




# Writing Formulas and Naming Compounds




Please cut out along the dotted lines.  
DO NOT glue until I tell you the order.



**Writing Formulas**

**Naming Compounds**



Paste your  
"Writing Formulas"  
Foldable Here

**Practice Problems:**

1. Na<sup>+</sup>, Cl<sup>-</sup> \_\_\_\_\_
2. Zn<sup>2+</sup>, S<sup>2-</sup> \_\_\_\_\_
3. Zn<sup>2+</sup>, OH<sup>-</sup> \_\_\_\_\_
4. Al<sup>3+</sup>, Cl<sup>-</sup> \_\_\_\_\_
5. K<sup>+</sup>, PO<sub>4</sub><sup>3-</sup> \_\_\_\_\_
6. Pb<sup>2+</sup>, O<sup>2-</sup> \_\_\_\_\_
7. Mn<sup>2+</sup>, Br<sup>-</sup> \_\_\_\_\_
8. H<sup>+</sup>, Cl<sup>-</sup> \_\_\_\_\_

Paste your  
"Naming Compounds"  
Foldable Here

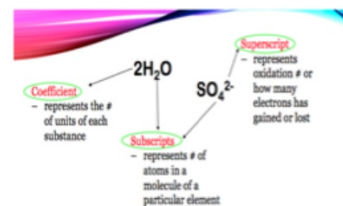
**Practice Problems:**

1. SiCl<sub>4</sub> \_\_\_\_\_
2. SiO<sub>2</sub> \_\_\_\_\_
3. CaCO<sub>3</sub> \_\_\_\_\_
4. SO<sub>2</sub> \_\_\_\_\_
5. PbBr<sub>2</sub> \_\_\_\_\_
6. Mg(NO<sub>3</sub>)<sub>2</sub> \_\_\_\_\_
7. P<sub>2</sub>O<sub>5</sub> \_\_\_\_\_
8. CCl<sub>4</sub> \_\_\_\_\_

**Covalent compounds**

– can form more than one compound with each other. Scientist use Greek prefixes to indicate # of atoms of each element in binary compound.

Prefixes For Binary Covalent Compounds								
#atoms	1	2	3	4	5	6	7	8
prefix	Mono-	di-	tri-	tetra	penta	hexa	hepta	octa



POLYATOMIC IONS		
Charged	Name	Formula
1+	Ammonium	NH <sub>4</sub> <sup>+</sup>
1-	Acetate	C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup>
1-	Chlorate	ClO <sub>3</sub> <sup>-</sup>
1-	Hydroxide	OH <sup>-</sup>
1-	Nitrate	NO <sub>3</sub> <sup>-</sup>
2-	Carbonate	CO <sub>3</sub> <sup>2-</sup>
2-	Sulfate	SO <sub>4</sub> <sup>2-</sup>
3-	Phosphate	PO <sub>4</sub> <sup>3-</sup>

Special Ions	
Name	Oxidation Number
Copper (I)	1+
Copper (II)	2+
Copper (III)	3+
Iron (II)	2+
Iron (III)	3+
Chromium (II)	2+
Chromium (III)	3+
Lead (II)	2+
Lead (IV)	4+

Please cut out these four tables  
DO NOT glue until I tell you the order.



## Writing Formulas

STEP 1

STEP 2

STEP 3

### Practice Problems

1.  $\text{Na}^+$ ,  $\text{Cl}^-$   $\text{NaCl}$
2.  $\text{Zn}^{2+}$ ,  $\text{S}^{2-}$   $\text{ZnS}$
3.  $\text{Zn}^{2+}$ ,  $\text{OH}^-$   $\text{Zn}(\text{OH})_2$
4.  $\text{Al}^{3+}$ ,  $\text{Cl}^-$   $\text{AlCl}_3$
5.  $\text{K}^+$ ,  $\text{PO}_4^{3-}$   $\text{K}_3(\text{PO}_4)$
6.  $\text{Pb}^{2+}$ ,  $\text{O}^{2-}$   $\text{PbO}_2$
7.  $\text{Mn}^{2+}$ ,  $\text{Br}^-$   $\text{MnBr}_2$
8.  $\text{H}^+$ ,  $\text{Cl}^-$   $\text{HCl}$

## Naming Compounds



STEP 1

STEP 2

STEP 3

### Practice Problems

1.  $\text{SCl}_6$  sulfur hexachloride
2.  $\text{SiO}_2$  silicon dioxide
3.  $\text{CaCO}_3$  calcium carbonate
4.  $\text{SO}_2$  sulfur dioxide
5.  $\text{PBr}_3$  phosphorus tribromide
6.  $\text{Mg}(\text{NO}_3)_2$  magnesium nitrate
7.  $\text{P}_2\text{O}_5$  diphosphorus pentoxide
8.  $\text{CCl}_4$  carbon tetrachloride

## *Writing Formulas*

STEP 1: Write the symbol of the element or polyatomic ion (ions with more than one atom), with the positive oxidation number 1<sup>st</sup>.

