Intro to Naming and Writing formulas

Naming Binary Ionic Compounds

Remember for simple ionic compounds you name the metal first and then the nonmetal and replace the ending of the nonmetal with –ide. The general pattern is" metal nonmetalide"

Ex. $CaCl_2$

The metal is Calcium The nonmetal is Chlor~~ine~~ The nonmetal ending in ide = Chloride

The name of this compound is Calcium Chlor*ide*

YOU Try a few!

1. $MgBr_2$
2. KCl
3. Al_2S_3
4. Mg_3P_2
5. NaF
6. Li_2O
7. Rb_3N
8. AlI_3

Writing Formulas for Binary Ionic Compounds

When writing formulas for Ionic compounds the charges of the cations must be equal to the charges of the anions. Your first step is to look up the element and determine the type of ion is makes. Then we need to add enough of them to cancel the charge of each out.

Ex. Sodium Oxide

Sodium is an alkali metal in the first column – it makes a 1+ ion = Na^{1+}
Oxygen is in the 6^{th} or 16^{th} column - it makes a 2- ion = O^{2-}

So with Na^{1+} and O^{2-} ions we need 2+ and 2- therefore we need Na^{+} Na^{+} to bond with a single O^{2-}

Our formula would be Na_2O

YOU Try a few!

1. calcium phosphide
2. aluminum sulfide
3. beryllium chloride
4. gallium nitride
5. calcium oxide
6. barium oxide
7. potassium bromide
8. magnesium fluoride

Naming Covalent Molecules

Remember a covalent bond is between two nonmetals (the right sides of the steps and hydrogen)
To name covalent molecules you use the prefixes given to you.

1 - mon(o)	2 - di	3 - tri	4 - tetr(a)	5 - pent(a)
6 - hex(a)	7 - hept(a)	8 - oct(a)	9 - non(a)	10 - dec(a)

1. **If the subscript for the first element is greater than one, indicate the identity of the subscript using one of the prefixes.** We do not write mono- at the beginning of a compound's name. *Example:* We start the name for N_2O_3 with *di-*.
2. **Attach the selected prefix to the name of the first element in the formula. If no prefix is to be used, begin with the name of the first element.** *Example:* We indicate the N_2 portion of N_2O_3 with *dinitrogen*.
3. **Select a prefix to identify the subscript for the second element (even if its subscript is understood to be one).** Leave the "a" off the end of the prefixes that end in "a" and the "o" off of mono- if they are placed in front of an element whose name begins with a vowel (oxygen or iodine). *Example:* The name of N_2O_3 grows to *dinitrogen tri-.*
4. **Write the root of the name of the second element in the formula as shown below.** *Example:* The name of N_2O_3 becomes *dinitrogen triox-.*
5. **Add -ide to the end of the name.** *Example:* The name of N_2O_3 is *dinitrogen trioxide.*

You Try a few!

1. P_4S_5
2. O_2
3. SeF_6
4. Si_2Br_6
5. SCl_4
6. CH_4
7. B_2Si
8. NF_3

Writing Formulas for Covalent molecules

This is easy because the subscript for each element is in the name as a prefix. Simply look up the prefixes, look up the elements an wha-la you are done.

Ex. antimony tribromide

Write the symbols for the elements in the order mentioned in the name. Sn and Br

Write subscripts indicated by the prefixes. If the first part of the name has no prefix, assume it is mono-.

Sn is one so there is no prefix = Sn Br has tri so you need 3 of them = Br_3

Therefore the formula is $SnBr_3$

You Try a few!

1. hexaboron silicide
2. chlorine dioxide
3. hydrogen iodide
4. iodine pentafluoride
5. dinitrogen trioxide
6. phosphorus triiodide

Stock Naming for Compounds with Transition metals

This is the naming with the roman numerals. The transition elements valence electrons available for bonding vary and therefore we need to specify the charge within the name. We do this by using a Roman Numeral.

