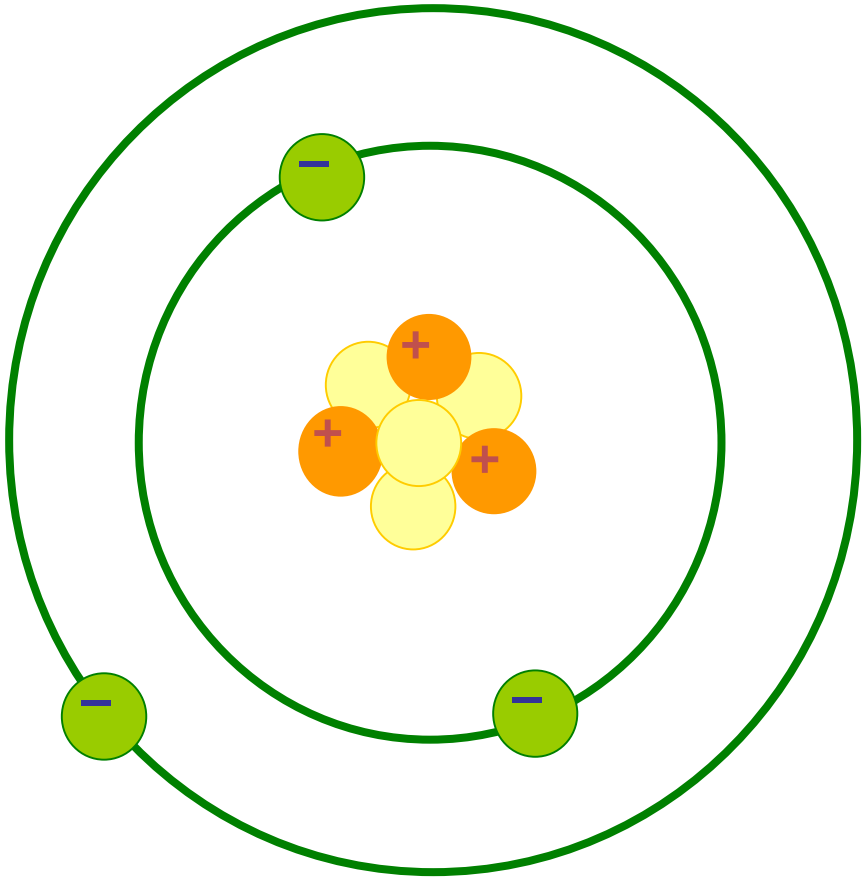
# Static Electricity

# What Is Static Electricity?


- A stationary electrical charge that is built up on the surface of a material

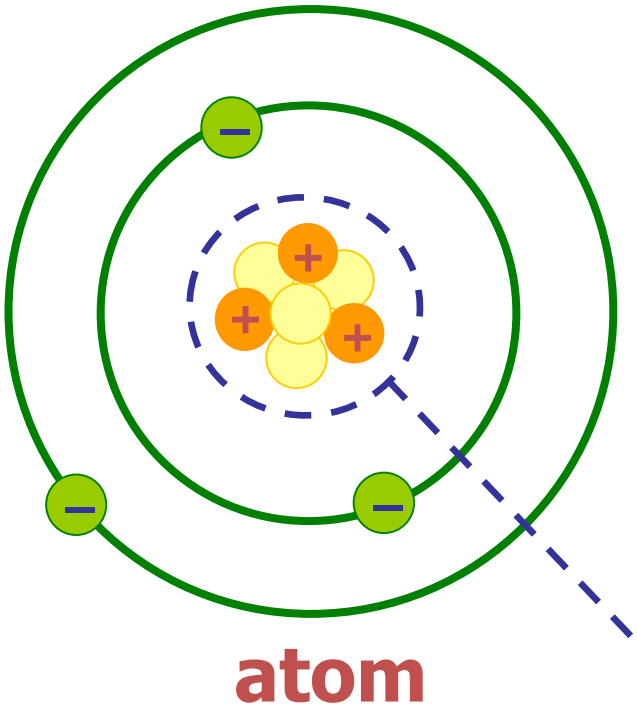
# Two kinds of charges

- Positive
- Negative



# Where do charges come from?

Matter is made up of atoms.




