

## Unit 2: Chemical Reactions

### Chemical Nomenclature – Naming Ionic Compounds

1. Give the metal its full name
2. Give the non-metal its ion name (with the -ide ending)

H \_\_\_\_\_ C \_\_\_\_\_ N \_\_\_\_\_ O \_\_\_\_\_

F \_\_\_\_\_ P \_\_\_\_\_ S \_\_\_\_\_ Cl \_\_\_\_\_

Br \_\_\_\_\_ I \_\_\_\_\_

Ex: NaCl

BaF<sub>2</sub>

### Writing Ionic Compound Formulas: Crossover method

1. Find the charge on each element
2. Cross over the charges (oxidation numbers)
3. Reduce if needed and omit ones

Ex: magnesium fluoride \_\_\_\_\_

Ex: calcium sulfide \_\_\_\_\_

### Classic and Stock System for Ionic Compounds

Most \_\_\_\_\_ metals (group B metals) and some other metals are \_\_\_\_\_, which means that they can have more than \_\_\_\_\_ valence, or charge. Ionic compounds with multivalent metals are named using either the \_\_\_\_\_ or the \_\_\_\_\_ system.

A stock system name contains the charge of the metal in \_\_\_\_\_ numerals.

Ex: copper (I) chloride

copper (II) chloride

To name a compound with a multivalent metal, follow these steps:

1. Reverse criss-cross
2. Draw brackets on top of the elements. And put the number of the subscript beside the bracket for both the elements.
3. Insert the charge of the anion in the bracket and multiply with the number of atoms present to get the total charge.
4. The total positive charge should be equal to the total negative charge as all ionic compounds are neutral.
5. Divide the total positive charge by the number of atoms present to get the charge of the positive ion.
6. Write the name showing the metal's valence in brackets, using Roman numerals.

Examples:

PbO

PbO<sub>2</sub>

Pb<sub>3</sub>N<sub>2</sub>

The classic system is an old system that uses the Latin name for the metal and the following 2 suffixes:

"ous" for the lower charge

"ic" for the higher charge

Examples:

cupric fluoride

cuprous fluoride

# Writing Formulas and Naming Compounds Practice Sheet

## Ionic Compounds

Name	Formula	Formula	Name
magnesium sulfide		Ba <sub>3</sub> P <sub>2</sub>	
rubidium selenide		Al <sub>2</sub> S <sub>3</sub>	
sodium sulfide		KCl	
calcium fluoride		NaF	
strontium oxide		MgF <sub>2</sub>	
aluminum chloride		MgO	
barium bromide		SrCl <sub>2</sub>	
lithium iodide		Li <sub>2</sub> O	

## Classic System for Ionic Compounds

Name	Formula	Name	Formula
auric chloride		cobaltous oxide	
cuprous bromide		ferrous sulfide	
stibnic carbide		cupric oxide	
stannous oxide		cobaltic sulfide	
mercurous bromide		manganous oxide	
mercuric bromide		ferrous nitride	
cuprous oxide		stannic oxide	
mercuric oxide		manganic oxide	

## Stock System for Ionic Compounds

Name	Formula	Formula	Name
lead (II) sulfide		FeCl <sub>2</sub>	
iron (III) oxide		SnO <sub>2</sub>	
nickel (II) chloride		CuBr	
copper (I) oxide		FeCl <sub>3</sub>	
gold (III) sulfide		CrCl <sub>3</sub>	
chromium (II) phosphide		CuCl <sub>2</sub>	
cobalt (II) iodide		CuO	
tin (IV) bromide		CdS	
manganese (IV) oxide		Sb <sub>2</sub> S <sub>5</sub>	
mercury (II) chloride		Pb <sub>3</sub> N <sub>4</sub>	
lead (II) iodide		Hg <sub>2</sub> O	

## Naming Polyatomic Ion Compounds (a metal and a group of non-metals)

### Polyatomic ion:

They are usually treated as a single element because they move as a \_\_\_\_\_.

