

## Unit 2: Chemical Reactions

### Binary Compounds

**Binary Ionic:** Composed of only \_\_\_ elements where one is a \_\_\_\_\_ and the other is a \_\_\_\_\_.

#### Univalent metal Elements

- Metal will only form one ion
- The elements of GROUPS 1, 2, 13 and
- $\text{Ag}^{+1}$  and  $\text{Zn}^{+2}$

#### Steps followed to write a name:

Step 1. metal name 1<sup>st</sup> – unchanged

Step 2. non-metal name 2<sup>nd</sup> – suffix changed to “ide”

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

P \_\_\_\_\_ S \_\_\_\_\_ Cl \_\_\_\_\_ Se \_\_\_\_\_ Br \_\_\_\_\_

I \_\_\_\_\_

eg.  $\text{MgCl}_2$  \_\_\_\_\_  $\text{Na}_2\text{O}$  \_\_\_\_\_

#### Steps followed to write the formula:

Step 1. Write the symbol for each element

Step 2. Assign the positive and negative charges to metal and non-metal components

Step 3. Use the crossover rule to find the # of each element in the formula

eg. Potassium nitride \_\_\_\_\_ Zinc chloride \_\_\_\_\_

#### Multivalent metal Elements

- Metal is variably valent
- ALL the other elements in the periodic table!!!
- The positive charge has to be **determined from the negative ion and the formula**

#### Steps to name:

Step 1. metal name 1<sup>st</sup> – unchanged

Step 2. In brackets, a Roman numeral to denote charge on metal ion.

Step 3. non-metal name 2<sup>nd</sup> – suffix changed to “ide”

Have to determine the charge on the metal using reverse crossover.

Eg  $\text{FeO}$  \_\_\_\_\_  $\text{Fe}_2\text{O}_3$  \_\_\_\_\_

#### Steps to write the formula:

Step 1. Write the symbol for each element.

Step 2. Assign the positive (Roman Numeral) and negative charges to metal and non-metal components.

Step 3. Use the crossover rule to find the number of each element in the formula.

eg. Nickel (I) sulphide \_\_\_\_\_ Copper (II) nitride \_\_\_\_\_

#### Classical (Alchemist) Method:

- Suffix added to “root” name
- Suffix: higher charge – “ic”
- Lower charge – “ous”

eg cupric oxide \_\_\_\_\_ plumbous chloride \_\_\_\_\_

## Binary Covalent Compounds

- Two \_\_\_\_\_ may combine to form more than one molecular compound.
- **Prefixes** are used to indicate the number of each element in the compound.
- Oxidation states are NOT used with this method.

### Prefixes

Number	Prefix	Number	Prefix
1	mono	6	hexa
2	di	7	hepta
3	tri	8	octa
4	tetra	9	nona
5	penta	10	deca

### Exceptions:

1. The prefix "mono" is not used for the 1<sup>st</sup> element
2. for prefixes that end with an "a" or "o", the "a" or "o" is dropped when combined with an element that starts with a vowel (but not with iodine)

eg. NO _____	NO <sub>2</sub> _____
N <sub>2</sub> O _____	N <sub>2</sub> O <sub>3</sub> _____
N <sub>2</sub> N <sub>4</sub> _____	N <sub>2</sub> O <sub>5</sub> _____

3. di not used with hydrogen compounds.

eg. H <sub>2</sub> O	H <sub>2</sub> S
HF	

### Special names:

H <sub>2</sub> O	water	not	hydrogen oxide
NH <sub>3</sub>	ammonia	not	nitrogen trihydride

## Writing Formulas and Names of Molecular/Covalent Compounds

### Diatomic Molecules

Chemical Name	Chemical Formula
hydrogen	
nitrogen	
oxygen	
fluorine	

Chemical Formula	Chemical Name
Cl <sub>2</sub>	
Br <sub>2</sub>	
I <sub>2</sub>	

### Noble Gases

Chemical Name	Chemical Formula
helium	
neon	
argon	

Chemical Formula	Chemical Name
Kr	
Xe	
Rn	

### Molecular Compounds

Chemical Name	Chemical Formula
nitrogen dioxide	
carbon dioxide	
carbon tetrachloride	
sulfur trioxide	
phosphorous triiodide	
dinitrogen tetroxide	
carbon monoxide	
silicon dioxide	
diarsenic pentasulfide	
dinitrogen monoxide	

Chemical Formula	Chemical Name
AsCl <sub>3</sub>	
PS <sub>5</sub>	
PO <sub>5</sub>	
AsCl <sub>5</sub>	
P <sub>2</sub> S <sub>5</sub>	
P <sub>2</sub> O <sub>5</sub>	
SO <sub>2</sub>	
NO <sub>2</sub>	
H <sub>2</sub> O	
NH <sub>3</sub>	