THE FORMATION OF COMPOUNDS

- Atoms, as they appear on the periodic table are not stable because they do not have a full outer shell, and therefore, are not following the octet rule.

- Last day we learned that atoms will gain or lose electrons in order to become stable by having a full outer shell

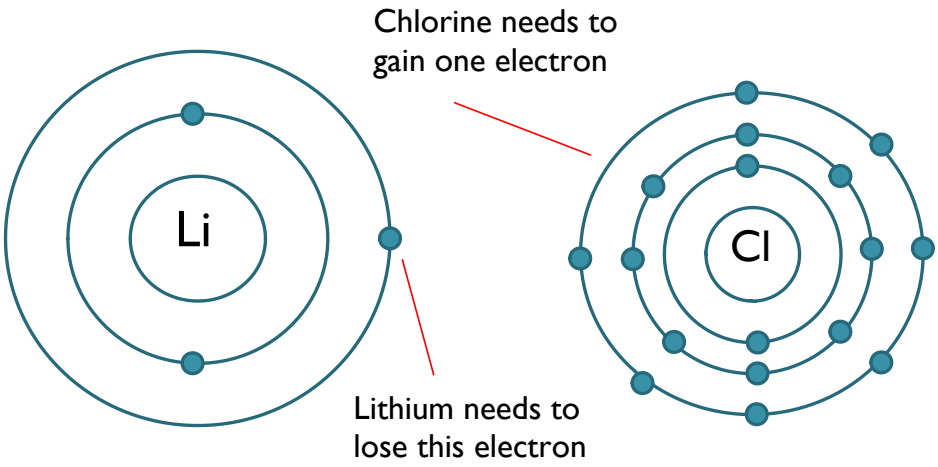
Questions: Where do these electrons come from and where do they go?????

For Example:

- In our examples last day we looked at the lithium atom and chlorine atom.

- We discovered that lithium would need to lose one electron in order to have a full outer shell and that chlorine would need to gain one electron in order to be full.

- Let's take a look.

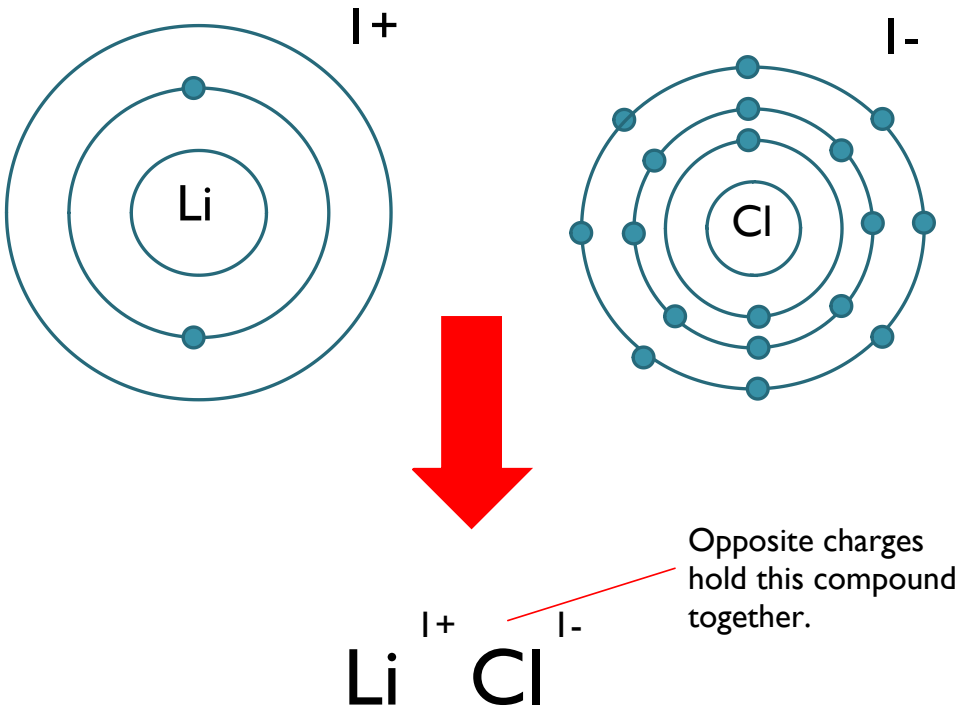


Do you see the connection???

