

Electricity

(based around Forrest Mims III)

Lightning and the shock you receive as you touch a door knob on a dry day are exactly the same thing.....Electricity! The only difference is the quantity. Benjamin Franklin was the first to show this with his famous kite experiment.



← Never Ever Try this at Home!!!!!!

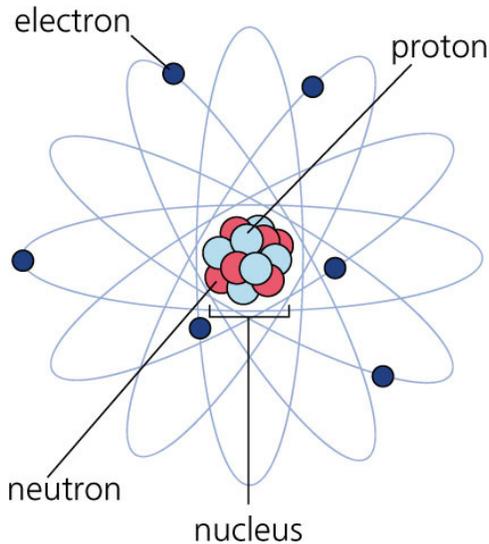
Experiment 1

If you want to see this effect yourself try this simple experiment. Drag your feet across a carpet while wearing hard soled shoes. Hold one bare wire of a small neon lamp in your between your fingers and touch the other end to anything largish and metal (like a door knob, or Pico's cage stand)

Believe it or not, you can never "see" electricity. You can only see the effect of electricity. The lightning you see is the ionization of the air. The flash in the neon bulb is just the shift in speed of the electrons thus releasing photons as light. (Okay that one was a little tough)

What is Electricity?

Electricity is a fundamental component of matter. To truly understand electricity we have to look at matter itself. To look at matter itself, we have to look at its smallest elemental component.....**the atom.**



<http://www.sciencewithmrmilstid.com/category/physics/matter-properties-of-matter/atomic-structure/>

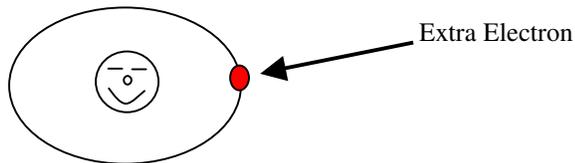
Atoms contain three primary parts:

- 1) The **Protons** which are found in the nucleus and have a **positive (+)** charge.
- 2) The **Neutrons**, which are also found in the nucleus and have a **neutral** charge (or no charge).
- 3) The **Electrons**, which are found orbiting the nucleus and have a **negative (-)** charge.

A little bit more.....

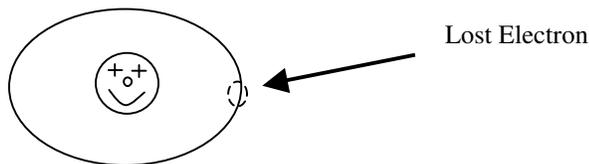
Ions

Under normal circumstances, every atom has a balance between the number of protons and electrons. Since the protons have a positive charge (+1) and the electrons have a negative charge (-1), the atom has an overall net electrical charge of zero, or a neutral charge. If an atom gains an extra electron, the atom has a net negative charge. This atom is then called a **Negative Ion** or **Anion**.



Negative Ion or **Anion**

If an atom loses an electron, the atom has a net positive charge. This atom is then called a **Positive Ion** or **Cation**.



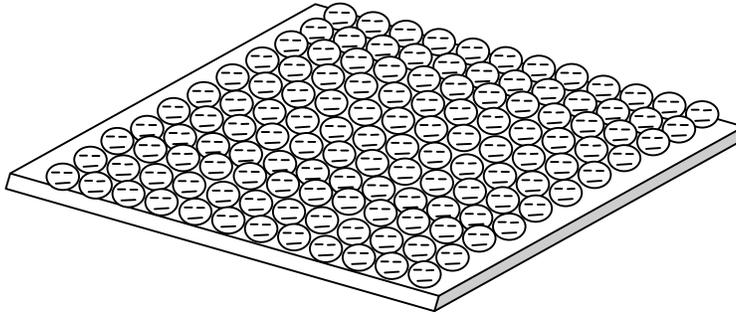
Positive Ion or **Cation**

Free Electrons

Free electrons can move very fast through metals, gasses or a vacuum. Electrons can also just sit there.....trillions of them.