Proton (positive charge)

neutron (neutral)

electron (negative charge)

# Where do charges come from?

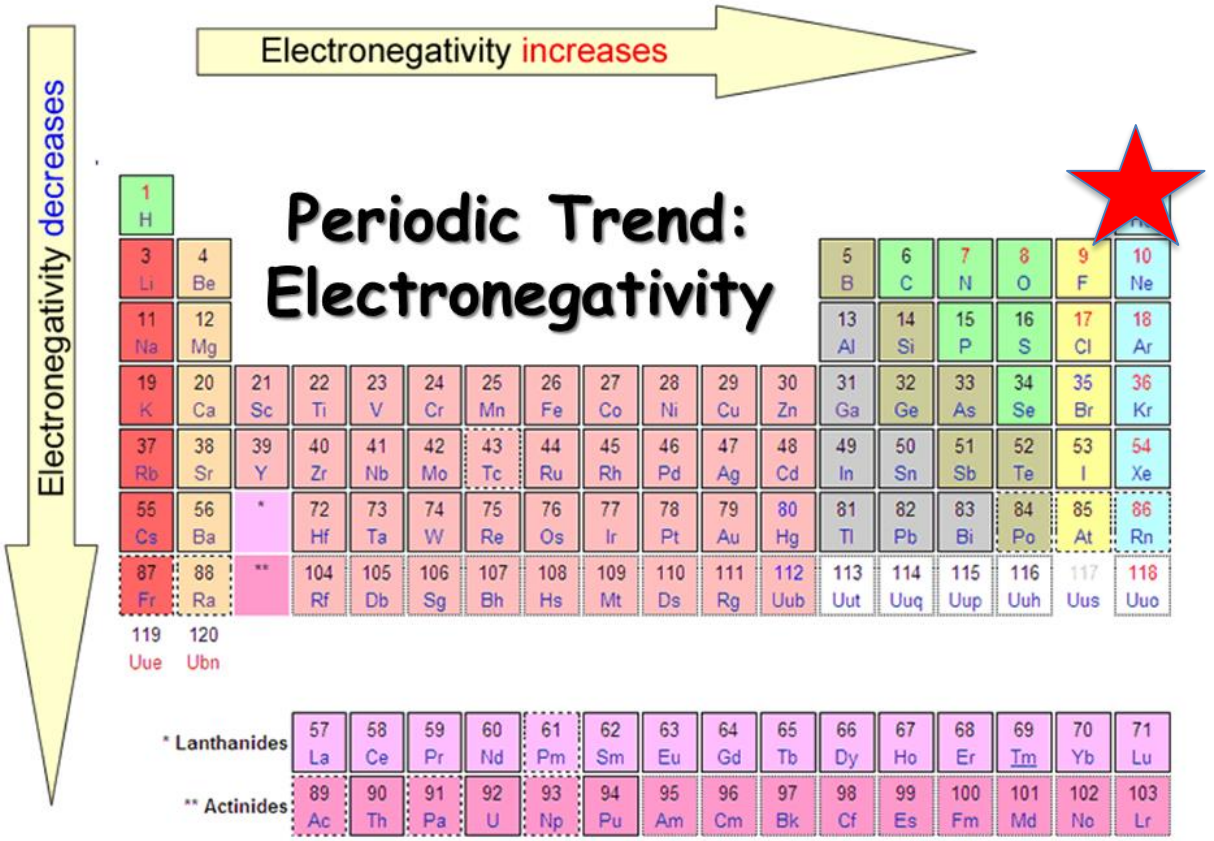
**If electrons = protons ⇒neutral charge**

