Writing Chemical Ionic Formulas HAVE OUT A PERIODIC TABLE AND POLYATOMIC LIST

* Ionic Compounds have a transfer of electrons from one atom onto another
* METALS lose electrons forming positive ions = CATIONS
* NONMETALS gain electrons forming negative ions = ANIONS
* AN IONIC COMPOUND is made up of a METAL and a NONMETAL or a CATION and an ANION
* **THE IONIC COMPOUND HAS A NET CHARGE OF ZERO. ALL CHARGES ADD UP TO ZERO**

TO WRITE AN IONIC CHEMICAL FORMULA FOLLOW THESE STEPS:

1. Look at the name of the metal and **write down its symbol**.
2. **Get the charge** of the metal and place it as a superscript to the right of the symbol.
	1. If no roman numeral is given then we determine the charge of the metal from common ion charges.

Metals with Constant Charge:

Group 1 = +1

Group 2 = +2

Al = +3

Zn = +2

Ag = +1



* 1. If a roman numeral is given then we KNOW the charge from the Roman numeral. ONLY TRANSITION METALS WILL HAVE ROMAN NUMERALS!



* 1. If it starts with ammonium, then write NH4+1
1. Look at the name of the anion. **Write down its symbol and charge** as a superscript to the right
	1. If it ends in –ide the symbol should be a nonmetal element and its charge will be based on the common ion charges above.
	2. If it ends in -ate or –ite the symbol should be a polyatomic ion and it charge will be based on the SET charge of the polyatomic ion.

|  |  |
| --- | --- |
| **Acetate, CH3COO-1 OR C2H3O2-1****Ammonium, NH4+1** **Carbonate, CO3-2** **Perchlorate, ClO4-1** **Chlorate, ClO3-1** **Chlorite, ClO2-1** **Hypochlorite, ClO-1**  | **Hydroxide, OH-1** **Nitrate, NO3-1** **Nitrite, NO2-1** **Peroxide, O2-2** **Phosphate, PO4-3** **Phosphite, PO3-3** **Sulfate, SO4-2** **Sulfite, SO3-2**  |

**Polyatomic Ion List**

1. **Swap Drop and Reduce** the charges to get the **CHARGE TO BALANCE TO ZERO**.

Example: Barium Chloride Example: Lead (IV) Oxide



ONLY USE PARATHESIS WHEN YOU NEED MORE THAN ONE OF THE POLYATOMIC ION.

You Try Now:

1. Beryllium sulfide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6. Silver carbonate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Potassium oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7. Iron (III) sulfate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Calcium hydroxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 8. Ammonium nitrite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Copper (I) phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 9. Barium acetate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Aluminum chlorate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 10. Zinc nitride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A SUMMARY OF FORMULA WRITING:

1. Get the symbol for the Cation
2. Get the charge Cation
3. Get the symbol for the Anion
4. Get the charge for the Anion
5. Swap Drop and Reduce

HOW TO NAME– PLEASE HAVE OUT A PERIODIC TABLE AND POLYATOMIC ION LIST!!!!

PART ONE: NAMING BINARY IONICS WITH CONSTANT CHARGE

* These are the easiest Ionic Compounds
* They will be BINARY (2 elements – 2 capital letters)
* The METAL WILL HAVE A CONSTANT CHARGE.
* The METAL IS ALWAYS NAMED FIRST AND LISTED FIRST IN THE COMPOUND.

Metals that don’t change charge are:

 Group 1 Group 2 3 Special Guests.

   

These will all start with a METAL that is listed above and end with a NONMETAL

Get To Know These Regions of Table:



***RULES:***

1. LOOK AT THE FIRST ELEMENT. IS IT LISTED ABOVE? IF YES
	1. NAME THAT METAL
2. LOOK AT THE SECOND ELEMENT. IT WILL BE A NONMETAL
	1. NAME THAT NONMETAL AND CHANGE ITS ENDING TO –ide

Example: NaCl Sodium Chloride

For this example: Na is one of the metals listed above. Cl is the nonmetal chlorine and will change its ending to ide.

Now You Try! Name these SIMPLE IONIC COMPOUNDS

a. KBr \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ e. AgI \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. RbCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ f. Mg3P2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. SrS \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g. RaO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. Li3N \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ h. ZnCl2  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PART TWO: NAMING IONIC COMPOUNDS THAT CONTAIN A POLYATOMIC ION

* We will start easy again and just use metals with constant charge
* These will have MORE than 2 capital letters!

