Physics Honors: Electric Charge

What is Electrostatics?

Electrostatics is the study of electric charge that can be collected and held in one place, or, static electricity

In the next unit, we will talk about electric current - which is the movement of electric charge.

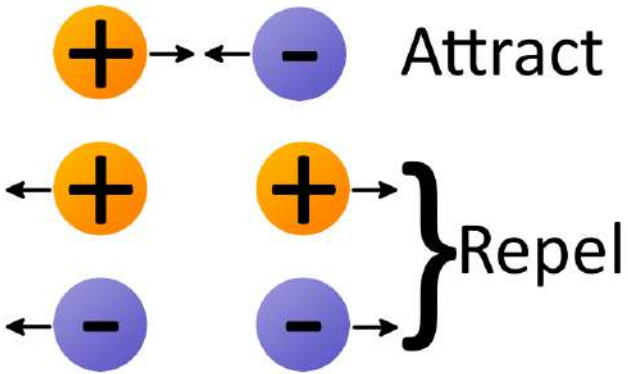
Electrostatic Force

- The force that causes the hair on the cat to stand up is the electrostatic force.
- The electrostatic force is stronger than gravity, because the cat’s hair is pulled upward

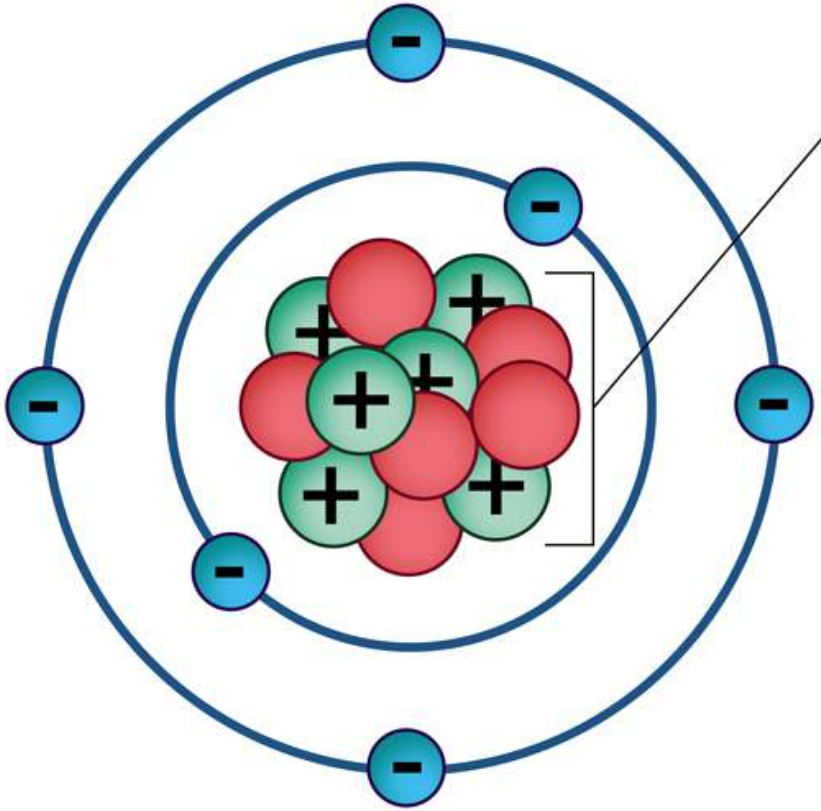
You know what they say… Opposites Attract

Objects that have similar electrical charge will repel each other

Objects that have opposite charges from each other will attract



Structure of Atom



Nucleus
(6 Protons
+
6 Neutrons)