- Lithium is going to give it's electron to chlorine.
- Chlorine will accept the electron from lithium.

- Both atoms have now become ions (charged atoms).

- The opposite charges on the atoms hold them together as a compound.



Types of Compounds

- The example between lithium and chlorine shows the formation of an ionic compound.

- There are two different types of compounds:

1. Ionic Compounds

2. Covalent Compounds

Ionic Compounds

- Forms between a METAL + NONMETAL.
- Results from a transfer of electrons from one atom to another.
- Opposite charges of the ions hold the compound together.

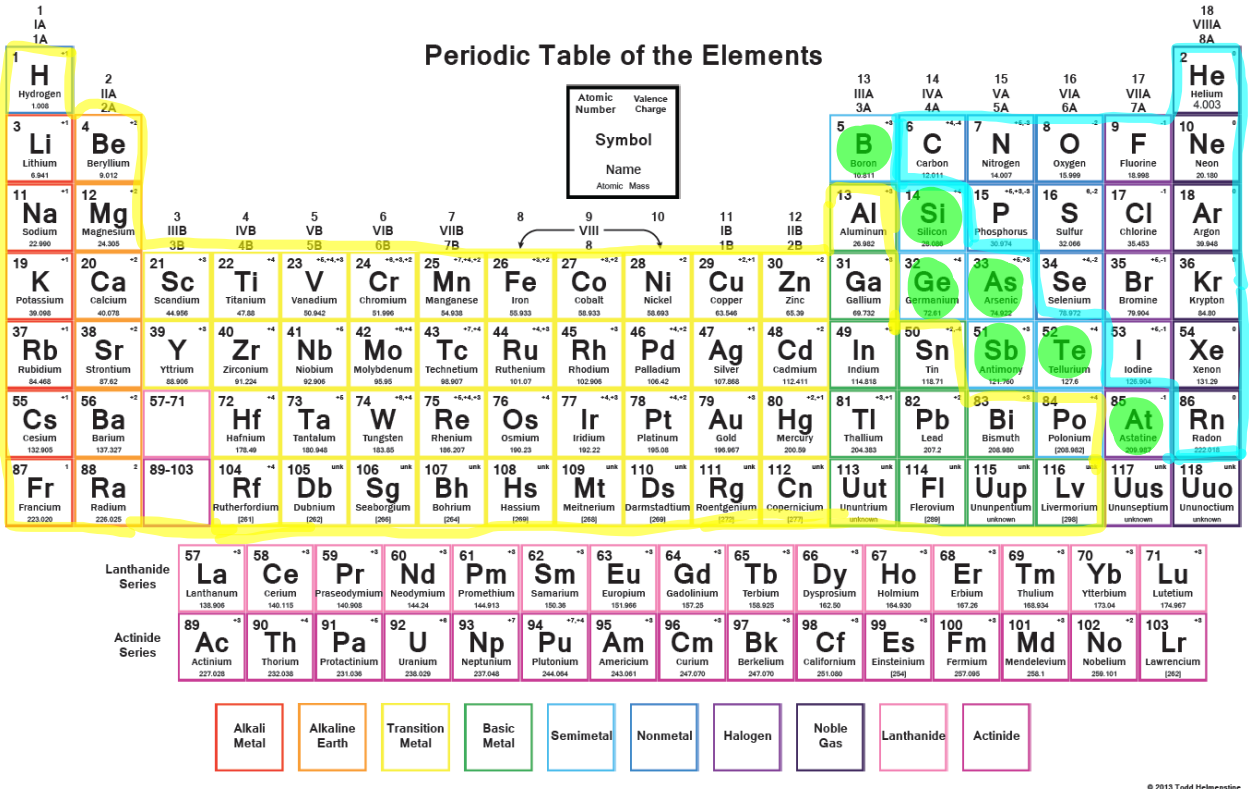
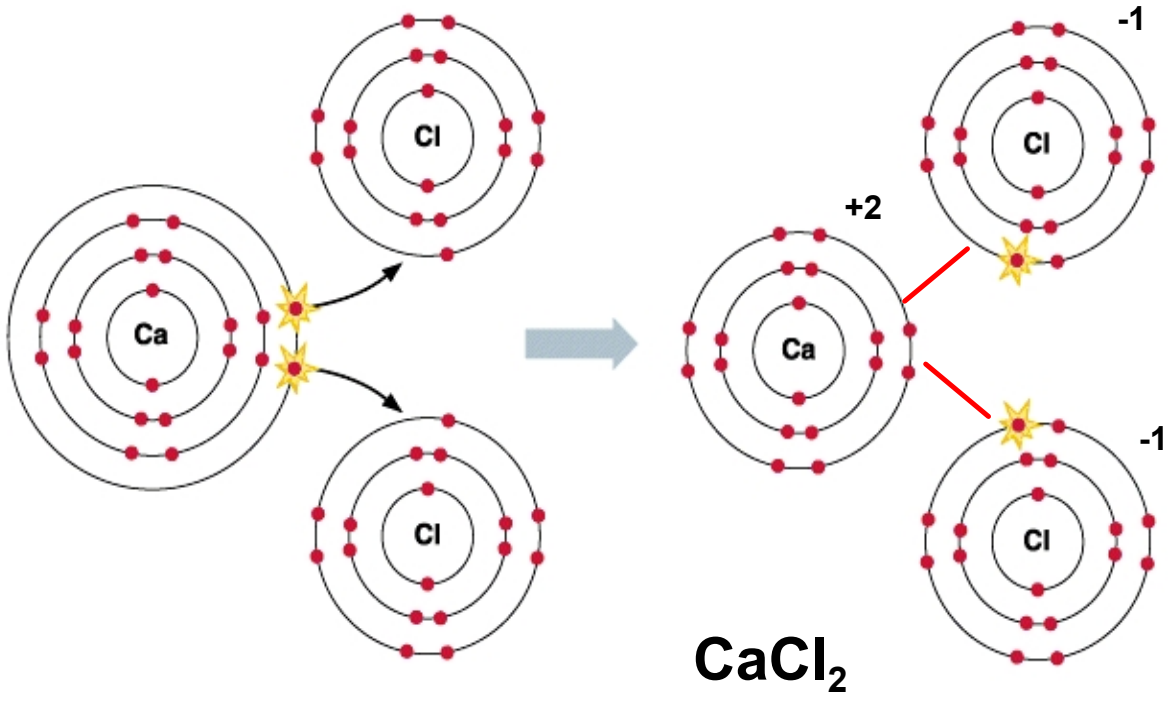


Illustration: Calcium and Chlorine bonding



$CaCl_2$

For Example:

Show the formation of an ionic compound between the following:

A. Lithium and Fluorine 

B. Lithium and oxygen

C. Magnesium and Chlorine

HINT: You may need more than one atom of each element in order to reach a full outer shell!!

Ions can be single atoms F^{1-}

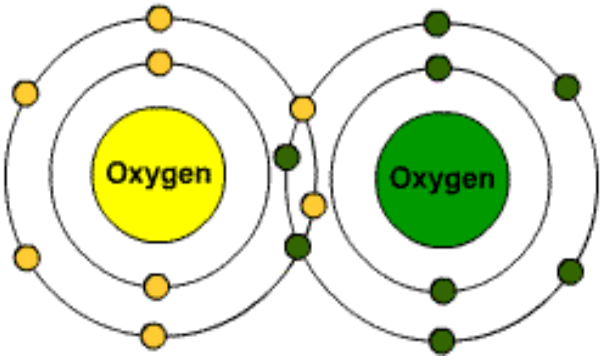
or

they can be group of atoms that have an unbalanced charge, called **polyatomic ions**.

