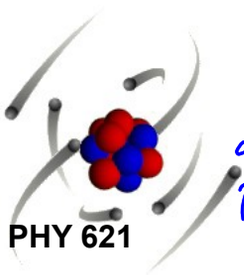
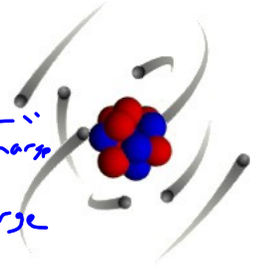


Antimatter
antiproton → proton with "−" charge
positron → electron with "+" charge



PHY 621 Review of Electrostatics

The two types of electric charges are called proton and electron.

Electrons are negative charged. They orbit the nucleus of the atom.

↑ not a universal definition → man made

Protons are positive charged. They are found in the nucleus of the atom with the neutrons.

Neutrons have none or neutral charge.

An atom is electrically neutral when the number of positive charges equals the number of negative charges. # p^+ = # e^-

An atom that has an electrical charge is called an ion.

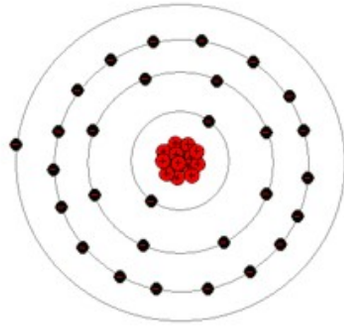
If an atom loses electrons, it will gain a positive charge and it becomes a cations.

If an atom gains electrons, it will gain a negative charge and it becomes a anion.

# of protons	# of electrons	electric charge?	gained or lost what?	Ion Type
8 p +	7 e-	1+	lose an e^-	cation
10 p +	12 e-	2 -	gained 2 e^-	anion
15 p +	15 e-	0	nothing	atom
36 p +	34 e-	2 +	lose 2 e^-	cation

Protons are held very tightly in the nucleus of the atom. (Remember that the number of protons in the nucleus determines what kind of element an atom is.If the number of protons were to change, as in radioactive decay the type of element would change.) This means only the electrons will be able to move on and off atoms.

Valence Electrons



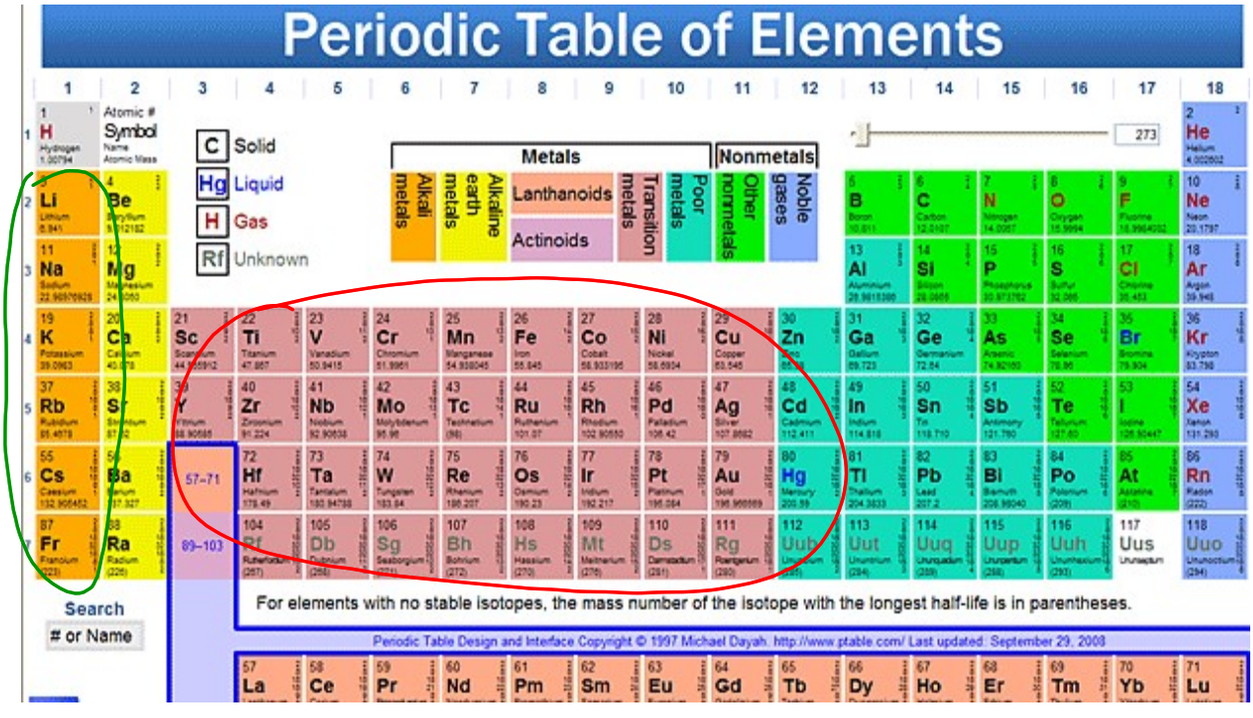
Bohr model

Valance electrons are the electrons found

in outermost shell.

Valence electrons are the electrons that....

⇒ interact during a chemical reaction.
⇒ form bonds between atoms.
⇒ are gained or lost to form ions (usually).



