

Electrostatics Review

All matter is made up of atoms, and all atoms are made up of three subatomic particles:
Electrons, neutrons, and protons

Draw a diagram of an atom to show the subatomic particles

Electrons are negative

Protons are positive

Neutrons are neutral

When atoms gain electrons they become negative ions, when they lose electrons they become positive ions

Electrostatics is the study of static electricity

When a static charge is created by rubbing two objects together

electrons are not created, rather they are transferred from one object to another. The object with the stronger ability to attract electrons becomes negative and the object with the weaker ability to attract electrons becomes positive. To help predict the charge that will be created by rubbing two objects together we can use the electrostatic series.

State the law of electric charges:

Like charges repel

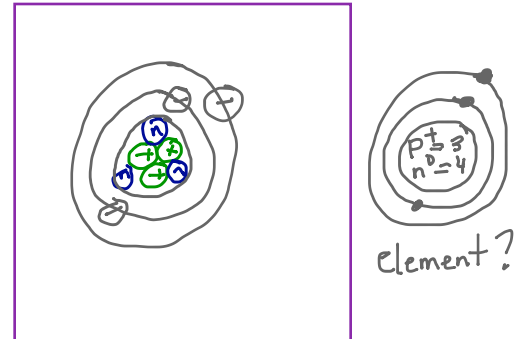
Unlike charges attract

If we have charged objects and we want to determine if they are positively or negatively charged we can use the attraction test. With the attraction test there are **two** ways to see an attraction: between opposite (unlike) charges or a charged object and a neutral object

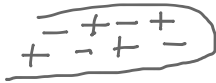
But there is only one way that there will be repulsion: must be the same (like) charge

When an object is neutral, it has an equal number of positive and negative charges.

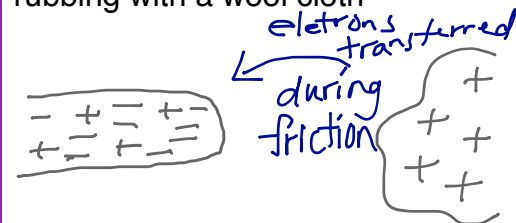
When an object has been charged, electrons have been transferred, so now there is an unequal number of positive and negative charges.



Neutral ebonite rod



Ebonite rod that has been charged by rubbing with a wool cloth

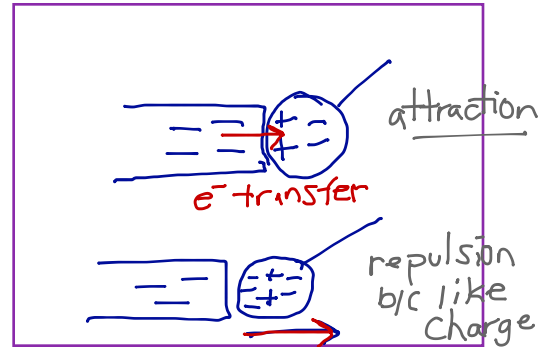


When a Balloon is charged by friction against your hair it becomes negatively charged.

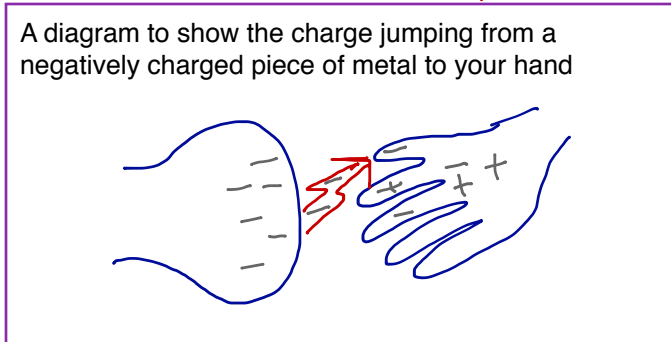
Because the balloon is made out of a material that is an insulator the charge stays in one place. A charge that does not move is called static charge. This is an example of charging by friction.