Example #1: Write the name for: **$FeCl_2$**

1. The first part of the name is the unchanged name of the first element in the formula. In this example, it would be iron.
2. The result from step one **WILL** be followed by a Roman numeral. Here is how to determine its value:
    a. multiply the charge of the anion (the Cl) by its subscript. Ignore the fact that it is negative. In this example it is one times two equals two.
    b. divide this result by the subscript of the cation (the Fe). This is the value of the Roman numeral to use. In this example, it is two divided by one equals two.
    c. The value of the Roman number equals the positive charge on the cation <u>in this formula</u>.

Since the result of step #2 is 2, we then use iron(II) for the name. Notice that there is no space between the name and the parenthesis.

3. The anion is named in the usual manner of stem plus "ide."

The correct name of the example is iron(II) chloride.

You Try a few!

1. $FeCl_3$
2. CrF_2
3. $ZnBr_2$
4. PbO
5. Co_3N_2
6. TiI_4
7. Fe_2O_3
8. SnO

Writing formulas using a Stock Name

When writing formulas for Ionic compounds with Roman numerals the roman numeral indicates the charge of the cation. Then look up the anion and write the formula like you did for a binary ionic compound.

Ex. Manganese (IV) Oxide

Manganese has a IV next to it therefore it is Mn^{4+}
Looking up Oxygen it is in the 6^{th} or 16^{th} column - it makes a 2- ion = O^{2-}

So with Mn^{4+} and O^{2-} ions we need 4+ and 4- therefore we need a Mn^{4+} to bond with O^{2-} O^{2-}

Our formula would be MnO_2

You try a few!

1. lead (II) chloride
2. copper (I) arsenide
3. lead (IV) nitride
4. iron (III) oxide
5. iron (II) bromide
6. vanadium (V) phosphide
7. copper (I) sulfide

Naming with Polyatomic Ions involved

Now we are going to add in something called a polyatomic ion. Here is a list of common polyatomic ions that you are going to want to become very familiar with. To make life easier you might want to make flash cards and learn them all…

+2		-1		-2	
Hg_2^{2+}	mercury(I) or *mercurous*	$C_2H_3O_2^-$	acetate	CO_3^{2-}	carbonate
		ClO_3^-	chlorate	CrO_4^{2-}	chromate
+1		ClO_2^-	chlorite	$Cr_2O_7^{2-}$	dichromate
NH_4^+	ammonium	CN^-	cyanide	HPO_4^{2-}	hydrogen phosphate
H_3O^+	hydronium	$H_2PO_4^-$	dihydrogen phosphate	O_2^{2-}	peroxide
		HCO_3^-	hydrogen carbonate or *bicarbonate*	SO_4^{2-}	sulfate
		HSO_4^-	hydrogen sulfate or *bisulfate*	SO_3^{2-}	sulfite
		OH^-	hydroxide	$S_2O_3^{2-}$	thiosulfate
		ClO^-	hypochlorite		
		NO_3^-	nitrate	-3	
		NO_2^-	nitrite	PO_4^{3-}	phosphate
		ClO_4^-	perchlorate		
		MnO_4^-	permanganate		
		SCN^-	thiocyanate		

Example #1 - write the formula for copper(II) chlorate

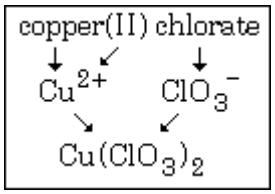
1 - the first word tells you the symbol of the cation. In this case it is Cu.

2 - the Roman numeral WILL tell you the charge on the cation. In this case it is a positive two.

3 - the polyatomic formula and charge comes from the second name. Chlorate means ClO_3^-.

4 - remembering the rule that a formula must have zero total charge, you write the formula $Cu(ClO_3)^2$.

This graphic summarizes example #1:



Example #2 - write the formula for silver cyanide

1 - the first word tells you the symbol of the cation. In this case it is Ag^+.

2 - silver has a constant charge of +1, it is not a cation with variable charge.

3 - the polyatomic formula and charge comes from the second name. In this case, cyanide means CN^-.

4 - remembering the rule that a formula must have zero total charge, you write the formula AgCN.

This graphic summarizes example #2: