unlike charges attract each other:

Take a glass rod and rub it with silk and suspend it freely by a silk thread. Bring near it an ebonite rod which is rubbed with cat's skin. It is observed that glass rod is attracted by ebonite rod.

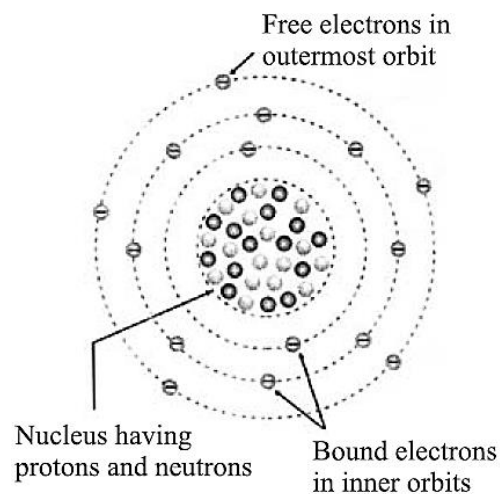


4. Briefly describe Rutherford's structure of atom.

Answer:

Rutherford's structure of atom:

- (i) An atom consists of three subatomic particles neutrons, protons and electrons.
- (ii) Neutron has no charge, proton has one unit positive charge and electron has one unit negative charge.
- (iii) Protons and neutrons form the central core of atom which is commonly called nucleus.
- (iv) The electrons revolve around the nucleus in fixed orbits.
- (v) As the atom of a normal element is electrically neutral therefore, it is believed that the number of protons in an atom is equal to the number of electrons.



5. State the mass and charge on
 (a) electron (b) proton (c) neutron

Answer:

	Charge	Mass
(a) Electron	1 unit negative charge	1/1837 times that of mass of one hydrogen atom.
(b) Proton	1 unit positive charge	Almost equal to hydrogen atom.
(c) Neutron	No electric charge	Almost equal to hydrogen atom.

6. What are conductors? Define on the basis of structure of atom.

Give four examples of different classes of conductors

Answer:

A substance, which has a large number of free electrons, such that they start drifting from one end of a substance to the other end, when it is connected to some source of electricity, is called conductor.

Four examples of different classes of conductors are:

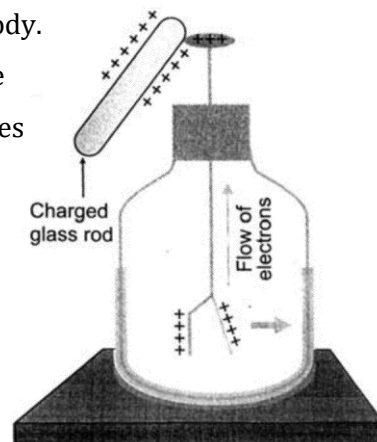
- (i) Metals: Iron, copper, gold, silver, etc.
 - (ii) Solution of acids in water: Dil hydrochloric acid, dil nitric acid, dil sulphuric acid and carbonic acid, etc.
 - (iii) Solution of alkalis in water: Sodium hydroxide, ammonium hydroxide, calcium hydroxide, potassium hydroxide, etc.
 - (iv) Solution of soluble salts in water: Sodium chloride, potassium nitrate, etc.
7. How can you use gold leaf electroscope to detect the charge on a body?

Answer:

Gold leaf electroscope (G.L.E) is used to detect the charge on a body.

Take a glass rod and rub it with silk. Touch the rubbed end of the glass rod with the disc of G.L.E. It is seen that leaf of G.L.E. diverges outward.

When the glass rod touches the brass disc of G.L.E, then free electrons from it flow to the glass rod. This causes a deficiency of electrons on the brass disc. To make up for this deficiency the electrons from leaves flow towards the disc. This, in turn, causes electron deficiency on the leaves. As leaves are positively



charged, they repel each other, and hence diverge. Thus, we can say that if a body, on touching disc of gold leaf electroscope makes its leaves diverge, then that body is charged.

8. (a) State the charge present on the glass rod and silk when rubbed with each other
(b) State the charge present on the ebonite rod and cat's skin when rubbed with each other.

Answer:

- (a) Glass rod gets positively charged and silk gains electrons so gets negatively charged after rubbing.
(b) Ebonite rod gets negatively charged and cat's skin gets positively charged when rubbed with each other.

9. Explain how a lightning conductor works?

Answer:

When two clouds carrying opposite charges approach each other, a charge flows from one to the other through the air. This electrical discharge which can be seen as a dazzling flash of light is called lightning.

When lightning occurs the air suddenly gets very hot and expands. It subsequently cools and contracts. This sudden and tremendous expansion and contraction of air produces an explosion of loud sound which is called thunder.

A lightning conductor is made of copper rod, on the one end of which are provided sharp copper points. It is installed on the highest point of the building. Its lower end is connected to a thick copper strip which is attached to flat copper plate and buried deep inside the earth.

When lightning strikes the sharp points of lightning conductor, all the electric discharge flows into the earth through the copper rod wire, without damaging the building.

10. Why does a glass rod get positively charged, when rubbed with silk? Explain on the basis of electron transfer.

Answer:

The glass rod transfers its electrons to the silk when it is rubbed with silk. Thus, glass rod has less number of electrons than the number of protons in the nucleus. Thus, on the whole, the glass rod gets positively charged.

11. Why does an ebonite rod get negatively charged, when rubbed with fur? Explain on the basis of electron transfer.

Answer

Ebonite rod gains electrons from the fur when it is rubbed with fur. Thus ebonite has more negative charges as compared to positive charges in the nucleus. Thus, on the whole, ebonite rod gets negatively charged.

12. What are insulators? Define on the basis of structure of atom. Name six insulators.

Answer

A substance, which has a few free electrons, such that they do not easily drift from one end of the substance to the other end, when connected to some source of electricity is called insulator.

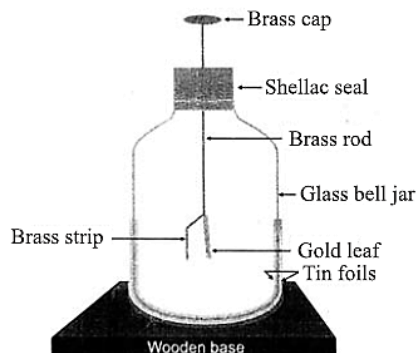
For example, alcohol, ether, sugar, starch, wool, fur etc.

13. What is an electroscope? Draw a neat diagram of gold leaf electroscope.

Answer

An electroscope is a device used for detecting electric charges, and finding the nature of electric charges.

Gold leaf electroscope



14. Give reasons for the following.

The diverging leaves of a charged electroscope collapse, the moment you touch the disc of the electroscope with your finger.

Answer

The diverging leaves of a charged electroscope collapse, the moment you touch the disc of the electroscope with your finger because no electric charge is present on it as the charge will flow from hand to earth through the body.