

Chapter 8. Electricity and Magnetism: Static Electricity

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Solution 1:

Electrostatics is defined as the study of charges at rest.

Solution 2:

Frictional electricity is also known as static electricity.

Solution 3:

Thales of Miletus was the scientist who observed the electric properties of amber.

Solution 4:

There are two kind of charges – positive and negative charge.

Solution 5:

A positively charged body signifies that its nucleus contains more number of protons than electrons.

Solution 6:

A negatively charged body signifies that it contains number of electrons more than number of protons.

Solution 7:

Benjamin Franklin was the scientist who first assigned the algebraic signs to charges.

Solution 8:

When a glass rod is rubbed with silk, the glass rod acquires the positive charge.

Solution 9:

When ebonite rod is rubbed with cat's fur, the ebonite rod acquires the negative charge.

Solution 10:

The quantization of charge is the property by virtue of which every charge exists only in discrete lumps or packets of some minimum charge.

Solution 11:

Energy other than electric charge is quantized.

Solution 12:

$$Q = Ne$$

$$N = Q/e = 1C / 1.6 \times 10^{-19} = 6.25 \times 10^{18}$$

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Solution 13:

1C is bigger than charge on an electron.

Solution 14:

$$Q = Ne$$

The charge on an electron = -1.6×10^{-19}

$$= 100 \times 1.6 \times 10^{-19} = 1.6 \times 10^{-17}$$

Solution 15:

$$Q = Ne$$

$$N = Q/e = -3.6 \times 10^{-18} / 1.6 \times 10^{-19} = 22.5$$

Since, n is not an integral value so this value of charge is not possible because charge is quantized.

Solution 16:

The origin of frictional forces is electrical in nature.

Solution 17:

The cause of charging is the frictional forces between the two bodies when they are rubbed against each other.

Solution 18:

The Sir Williams Gilbert was the scientist who showed two charges and Benjamin Franklin was the scientist who gave name to charges.

Solution 19:

Two differences between charge and mass are ::

- Electric charge can be positive, negative or zero while mass of the body is strictly positive.
- Electric charge is quantized while the quantization of mass is not yet established.

Solution 20:

Yes, mass of the body gets affected on charging.

Solution 21:

There will be attractive force between the B and C because both carry opposite charges.

Solution 22:

Unlike charges attract each other and like charges repel each other.

Solution 23:

No, the motion of the object does not affect the charge on the body.

Solution 24:

The properties of an electric charge are

- Electric charges are quantized.
- Like charges repel each other while unlike charges attract each other.

Solution 25:

Photons can never have charge because charges never exist without rest mass.

Solution 26:

The silk cloth will acquire the charge opposite to the charge of glass rod. So the charge acquired by silk cloth will be $= -1.6 \times 10^{-19} \text{ C}$.

Solution 27:

The S.I unit of charge is coulomb.

Solution 28:

The value of charge on an electron = -1.6×10^{-19} C. No, the charge less than charge of an electron is not possible.

Solution 29:

The net charge on an atom is zero.

Solution 30:

The electrons of the outermost orbit of an atom are the free electrons and they easily leave their respective atoms and become free to move inside the solid.

Solution 31:

An ion is an atom which has either gained one or more electrons or which has lost one or more electrons. When an atom's valence electrons leave their atom and become free to move inside the solid and move to another atom then positive ion is formed. And, the other atom which gain electrons become the negative ion.

Solution 32:

- On positive ion, there exist a positive charge.
- On negative ion, there exists a negative charge.

Solution 33:

If the electrified silk cloth or the ebonite rod are brought near to each other then they will repel each other but when electrified silk cloth and glass rod are brought together then they attract each other. The charges on the electrified silk cloth and ebonite rod is negatives while on glass rod , its positive so we can say that like charges repel each other while unlike charges attract each other.

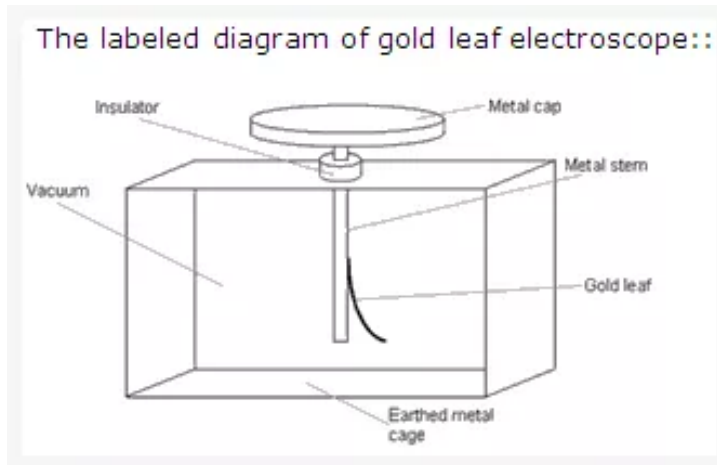
Solution 34:

When the nylon cloth get rubbed with hairs then it acquires the negative charge because few free electrons get transferred from hairs to nylon and they get attracted towards nylon cloth so the hair stands on their end.

Solution 35:

The charge is quantized and $Q = ne$ where n should be only integer . Since $Q = -1.8 e$ where n is not an integer. So, this charge is not possible.

Solution 36:



Solution 37:

The purpose of an electroscope is to detect the presence of charge on the body and nature of charge (whether its positively charged or negatively charged) on the body.

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Solution 38:

P is a Cap, Q is plug and R is the bottle in the negatively charged gold leaf electroscope. P is a conductor and Q, R is an insulator.

Solution 39:

- P will have the positive charge
- Q will have no charge.
- Cap of the electroscope will have no charge.
- The gold leaf will have negative charge.
- The leaf will diverge because like charges repel each other
- If electroscope is earthed then metal rod will have positive charge.

Solution 40:

Earthing of an electroscope is meant to take the thick copper strip inside the earth so that charges induced from thunderstorm on the metal spikes can move to earth to safeguard buildings from thunderstorm.