The periodic table is arranged in a special way

The rows are called Periods, hence the name.

The columns are called Groups and the atoms there share similar chemical properties. Typically (not a guaranty), atoms in the same column have the same number of valence electrons.

Bonding

Atoms can form a bond, a way to join up, in different ways.

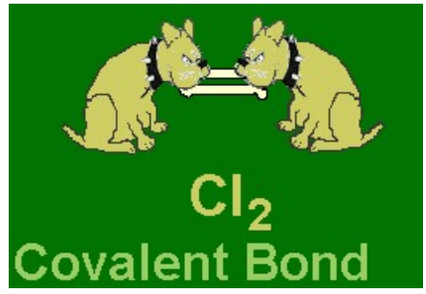
The 2 most common ways both involve electrostatic attraction.

1. Ionic Bonding

> One atom has a Very strong attraction to the valence electrons and takes them completely

> In this case, each atom becomes an ion and are attracted to each other

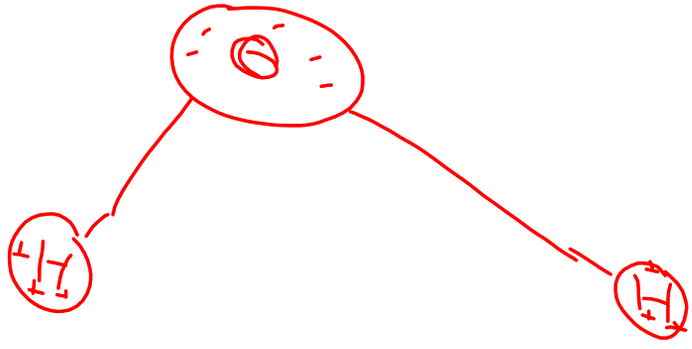
2. Covalent Bonding



> Each atom pulls has enough attraction to both hold onto the valence electrons.

> Sometimes one atom has the valence electrons more than the other

> That molecule then becomes Polarized and each side becomes slightly charged



Basic Rule for Electric Charges

"Like" charges repel each other
> + + and - -

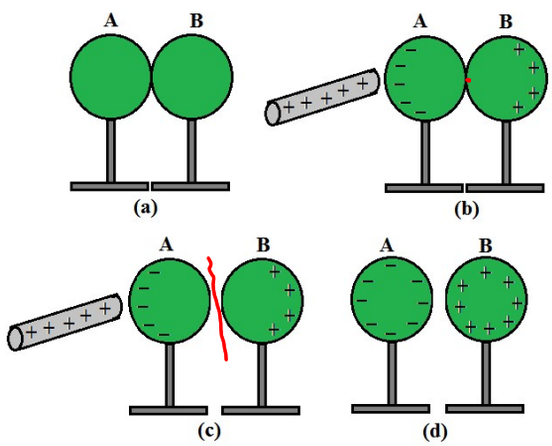
"Opposite" charges attract each other
> + - and - +

Electrostatics is the study of electric charges that can be collected and held in one place. Charges in place will feel a force from others around them.

Current Electricity is the flow of electric charges from one place to another. Charges will feel a force that pushes/pulls them in a particular direction.

The **Law of Conservation of Electric Charges** states that the total charge of the system remains constant. Individual charges are never created or destroyed. These charges may be transferred from one location to another within the system.

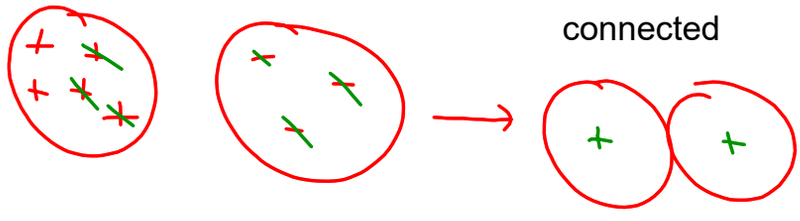
Induction



Connected objects have equal charge

Collection of charge can be separated if objects no longer remain connected

Reverse is also true, charged objects balance out if they become connected

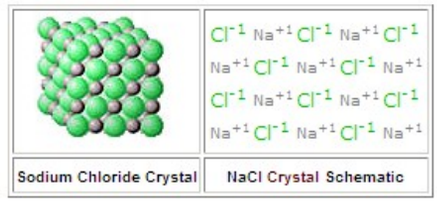


Electric Conductivity

Electrical conductors are materials that allow electric charges to move from one spot to another spot easily.

metals - silver, copper, gold, aluminum, tungsten, zinc, etc.

solutions - ionic solutions (ex. salt solutions with NaCl)



For example, if electrons are added to one spot on a conductor, these extra electrons will repel each other. They will be pushed to other locations trying to get as far away as possible from each other. The extra electrons are able to move physically throughout the material.

Electrical insulators are materials that do not allow electric charges to move through them easily.

dry air, wool, ceramics, glass, plastic, vinyl, rubber, etc.

For example, if electrons are removed from one location on an insulator, that area becomes positively charged. These lost electrons will not be replaced from electrons in other areas because they cannot physically move there.

Semi conductors are materials that are found between conductors and insulators.

qubit

They are used in electronic devices because they can easily be controlled to allow electric charges to move only when desired to

Types of Semiconductor Devices