STEP 2: Write the symbol of the element or polyatomic ion, with the negative oxidation number 2<sup>nd</sup>.

STEP 3: Add subscripts so that the sum of the oxidation numbers of all atoms in the formula is zero. Using the criss-cross method: the charge (without the sign) of one ion becomes the subscript of the other ion.

## *Naming Compounds*

STEP 1: Write the name of the positive ion 1<sup>st</sup>. For special ions, use roman numerals in parentheses after the ions name to balance the overall charge.

Ex: Fe <sup>2+</sup> Iron (II), Pb <sup>4+</sup> is Lead (IV).

STEP 2: Write the root name of the negative ion with part of the element's name 2<sup>nd</sup>, such as Chlorine is chloro- or Oxygen is ox-.

STEP 3: Add the ending -ide or -ate to the root depending on the type of compound.

Example: CO is named carbon monoxide

Ba (ClO<sub>3</sub>)<sub>2</sub> is barium chlorate

# Oxidation Numbers

1+



2+



0



3+



4+



3-



2-



1-



2  
He  
4.003  
Helium

10  
Ne  
20.18  
Neon

18  
Ar  
39.95  
Argon

36  
Kr  
83.80  
Krypton

54  
Xe  
131.3  
Xenon

86  
Rn  
222  
Radon

The Combining Power or Valencies of the Elements of the Periodic Table

1 H 1.008 Hydrogen	4 Be 9.012 Beryllium											5 B 10.81 Boron	6 C 12.01 Carbon	7 N 14.01 Nitrogen	8 O 16.00 Oxygen	9 F 19.00 Fluorine	10 Ne 20.18 Neon	
3 Li 6.941 Lithium	11 Na 22.99 Sodium	12 Mg 24.31 Magnesium											13 Al 26.98 Aluminum	14 Si 28.09 Silicon	15 P 30.97 Phosphorus	16 S 32.07 Sulfur	17 Cl 35.45 Chlorine	18 Ar 39.95 Argon
19 K 39.10 Potassium	20 Ca 40.08 Calcium	21 Sc 44.96 Scandium	22 Ti 47.87 Titanium	23 V 50.94 Vanadium	24 Cr 52.00 Chromium	25 Mn 54.94 Manganese	26 Fe 55.85 Iron	27 Co 58.93 Cobalt	28 Ni 58.69 Nickel	29 Cu 63.55 Copper	30 Zn 65.38 Zinc	31 Ga 69.72 Gallium	32 Ge 72.64 Germanium	33 As 74.92 Arsenic	34 Se 78.96 Selenium	35 Br 79.90 Bromine	36 Kr 83.80 Krypton	
37 Rb 85.47 Rubidium	38 Sr 87.61 Strontium	39 Y 88.91 Yttrium	40 Zr 91.22 Zirconium	41 Nb 92.91 Niobium	42 Mo 95.96 Molybdenum	43 Tc 98.91 Technetium	44 Ru 101.1 Ruthenium	45 Rh 102.9 Rhodium	46 Pd 106.4 Palladium	47 Ag 107.9 Silver	48 Cd 112.4 Cadmium	49 In 114.8 Indium	50 Sn 118.7 Tin	51 Sb 121.8 Antimony	52 Te 127.6 Tellurium	53 I 126.9 Iodine	54 Xe 131.3 Xenon	
55 Cs 132.9 Cesium	56 Ba 137.3 Barium	57-71 Lanthanoids	72 Hf 178.5 Hafnium	73 Ta 180.9 Tantalum	74 W 183.9 Tungsten	75 Re 186.2 Rhenium	76 Os 190.2 Osmium	77 Ir 192.2 Iridium	78 Pt 195.1 Platinum	79 Au 197.0 Gold	80 Hg 200.6 Mercury	81 Tl 204.4 Thallium	82 Pb 207.2 Lead	83 Bi 209.0 Bismuth	84 Po 209 Polonium	85 At 210 Astatine	86 Rn 222 Radon	
87 Fr 223 Francium	88 Ra 226 Radium	89-103 Actinoids	104 Rf 261 Rutherfordium	105 Db 262 Dubnium	106 Sg 263 Seaborgium	107 Bh 264 Bohrium	108 Hs 265 Hassium	109 Mt 266 Meitnerium	110 Ds 271 Darmstadtium	111 Rg 272 Roentgenium	112 Cn 285 Copernicium							