**If electrons > protons ⇒ gaining electrons = negative charge**

**If electrons < protons ⇒ losing electrons = positive charge**

# Electronegativity

**Electronegativity** is a measure of the tendency of an atom to attract a bonding pair of electrons.



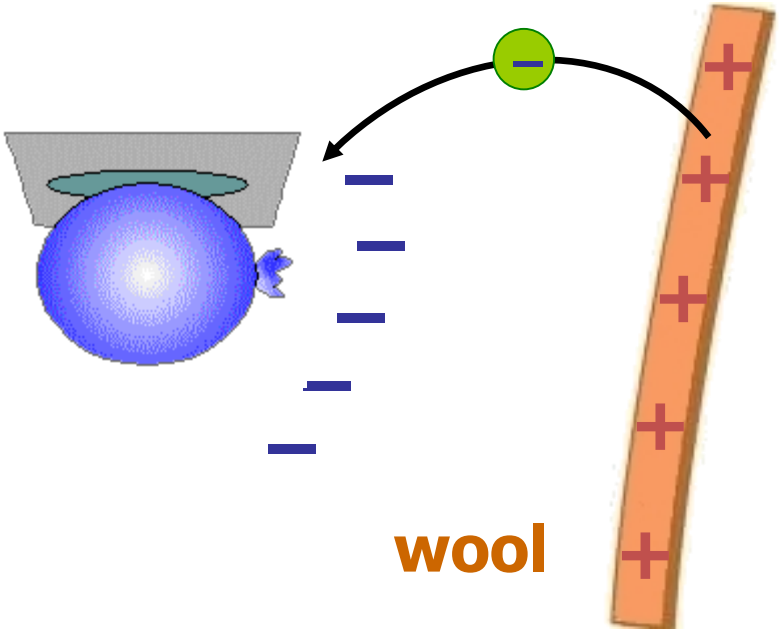

Elements here are more likely to gain or lose electrons when bonding (positive and negatively charged atoms)

# Where do charges come from?

Rubbing materials together does NOT create electric charges. It just transfers electrons from one material to the other.

# Where do charges come from?

When a balloon rubs a piece of wool...




electrons are pulled from the wool to the balloon.

The balloon has more electrons than usual.

**The balloon: – charged,**
**The wool: +charged**

# Insulators and conductors

Insulators: materials that do NOT allow electrons to flow through them easily.

Insulators can be easily charged by friction as the extra electrons gained CANNOT easily escape.

# Insulators and conductors

Conductors: materials that allow electrons to flow through them easily.

Conductors CANNOT be easily charged by friction as the extra electrons gained can easily escape.

Static

# Charging by Friction

- Caused by rubbing two different substances together (friction)
- When the objects are rubbed together, one object will lose electrons and another will gain electrons

Late at night, and without permission, Reuben would often enter the nursery and conduct experiments in static electricity.

# Charging by Contact

- Uncharged (or neutral) objects can become charged if they come into contact with charged objects.
- When an uncharged object is charged with a neutral one, it will take on the same charge as the one that touches it.

- Example: If a negatively charged metal rod touches a ball, the ball will become negatively charged. Since they now have the same charge, they will *repel* each other. Remember, like charges *repel*!

# Charging by Induction

- Requires a charged object to be moved near a neutral one (cannot touch)
- When charging by induction, the once neutral object always takes on the opposite charge to the object that approached it.

# Example of Charging by Induction

- If you rub a balloon against your hair (friction) & is now negatively charged. The nearby wall is neutral meaning it contains an equal number of positive and negative charges.

- As the negatively charged balloon approaches the neutral wall, it will repel the negative charges at the wall's surface, leaving behind the positive charges. Now they are opposite charges, and are attracted to each other.

# Grounding

What is grounding?