Charges can also be transferred by contact. When a charge is transferred by contact, the charge transferred will be the same.

A diagram that shows the negative charge on a polyethylene strip being transferred to a pith-ball electroscope.

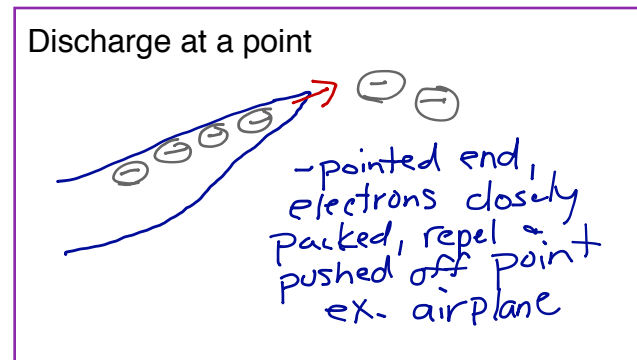
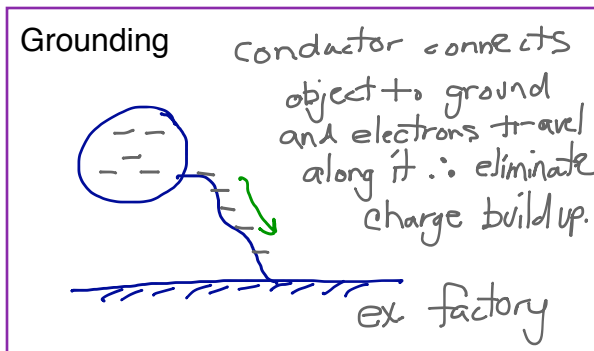


Sometimes a charge can "jump" from one object to another. When this happens we often see a spark. The charge always jumps from an area with a high amount of negative charge to an area with a low amount of negative charge. This can be dangerous because sometimes there is heat created as electrons move through the air. One potential danger is that when at a gas pump: could ignite gas and cause a fire or explosion.

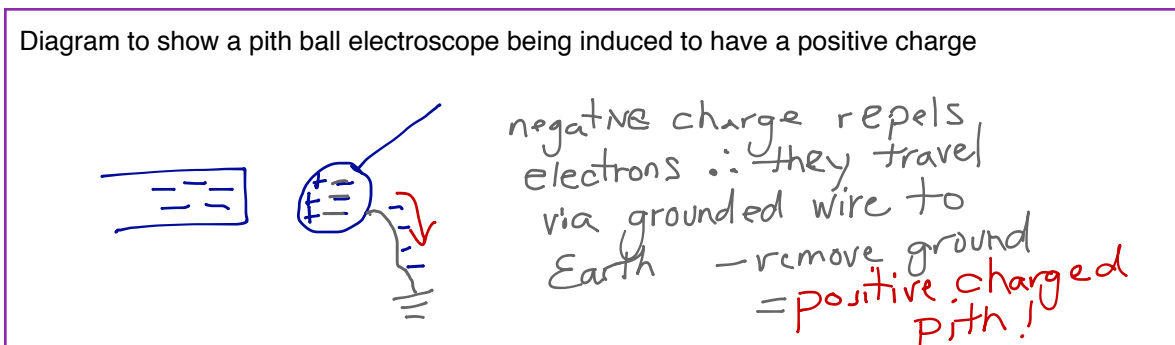


Example 2: lightning!

For safety reasons we often want to remove built-up negative charges. The process of removing the negative charges to return the object to neutral is called discharging. To remove the build-up of negative charges there are two main methods, explain how each works:



An electrical charge can also be created without two objects coming into contact. This is known as charging by induction. When a charge is created this way it is the opposite of that on the object used to create the charge. If there is a ground attached to the object being charged, then a permanent charge can be created.



Electric charges can also be built up on conductors. A conductor is a material that allows electrons to flow/ move freely. This means that on a charged conductor the charge is evenly distributed over the surface of the object.