Neutron

Proton

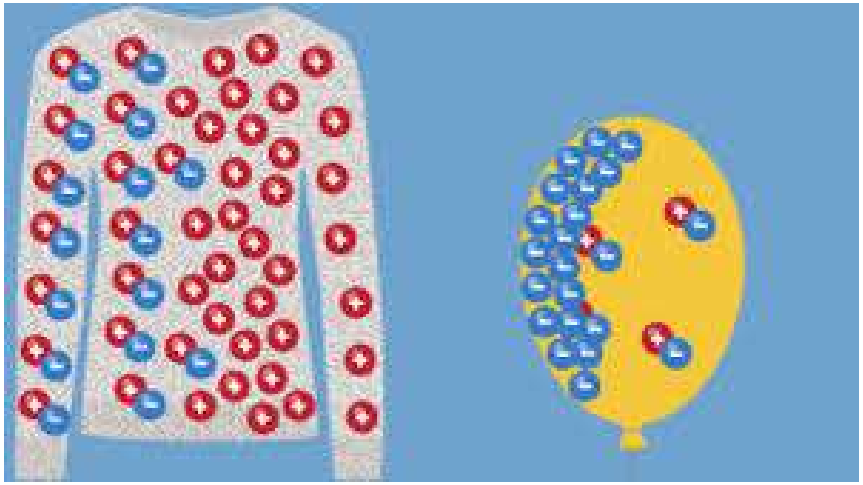
Electron

Carbon atom

Transfer of Charge

A neutral object is an object that has the same number of protons and electrons

When given extra energy, electrons can be removed from an atom. When this happens, the object they LEAVE becomes more POSITIVE, and the object they GO TO becomes more NEGATIVE

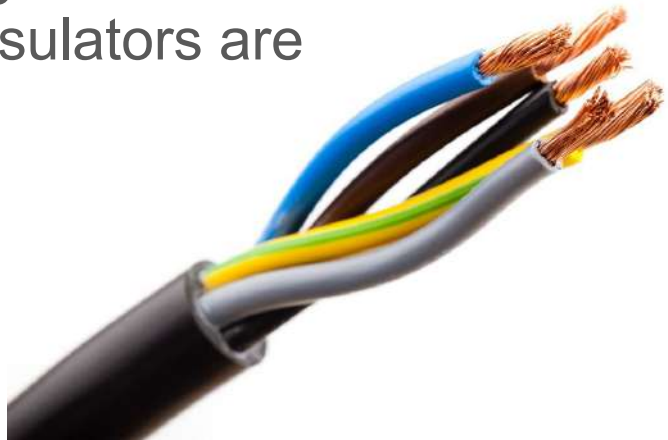


Two neutral objects, when rubbed together, can become charged by one object transferring its electrons to the other object

Conductors and Insulators

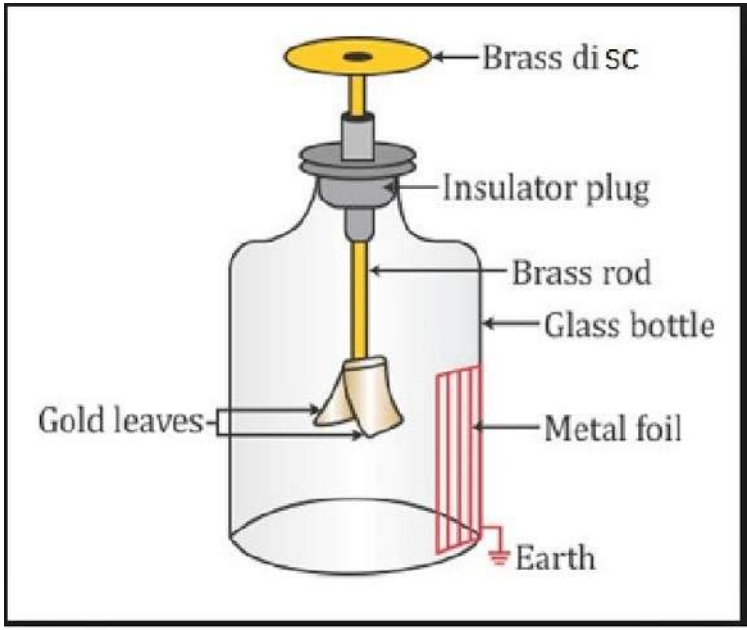
A conductor is an object that electric charge moves through easily. The best examples of conductors are metals, especially copper.