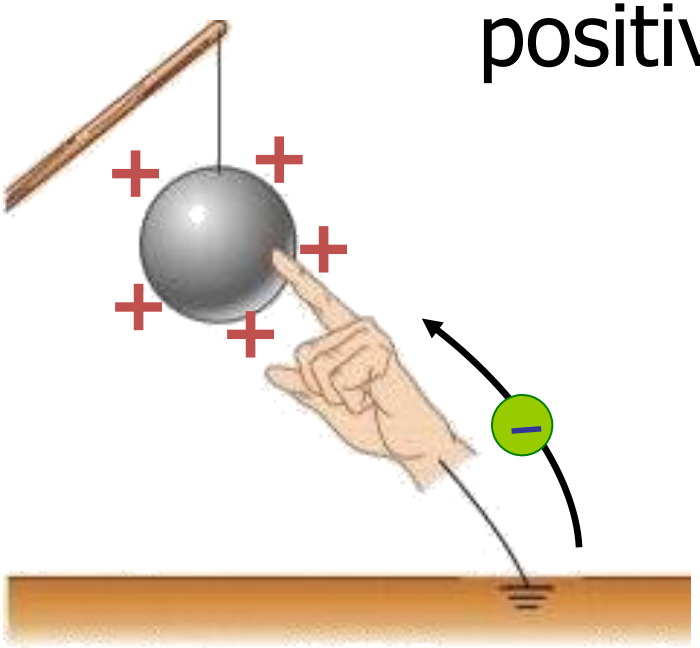
An object is grounded when it is connected to the earth through a connecting wire.

If a charged conductor is grounded, it will become neutral.

# Grounding

## How does grounding occur?

When we touch a metal ball of positive charge...

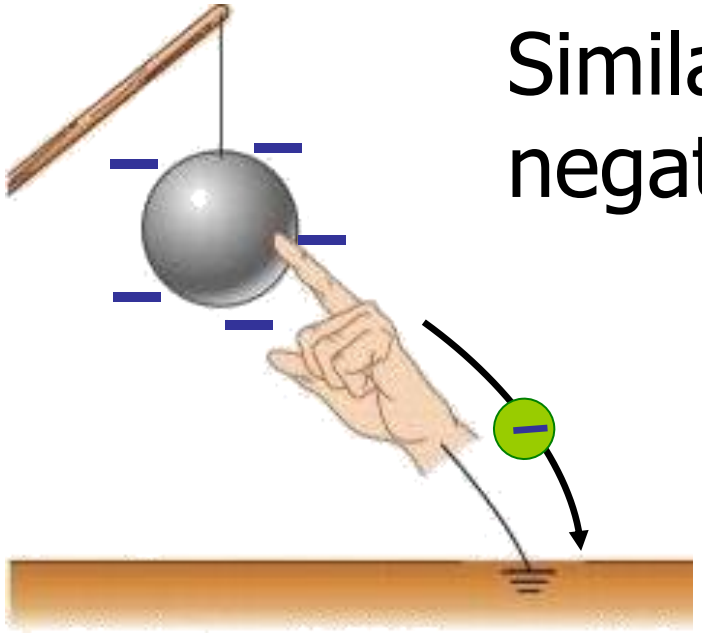


Electrons flow from the earth to the metal ball to neutralize the metal ball.

Metal ball becomes neutral.

# Grounding

## How does grounding occur?



Similarly, if the metal ball is of negative charge...