If there is more than one polyatomic ion, then it is put in \_\_\_\_\_, and a subscript outside the brackets indicates how many polyatomic ions are in the compound.

### Examples:

1. Find the chemical formulas for:  
silver nitrate: \_\_\_\_\_ aluminum sulfate

2. Name the following compounds:  
KMnO<sub>4</sub> \_\_\_\_\_ CuSO<sub>4</sub>

### Polyatomic Ions

Name	Formula	Formula	Name
sodium iodate		Ba(OH) <sub>2</sub>	
potassium sulfate		Mg(ClO <sub>3</sub> ) <sub>2</sub>	
magnesium nitrate		KNO <sub>3</sub>	
calcium bromate		KMnO <sub>4</sub>	
lithium phosphate		NaC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	
ammonium sulfate		Al(CN) <sub>3</sub>	
ammonium thiosulfate		Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	
ammonium nitrate		H <sub>2</sub> O <sub>2</sub>	

### Polyatomic ions – where metal are multivalent

Name	Formula	Formula	Name
copper (II) sulfate		CuSO <sub>4</sub>	
iron (II) chlorate		Cu <sub>2</sub> SO <sub>4</sub>	
cobalt (II) carbonate		CuSO <sub>3</sub>	
iron (III) phosphate		Pb(NO <sub>3</sub> ) <sub>4</sub>	
gold (II) acetate		Fe(ClO <sub>3</sub> ) <sub>2</sub>	
antimony (III) thiosulfate		HgSO <sub>4</sub>	
tin (II) hydroxide		Sn(CO <sub>3</sub> ) <sub>2</sub>	
copper (II) phosphate		Pb(SO <sub>4</sub> ) <sub>2</sub>	
copper (I) nitrate		Pb(OH) <sub>2</sub>	
nickel (II) carbonate		ZnSO <sub>4</sub>	
iron (III) bromate		Hg <sub>2</sub> O <sub>2</sub>	
copper (I) acetate		Cu <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	
mercury (I) hydroxide		AgNO <sub>3</sub>	
antimony (V) acetate		NiC <sub>2</sub>	

iron (III) cyanide		$\text{Sn}(\text{NO}_3)_2$	
iron (III) chlorate		$\text{FePO}_4$	
lead (IV) carbonate		$\text{Au}(\text{CO}_3)$	
manganese (II) oxalate		$\text{PbS}_2\text{O}_3$	
manganese (III) phosphate		$\text{CrC}_2\text{O}_4$	
mercury (I) nitrate		$\text{Ni}(\text{IO}_3)_2$	
tin (II) bromate		$\text{Co}(\text{BrO}_3)_3$	
antimony (V) phosphate		$\text{FeCO}_3$	
nickel (II) thiocyanate		$\text{MnPO}_4$	
lead (IV) hydroxide		$\text{SbPO}_4$	
gold (I) sulfate		$\text{Cu}_2\text{SO}_4$	

### Naming Molecular (Covalent) Compounds (2 or more non-metals)

Step 1: Give the first atom its full name and the second atom its ion name ("ide" ending)

Step 2: Use \_\_\_\_\_ to indicate the number of each atom

**No mono if the first element has only one atom**

# of atoms	Prefix
1	Mono
2	Di
3	Tri
4	Tetra
5	Penta
6	Hexa
7	Hepta
8	Octa
9	Nona
10	Deca

Ex.  $\text{CO}_2$

$\text{NO}_3$

$\text{N}_2\text{O}_2$

$\text{N}_2\text{O}_4$

### Writing Molecular Compound Formulas

Use the prefixes to determine how many of each atom you have.

Ex. diphosphorous pentoxide

### Diatomic Gases (7):

### Some commonly used names of molecular compounds

$\text{H}_2\text{O}$  \_\_\_\_\_

$\text{H}_2\text{O}_2$  \_\_\_\_\_

$\text{NH}_3$  \_\_\_\_\_

$\text{CH}_4$  \_\_\_\_\_