Here is the list of Polyatomic Ions you need to be familiar with:

|  |  |
| --- | --- |
| **Acetate, CH3COO-1 OR C2H3O2-1****Ammonium, NH4+1** **Carbonate,** CO3-2**Perchlorate, ClO4-1** **Chlorate, ClO3-1** **Chlorite, ClO2-1** **Hypochlorite, ClO-1** **Hydrogen carbonate or bicarbonate, HCO3-1**  | **Hydroxide, OH-1** **Nitrate, NO3-1** **Nitrite, NO2-1** **Peroxide, O2-2** **Phosphate, PO4-3** **Phosphite, PO3-3** **Sulfate, SO4-2** **Sulfite, SO3-2**  |

**Polyatomic Ion List**

***RULES:***

1. LOOK AT THE FIRST ELEMENT. IS IT IN GROUP 1? GROUP 2? OR ONE OF THE SPECIAL GUESTS? IF YES THEN…
	1. NAME THAT METAL
2. IF IT STARTS WITH NH4+1
	1. NAME IT AMMONIUM AS SEEN ABOVE IN THE POLYATOMIC ION LIST
3. LOOK AT WHAT COMES AFTER THE METAL OR WHAT COMES AFTER AMMONIUM. IS IT A POLYATOMIC ION (2 OR MORE CAPITAL LETTERS)? IF YES THEN….
	1. NAME THAT POLYATOMIC
	2. Sometimes that polyatomic is in parentheses. That just means we need more than one of that polyatomic.

Examples: LiNO3 Lithium Nitrate

Li is in group 1 so it is just named lithium and NO3-1 is a the polyatomic nitrate

Example 2: NH4ClO3 Ammonium chlorate

NH4+1 is named ammonium and ClO3-1 is named chlorate

Now You Try! Name these SIMPLE IONIC COMPOUNDS

a. SrSO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ e. Fr2CO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Al(OH)3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ f. Mg3(PO4)2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. NH4NO2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g. Ca(C2H3O2)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. AgNO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ h. CsClO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PART THREE: NAMING BINARY IONICS WITH METALS THAT CHANGE CHARGE (MULTIVALENT METALS)

* These will all start with a metal that is NOT a member of Group 1, Group 2 or Al, Zn, or Ag.
* They will be in the transition metal group (Section D)



Naming Ionic Compounds that have a Transition Metal:

1. Name the metal and if it is not in Group 1, Group 2 or Al, Zn, and Ag then put parenthesis after the metal’s name.
2. Name the anion
	1. If the anion is a monoatomic ion change its ending to –ide
	2. If the anion is a polyatomic ion then the name doesn’t change
3. Now we have to get the roman numeral that goes into the parenthesis. There are 2 ways to do this:
	1. The compound must charge balance to zero.
	2. Everything in the compound must add up to zero
	3. Set up on equation that is equal to zero and solve for the unknown

Method 1: Fe2S3  0 = 2Fe + 3S Iron (III) Sulfide

 0 = 2Fe + 3(-2)

 0 = 2Fe - 6

 6 = 2Fe

 Fe = +3

Method 2: Fe2S3 Reverse Swap and Check

-2

+3333333333

 Fe2S3 Is the common ion charge of Sulfide a -2? YES!!!

 Fe, iron must be +3!!! Iron (III) Sulfide

 Try This!

**Summary:**

1. Name the metal or cation
2. If that metal is NOT IN Group 1, 2 or Al, Zn, Ag then put parenthesis after the metal name. Determine the charge on the metal using the methods shown and put that charge in ( ) as a roman numeral.
3. Name the anion

1. CuCl \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. CrPO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. NiSO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. PbCl4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. FeO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

HOW TO NAME COVALENT COMPOUNDS:

* COVALENT compounds are made up of TWO NONMETALS (RIGHT OF STAIRS)
* These will only contain TWO CAPITAL LETTERS
* These will all end in **–ide**

Steps to Naming Covalent Compounds:

1. Look at the first part of the compound.
	1. Is it a metal? Is it Ammonium? If it is then you are using the wrong system. These are ionic compounds and you should use the ionic notes to help you name these compounds.
	2. If it is a nonmetal:
		1. LOOK AT THE SUBSCRIPT ON THE FIRST NONMETAL.
		2. If that subscript is an assumed one then just NAME THE NONMETAL.
		3. If it is greater than one, convert that number to a prefix. Write down that prefix and then name the nonmetal.



1. Look at the second element in the compound.
	1. Look at the subscript on the second element.
	2. Convert that number to a prefix
	3. Write down the prefix and then element name but CHANGE THE ENDING TO **–ide**

**Note: When the addition of the Greek prefix places two vowels adjacent to one another, the "a" (or the "o") at the end of the Greek prefix is usually dropped; e.g., "nonaoxide" would be written as "nonoxide", and "monooxide" would be written as "monoxide". The "i" at the end of the prefixes "di-" and "tri-" are never dropped.**

Let’s Try:

1. N2S4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. XeF6 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. CCl4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. PBr3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. N2O4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. CO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. N2O5 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. C3H8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How to write the formula of COVALENT Compounds:

* This system is only used with COVALENTS
* The first part of the name will be a NONMETAL

Steps to writing the formula of a Covalent Compound:

1. The first element named will be a nonmetal
	1. If it has NO prefix than just write down the symbol of that nonmetal
	2. If it has a prefix then convert the prefix to a number. Write down the element symbol and place the number as a subscript to the right of the first symbol
2. The second element will always be a nonmetal with a prefix.
	1. Convert the prefix to a number. Write down the element symbol and place the number as a subscript to the right of the second symbol
3. NEVER REDUCE THESE COMPOUNDS!!!



Let’s Try:

1. Boron trihydride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Dinitrogen tetroxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Pentacarbon decahydride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Triarsenic hexiodide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Sulfur dioxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_