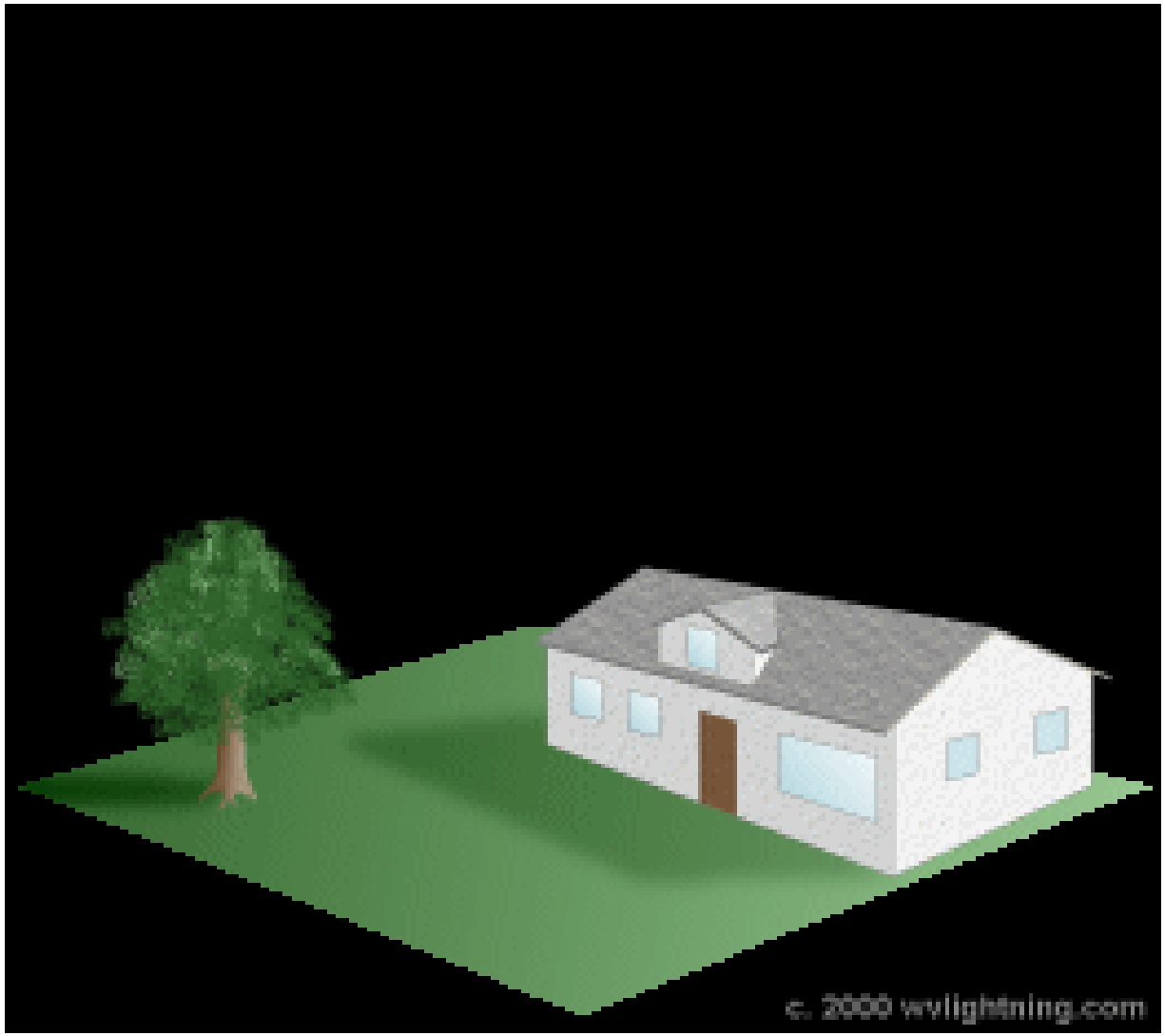
Extra electrons flow from the metal ball to the earth and the ball becomes neutral.

# Lightning

- A natural process where electric charges are moving through the air.
- The jagged path is cause by the electric charges trying to find the fastest path to the ground.
- The electrical charges are drawn to tall buildings because these shorten their path to the ground.

# Lightning Rods

- A metal rod (a conductor) placed on the top of a building, and is long and pointed so it will be the tallest part of the building.
- The rod should be the part of the building first hit by the lightning and then should channel the lightning into the ground.
- Lightning always seeks the fastest route to the ground.


c. 2000 wvlightning.com

# A balloon has a negative charge when rubbed by a woolen cloth.

If the balloon can attract some paper scraps, which of the following cannot be the charge of paper scraps?

A Neutral

B Positive

C Negative

# A balloon has a negative charge when rubbed by woolen cloth.

During rubbing, what have been transferred between the woolen cloth and the balloon?

A Electrons

B Protons

C Neutrons

# Do Now


**Write a paragraph about the cartoon. Tell what he is trying to do. Will it work and why? What do you think will happen? Use the following words, static electricity, lightning, electrons, positive and negative charges.**

# The End