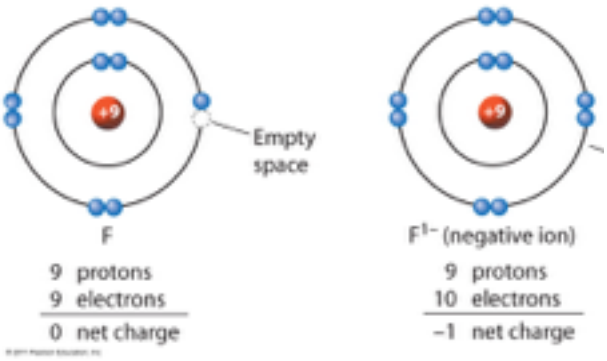
Name: _____ Date: _____

Ionic Bonding Review

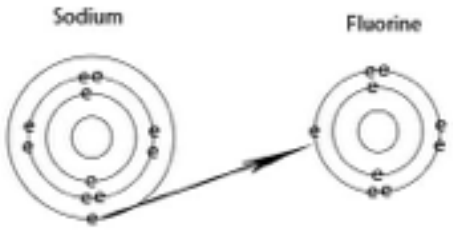
As you know from the Electrons unit, all atoms are striving for full valence shells. These valance shells are full with either 2 electrons (if it is the first valence shell) or 8 electrons (if it is not the first energy shell). We know that atoms are striving for 8 elections in their valence shell because the Octet rule tells us that atoms are the MOST STABLE when they have a full valence shell. To make this happen, atoms form bonds. Today we will review IONIC BONDS: when electrons are transferred between a metal and a non-metal to help both atoms achieve full valence shells.

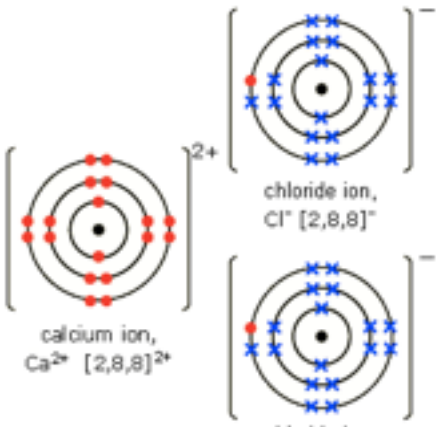
Ion Formation: When elements participate in ionic bonding, they become IONS. Ions are atoms that have either lost or gained electrons. An ion that has **lost electrons** has a positive charge and is called a **CATION**. An ion that has **gain electrons** has a negative charge and is called an **ANION.** Generally, the **metals** want to **lose an electron** and will form cations while the **non-metals** want to **gain electrons** and will form anions. We can determine how many electrons an element wants to gain or lose based on the number of electrons in an elements valence shell.



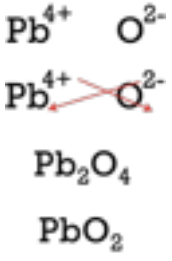
For example, in Fluorine, there are generally 9 electrons which leaves 7 electrons in the outermost shell. As such, Fluorine will want to gain one electron which will result in an overall "net" charge of -1.

Bond Formation: When the atom's form ions, the electrons are transferred between the two atoms. The atoms will pair in such a way that results in a "beneficial trade." For example, a Fluorine might pair with a Sodium atom that wants to lose one electron. Since the Fluorine and Sodium both want to gain/lose 1 electron, they will bond together in a 1 to 1 ratio.





Ratio of Atoms in Bond Formation: Sometimes atoms are not able to form in a 1:1 ratio in ionic bonding. This would occur if the atoms did not want to gain/lose the same numbers of electrons. For example, calcium wants to lose two electrons but chloride only wants to gain one. Instead of bonding in a 1:1 ratio, the atoms will bond in a 1 calcium to 2 chloride ratio. A simple way of determining the ratio is by performing the "Criss-Cross" method which you can see here:



Transition Metals: The transition metals, found in the middle of the periodic table, do not always have the same ionic charge. As such, we indicate their charge with a roman numeral. For example, Tin(II)Oxide would have a charge of +2. We can also determine the charge of a transition metal from the compound formula using a reverse criss-cross method.

Polyatomic Ions: Instead of bonding with a single atom, an ionic bond can sometimes form between an atom and a group of atoms called a **POLYATOMIC ION**. These ions can be found in your reference tables in Table E. Here you can find the ions charge, the components of the ion, and the common name of the ion.

Name: _____ Date: _____

1. What “types” (ex: metals, non-metals, metalloids) of elements form ionic bonds?
   _____
2. Why do elements interact to form ionic bonds?
   _____
   _____
   _____
3. Compare and contrast the ionic bond formed between sodium and chorine and the bond between sodium and oxygen. _____
   _____
   _____
   _____
4. What will the formula be for a compound with sodium and oxygen? Follow these steps to use the criss-cross method:
   1. Write the ion charge for sodium on the upper right-hand side of the symbol: ___Na___
   2. Write the ion charge for oxygen on the upper right-hand side of the symbol: __O__
   3. Write these two symbols next to each other with the charges: _____
   4. Bring the number from the upper side of O to the lower side of Na and do the same from the Na to the O: _____
   5. Rewrite from step 4 without the charges: _____ <— —- this is the formula
5. Was is the name of this ionic formula? $Cu(SO_4)$
   1. Write the charge of (SO_4)? (hint use table E): _____
   2. Are Cu and (SO_4) in a 1:1 ratio? If yes, then the charge of Cu is the same as (SO_4): _____
   3. What is the roman numeral for the charge of Cu? _____
   4. What is the name of (SO_4)? (hint use table E): _____
   5. What is the name of Cu? _____
   6. Write out the full name, including the roman numeral in the middle of the name: _____
6. What is one question that you have about ionic bonding that you would be nervous to see on the midterm exam? _____
   _____
   _____
   _____