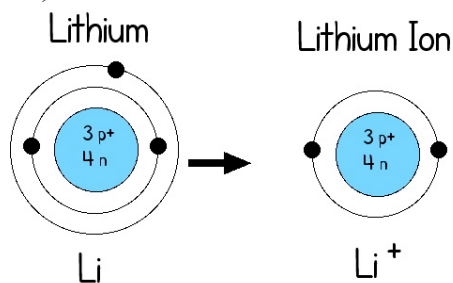


CHEMICAL BONDING: IONIC BONDS & IONS

What is an Ion? Ions are _____ particles that form when atoms gain or lose electrons. _____ electrons changes an atom into a negative ion. _____ electrons changes an atom into a positive ion.

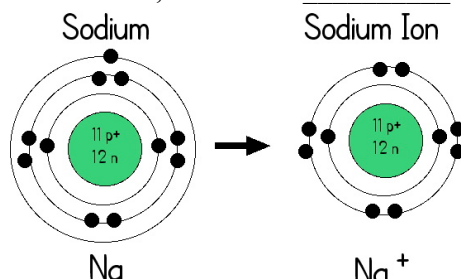
Lithium Ion

Here is a lithium atom with 1 valence electron. It is NOT happy about that, so it will give that lonely electron away to some deserving atom. When it loses an electron, it now has 1 more positive proton, giving it an overall negative charge. Notice I write the charge, Li^+ , as a _____ (superscript = superman = up in the air)



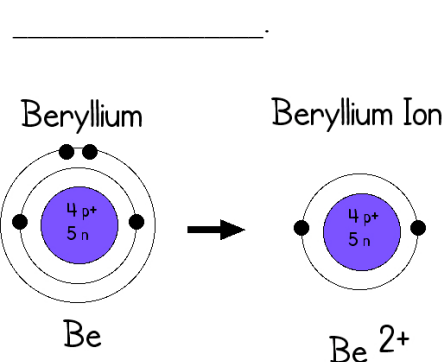
Sodium Ion

We've seen sodium before. Just like lithium, and all other alkali metals, it has 1 valence electron. When it loses that electron, it becomes _____.



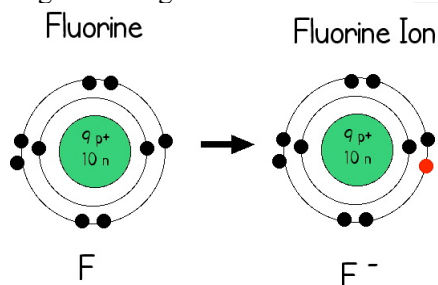
Beryllium Ion

Let's take a look at beryllium. It has 2 valence electrons & is able to lose both. What do you think the charge becomes? $2+$! Notice how I write the charge _____ the number. Positive ions are called _____.



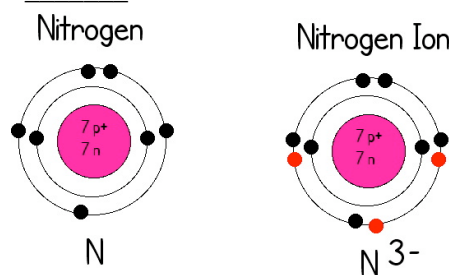
Fluorine Ion

Now, let's take a look at a fluorine atom, a halogen, with 7 valence electrons. It is definitely unhappy with 7 electrons, it really wants 1 more. If it gains an extra electron, its overall charge becomes negative. Negative ions are called _____.



Nitrogen Ion

Looking at nitrogen, with 5 valence electrons, what do you think it will become? It gains 3 electrons, making it _____.



Oxidation Numbers

We actually have an easier way of remembering this... An oxidation number indicates the charge on the atom when electrons are lost or gained. Use this table to help remember:

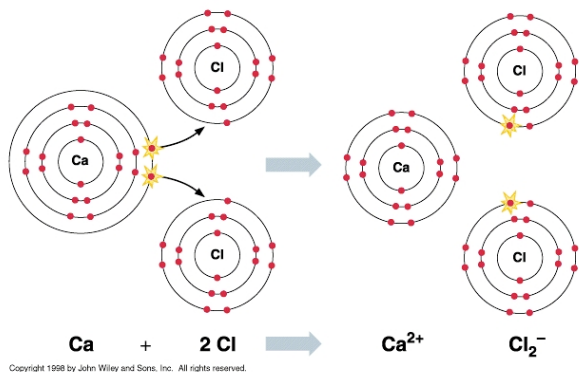
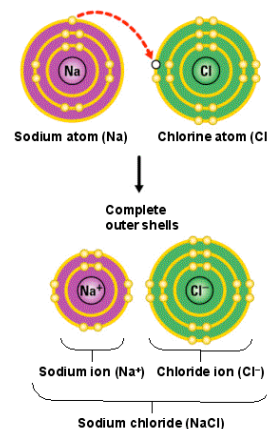
- _____ Oxidation Number = _____ electrons
- _____ Oxidation Number = _____ electrons

1+	2+	Most common oxidation #		3+	4+	3-	2-	1-			
1a	2a	3b-12b				3a	4a	5a	6a	7a	8a
Alkali metals	Alkaline – Earth metals	Transition Metals				Boron Family	Carbon Family	Nitrogen Family	Oxygen Family	Halogens	Noble Gases

Bonding Atoms: The point of the electron dating game was that some elements match really well. Let's look again at sodium & chlorine. Sodium has an extra electron. Chlorine needs an electron. Sodium gives its lonely electron to chlorine & voila! Perfect! Match made in heaven!

Why, I ask? So, after the electron moves, the positive sodium ion is then immediately attracted to the negative chloride ion. Why are they attracted to each other? *Well, as Paula says...*

Ionic Bond: An ionic bond occurs when electrons are _____ from one atom to another, creating an _____ between _____ charges. These bonds are not limited to a single pair of atoms. In NaCl, each Na⁺ is attracted to all of the neighboring chloride ions. Likewise, each Cl⁻ is attracted to all the neighboring sodium atoms. These ions form in a repeated, 3-dimensional pattern called a _____. This means the positive and negative atoms are arranged in alternating patterns. This is why salt is formed in cubes.



Ionic Bond Example

The best example of an ionic bond is NaCl, but there are many more examples of ionic bonds. Let's look at calcium & chlorine. Calcium gives 1 electron to 2 different chlorine atoms. When calcium loses two electrons, it becomes _____. Each chlorine gains 1 electron, becoming _____. BUT... we have 2 chlorine atoms!

Mini-lesson on Chemical Formulas

- If 1 calcium atom bonds to 2 chlorine atoms, the compound is _____
- To show there are 2 chlorine atoms for every 1 calcium atom, we place a _____ 2 to the right of the chlorine atom's symbol.
- Subscript (sub = below) is written to the right & slightly below the symbol.

Compound	Elements
CO ₂	
NH ₄	
C ₃ H ₈	
Al(OH) ₃	
CO(NH ₂) ₂	

Making Bonds

➤ Let's put it all together & see if you can write the chemical formula for each of the two ions.

➤ The goal: the oxidation numbers add up to 0.

Cation (+)	Anion (-)	Compound
Li ⁺	S ²⁻	
Mg ²⁺	Cl ¹⁻	
Al ³⁺	(PO ₄) ³⁻	
Al ³⁺	S ²⁻	
Al ³⁺	(OH) ¹⁻	
Mg ²⁺	(PO ₄) ³⁻	

