

# REVIEW OF NAMING IONIC COMPOUNDS

Textbook Reference: Chapter 5.8, page 195

## Writing Formulas of Ionic Compounds

The formula of a compound represents the number of atoms of each element in one molecule of the compound.

For example:  $\text{H}_2\text{O}$ , has two atoms of hydrogen and one atom of oxygen in each molecule.

A **BINARY** compound contains only two elements.

## Compounds of a metal and a non-metal: Ionic Compounds

Recall that the valence of an element, (aka: oxidation number, charge), is the number of bonds an atom of that element can form.

The valence of an element in **Group I** = the Group number, +1

The valence of an element in **Group II** = the Group number, +2

The valence of an element in **Group III** = the Group number, +3

The valence of an element in **Groups IV, V, VI and VII** = **8 — Group Number**

Hence, for elements in Group IV =  $8 - 4 = 4$

for elements in Group V =  $8 - 5 = 3$

for elements in Group VI =  $8 - 6 = 2$

for elements in Group VII =  $8 - 7 = 1$

Now let us see how the formula is related to the valences of the elements:

## The Crossover Rule for Writing Formulas

1. Write down the symbols of the elements (metal always first).
2. Record the valence value for each element given.
3. Cross over the valences.
4. Find the highest factor common to the two valences.
5. Divide the two valence values by the highest factor.
6. Drop any "1" in the formula and write the remaining numbers as subscripts. (The symbol of an element refers to one atom of the element.)

<u>Examples</u>	<u>Formula</u>	<u>Name</u>
$\text{Li}^1 + \text{F}^1 \longrightarrow$	$\text{LiF}$	lithium fluoride
$\text{Na}^1 + \text{O}^2 \longrightarrow$		
$\text{Mg} + \text{O} \longrightarrow$		
$\text{Al} + \text{S} \longrightarrow$		

## Writing the Chemical Name

1. Write the name of the metal first.
2. Write the name of the non-metal
3. Add the suffix — IDE to the name of the non-metal.

[Do not use any Prefixes.]

## Naming Ionic Compounds containing atoms with More than one Valence

### STOCK Method

( Named after the German chemist Alfred Stock)

1. The atoms of some metals form more than one stable ion.
2. In such cases a Roman Numeral in parentheses, is added immediately after the name of the element to indicate the valency (i.e. oxidation number, or charge), of the metal.

Element, Symbol	Valence (O.N, charge)	Roman Numeral
Copper, Cu	+1, +2	I, II
Mercury, Hg	+1, +2	I, II
Lead, Pb	+2, +4	II, IV
Tin, Sn	+2, +4	II, IV
Iron, Fe	+2, +3	II, III
Arsenic, As	+3, +5	III, V
Antimony, Sb	+3, +5	III, V

### Examples

Name					Formula
Copper (I) chloride	Cu <sup>+1</sup>	Cl <sup>-1</sup>			CuCl
Copper (II) chloride	Cu <sup>+2</sup>	Cl <sup>-1</sup>			CuCl <sub>2</sub>
Lead (II)oxide	Pb <sup>+2</sup>	O <sup>-2</sup>	= Pb <sub>2</sub> O <sub>2</sub>	=	PbO
Lead (IV)oxide	Pb <sup>+4</sup>	O <sup>-2</sup>	= Pb <sub>2</sub> O <sub>4</sub>	=	PbO <sub>2</sub>

### Write the formula for each of the following:

1. Copper (I) bromide \_\_\_\_\_
2. Copper (II) bromide \_\_\_\_\_
3. Iron (II) sulphide \_\_\_\_\_
4. Tin (II) sulphide \_\_\_\_\_
5. Lead (II) nitride \_\_\_\_\_
6. Antimony (III) phosphide \_\_\_\_\_
7. Mercury (II) chloride \_\_\_\_\_
8. Arsenic (V) oxide \_\_\_\_\_
9. Lead (IV) oxide \_\_\_\_\_
10. Iron (III) fluoride \_\_\_\_\_

### Name the following using the Stock method

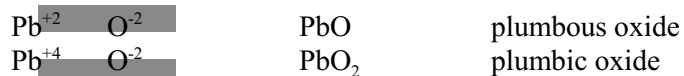
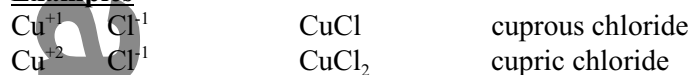
1. SnCl<sub>2</sub> \_\_\_\_\_
2. SnCl<sub>4</sub> \_\_\_\_\_
3. Fe<sub>2</sub>O<sub>3</sub> \_\_\_\_\_
4. CuS \_\_\_\_\_
5. Cu<sub>3</sub>N \_\_\_\_\_
6. SnO \_\_\_\_\_
7. FeI<sub>2</sub> \_\_\_\_\_
8. FeN \_\_\_\_\_
9. HgO \_\_\_\_\_
10. Sb<sub>2</sub>S<sub>5</sub> \_\_\_\_\_

## The CLASSICAL Method

1. An older method of naming ions of metals when the oxidation number can change is referred to as the Classical method.
2. This method uses the Latin name of the metal.
3. The **LOWER** oxidation number, uses the suffix — **OUS**, with the name of the metal.
4. The **HIGHER** oxidation number uses the suffix — **IC**, with the name of the metal.

Name, Symbol	Latin Name	Oxidation Number	Classical Name
Copper, Cu	Cuprum	+1 +2	cuprous cupric
Mercury, Hg	Hydrargyrum	+1 +2	mercurous mercuric
Lead, Pb	Plumbum	+2 +4	plumbous plumbic
Tin, Sn	Stannum	+2 +4	stannous stannic
Iron, Fe	Ferrum	+2 +3	ferrous ferric
Arsenic, As	Arsenic	+3 +5	
Antimony, Sb	Stibinum	+3 +5	stibinous stibinic

### Examples



### Write the formula for each of the following

- |                            |                             |
|----------------------------|-----------------------------|
| 1. Cuprous bromide _____   | 2. Stannous iodide _____    |
| 3. Plumbic oxide _____     | 4. Ferric oxide _____       |
| 5. Mercuric sulphide _____ | 6. Stibinic phosphide _____ |
| 7. Arsenous nitride _____  | 8. Stannic oxide _____      |
| 9. Plumbous bromide _____  | 10. Ferrous oxide _____     |

### Write the formula for the following using the Classical Method

- |                           |   |
|---------------------------|---|
| 1. PbS _____              | 2. FeCl <sub>3</sub> _____              |
| 3. SnO <sub>2</sub> _____ | 4. CuI _____                            |
| 5. FeP _____              | 6. HgO _____                            |
| 7. PbO <sub>2</sub> _____ | 8. Sb <sub>2</sub> O <sub>5</sub> _____ |
| 9. FeO _____              | 10. AsCl <sub>3</sub> _____             |