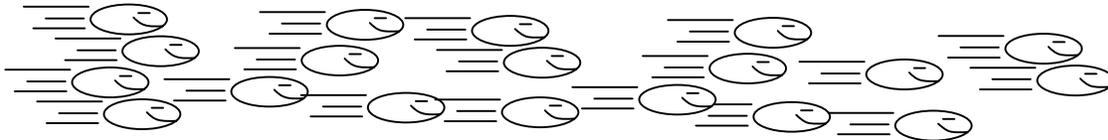
Non moving electrons

A group of resting electrons that are sitting on a surface can cause that surface to be negatively charged. Since they are just sitting there and not really moving they are considered static..or not moving. The entire surface is then considered to be under a **negative static electrical charge**.



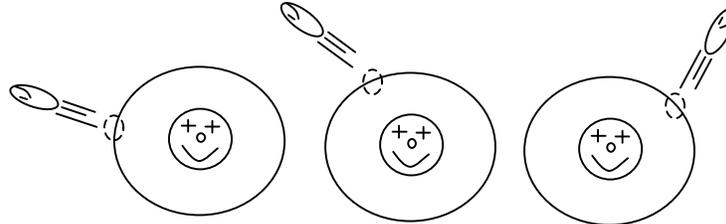
Moving Electrons

Water flowing in a stream is called a current. In just the same way, a stream of flowing electrons is called an electrical current.



Missing Electrons

Friction, light, heat of chemical reactions can knock electrons from a surface. This then causes the surface to have a net positive charge. If the surface is at rest, the surface can be said to have a Positive Static Electrical Charge



Electrons being displaced by friction, light, heat or
Chemical reactions

Static Electricity

You have all experienced it. Walk across carpet in the dry of winter and touch a door knob.....ZAP! Put on cloths fresh out of the dryer.....Snap, Crackle....ZAP! Drag your cat across a fuzzy blanket.....Meow..ZAP! REEEOW HISSSS.

Perhaps the easiest for us to get is electrified plastic and glass. If you rub a comb through your hair on a dry day you'll transfer electrons from your hair to the comb. Rub a glass rod with a silk cloth or a plastic paint brush and the glass rod will become positively charged as it loses electrons.

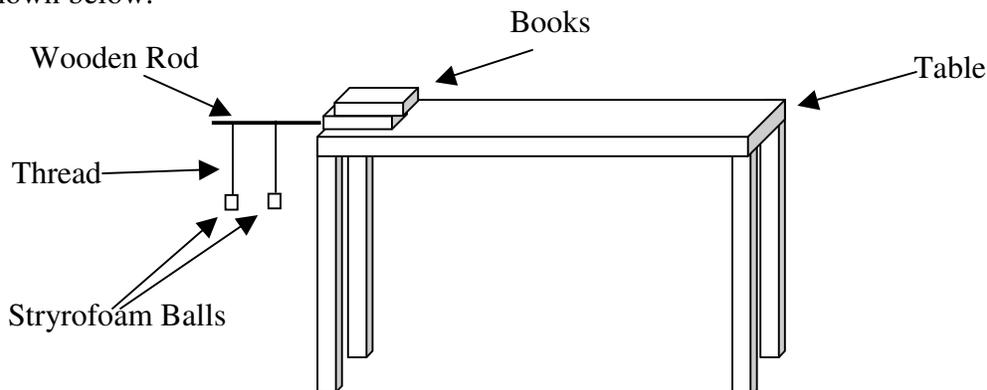
Experiment #2

Opposite and Like Charges

To determine the behavior of charges, all you need is some thread, doll rod and some styrofoam packing peanuts.

Directions:

Cut a packing peanut in half. Tie a thread around each half and suspend them from a rod as shown below.



See separate sheet for experimental hypothesis and results.

Experiment #3

The Electroscope

Handy dandy device to measure static electricity.

In this lab, try as many combinations of rods, plastics, Metals and debris as you can. Try to predict which ones will Cause the foil to separate with a charge.