NH_4^{1+}

Covalent Compounds

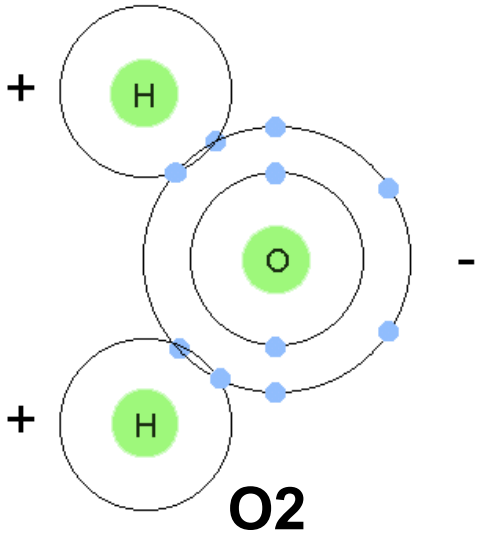
- Form between TWO NON-METALS.
- Results from a SHARING of electrons between atoms.
- There are two types of covalent compounds:



Pure Covalent Compound

2 e- pairs
2 covalent bonds

Two bonds



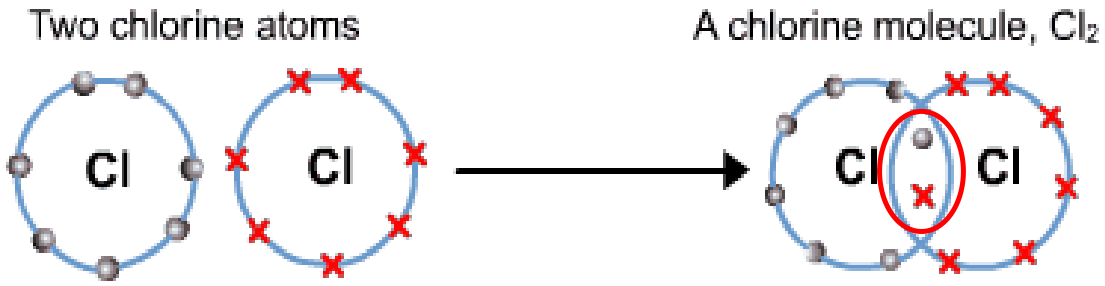
O2

Polar Covalent Compound

Two bonds

Between non-metal atoms:
1 e- pair = 1 covalent bond = single bond
2 e- pairs = 2 covalent bonds = double bond
3 e- pairs = 3 covalent bonds = triple bond

Illustration: chlorine + chlorine



Cl_2

1 e- pair
1 covalent bond

Note:

There are **7** non-metals that naturally exist as molecules:

- H_2 (g)
- O_2 (g)
- Br_2 (g)
- F_2 (g)
- I_2 (g)
- N_2 (g)
- Cl_2 (g)

These elements are referred to as ***diatomic elements***

Chemical Formulas

- ***Chemical formulas*** *r*epresent the types of atoms that bond together to form the compound.
- Chemical formulas also show how many atoms of each element are in the compound.

Examples: $CaCl_2$ = 1 calcium atom
2 chlorine atoms

$Ba(NO_3)_2$ = 1 barium atom
2 nitrogen atoms
6 oxygen atoms

Try the following:

1. K_2SO_4 =

2. $Ca_3(PO_4)_2$ =

3. Write the chemical formula for a compound containing 4 phosphorus atoms and 10 oxygen atoms.