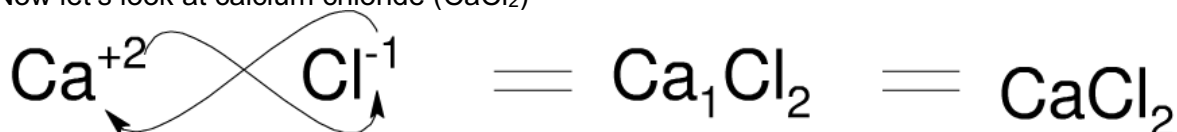**Criss Cross Method for Predicting Formulas**

Ions attract one another to form neutral compounds. We will employ the criss cross method to predict the ration of ions in a compound and therefore predict the chemical formulas.

Let's look at 2 ions sodium (Na^{+1}) and chlorine (Cl^{-1}). We know that these ions combine in a 1:1 ratio. 1 Na ion for every 1 Cl ion. The compound that results is NaCl (sodium chloride).
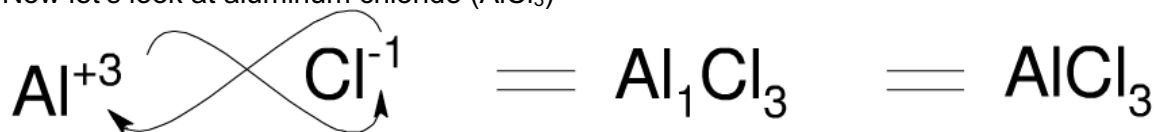
Now let's use the criss cross method. In the criss cross method you take the number for the charge on an ion (ignore the positive and negative) and you make it the other atoms subscript.

$$Na^{+1} \times Cl^{-1} \quad = \quad Na_1Cl_1 \quad = \quad NaCl$$
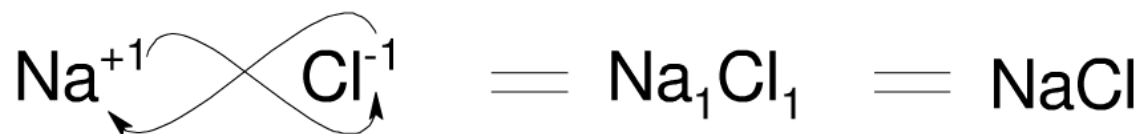
Now let's look at calcium chloride ($CaCl_2$)

$$Ca^{+2} \times Cl^{-1} \quad = \quad Ca_1Cl_2 \quad = \quad CaCl_2$$

Now let's look at aluminum chloride ($AlCl_3$)

$$Al^{+3} \times Cl^{-1} \quad = \quad Al_1Cl_3 \quad = \quad AlCl_3$$
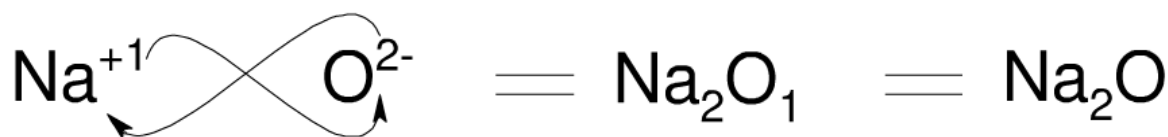
As you can see knowing the charge of the ions makes it extremely simple to predict formulas.

Let's take a look at sodium oxide.

$$Na^{+1} \times O^{2-} \quad = \quad Na_2O_1 \quad = \quad Na_2O$$

Let's take a look at magnesium oxide

$$Mg^{+2} \times O^{2-} \quad = \quad Mg_2O_2 \quad = \quad MgO$$
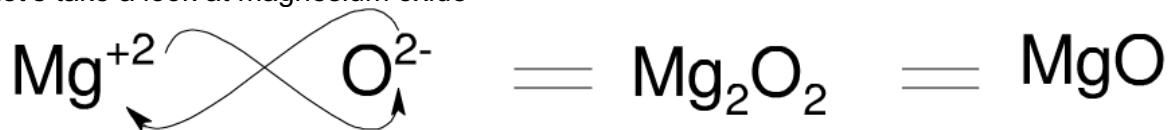
In a case like these where you have two ions that have the same number of an oxidation state you want to find the least common multiple of the numbers. Always reduce the compound to its simplest form when dealing with ionic compounds.

Aluminum Oxide

$$Al^{+3} \bowtie O^{2-} = Al_2O_3$$

So let's check if this method has still generated a compound with a net 0 charge. To do this all we need to do is add up all the positive charges and add that to the sum of all the negative charges.

$2\ Al^{+3}$ = (+3) + (+3) = +6
$3\ O^{2-}$ = (-2) + (-2) + (-2) = -6
(+6) + (-6) = 0 neutral compound

Therefore the compound's formula is correct.

What would the formula be for Pb^{+4} and O^{2-} be?

$$Pb^{+4} \bowtie O^{2-} = Pb_2O_4 = PbO_2$$

Remember always reduce to the least common multiple.

Ionic Bonding Practice

Directions: Write the Charge for each ion and fill the table by creating compounds.

	F	O	P	S	Br	C	Se	Cl
Ba								
Al								
Pb								
Fe^{2+}								
Fe^{3+}								