An insulator is a material that electric charge does NOT move through easily. Some examples of insulators are glass, plastic, and wood



Determining Charge

- An Electroscope is a device that is used to determine charge
- Bringing a neutral object near the electroscope will cause the leaves to hang parallel
- Negatively charged objects will cause the leaves to seperate, positively charged objects will cause the leaves to move together



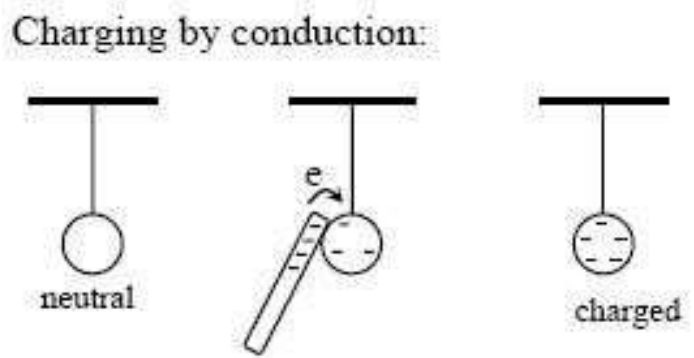
Types of Charging

There are 3 main ways that an object can become charged:

1. Conduction
2. Induction
3. Polarization

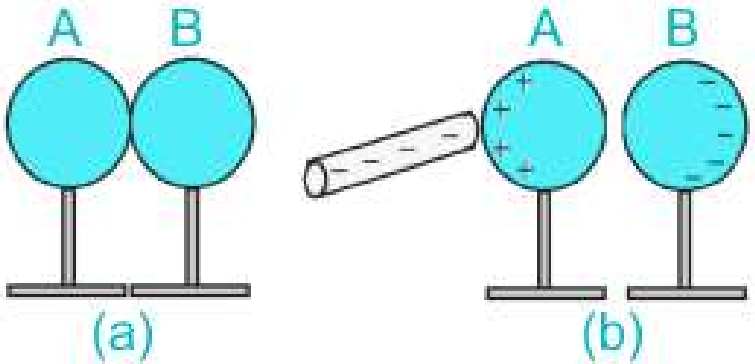
Charging by Conduction

Conduction occurs when a neutral object is touched by a charged object



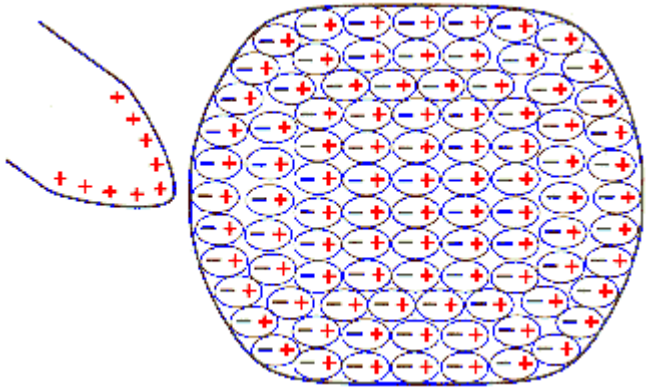
Induction

Induction occurs when you have two neutral objects. If you bring a negatively charged object near one of the objects, that object will get a positive charge, while the other neutral object will get a negative charge, as shown below



Polarization

Polarization occurs when a charged rod is brought near a neutral insulator.



Even though no charge moves, the charges align themselves so that the negative charge of the insulator is near the positive charge of the charged rod

Grounding

Grounding is the process of removing excess charge by connecting an object to the Earth. Earth is large, so it can absorb the extra charge without becoming noticeably charged itself.