KEY

Atomic Number	79
Symbol	Au
Standard Atomic Weight	197.0
Name	Gold

The Combining Power or Valencies of the Transition Metals Vary

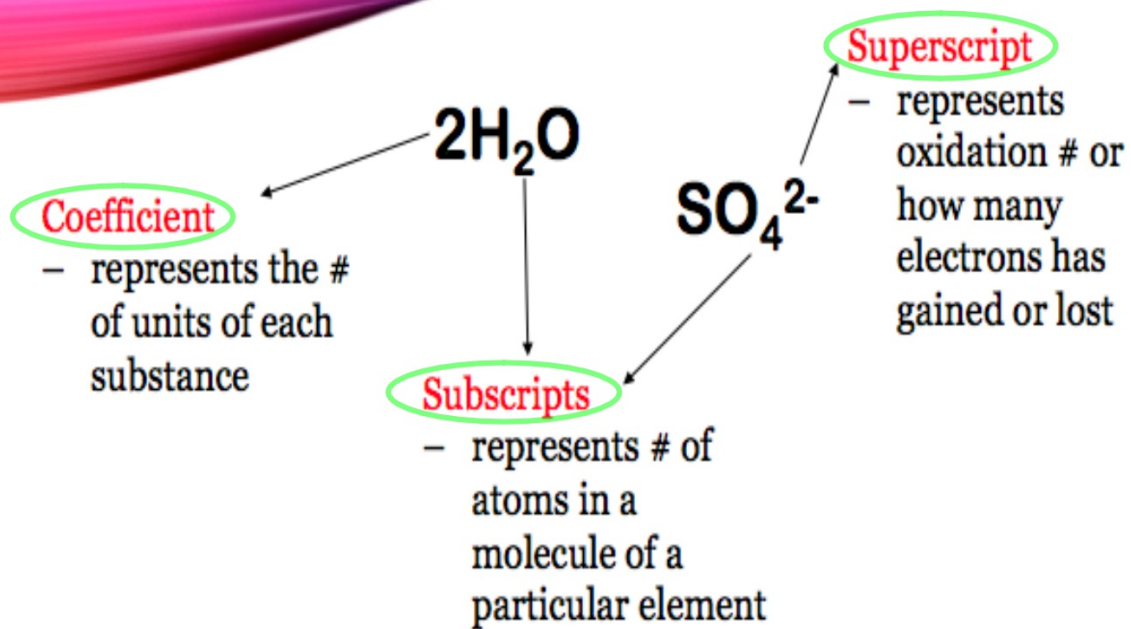
## ION

–positive (cation) or negatively (anion) charged atom

## Transition Metals

Special Ions	
Name	Oxidation Number
Copper (I)	1+
Copper (II)	2+
Copper (III)	3+
Iron (II)	2+
Iron (III)	3+
Chromium (II)	2+
Chromium (III)	3+
Lead (II)	2+
Lead (IV)	4+

When naming these compounds, the oxidation number is expressed in the name with a Roman Numeral. It represents the Charge.

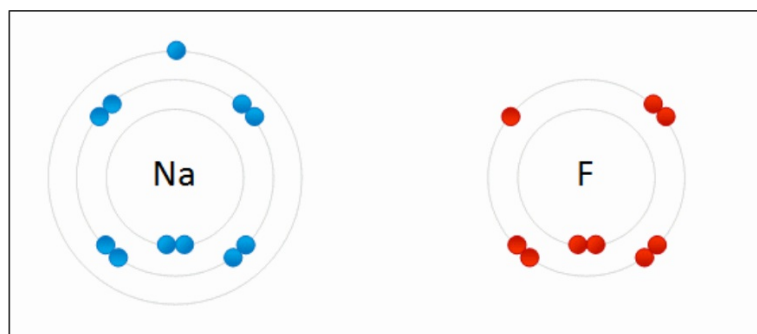




## Formulas of Binary Ionic Compounds



*Sodium  
Fluoride*



\*The cations and anions are combined in a way that produces a electrically neutral compound.

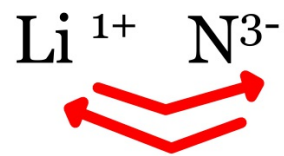
\*Metal is named first, Non-metal is named second.

\*Use -ide to write the name of the compound.

## Criss-Cross Method

Lithium  $\longrightarrow$   $\text{Li}^{1+}$

Nitrogen  $\longrightarrow$   $\text{N}^{3-}$



The charge (without the sign) of one ion becomes the subscript of the other.



*Practice*

Lead (IV) phosphide

Iron (III) Oxide

Now write the names of these formulas in your journal.

1. Copper (I) Oxide
2. Aluminum Chloride
3. Barium Fluoride
4. Calcium Chloride
5. Chromium (III) Oxide
6. Iron (II) sulfide
7. Magnesium Chloride

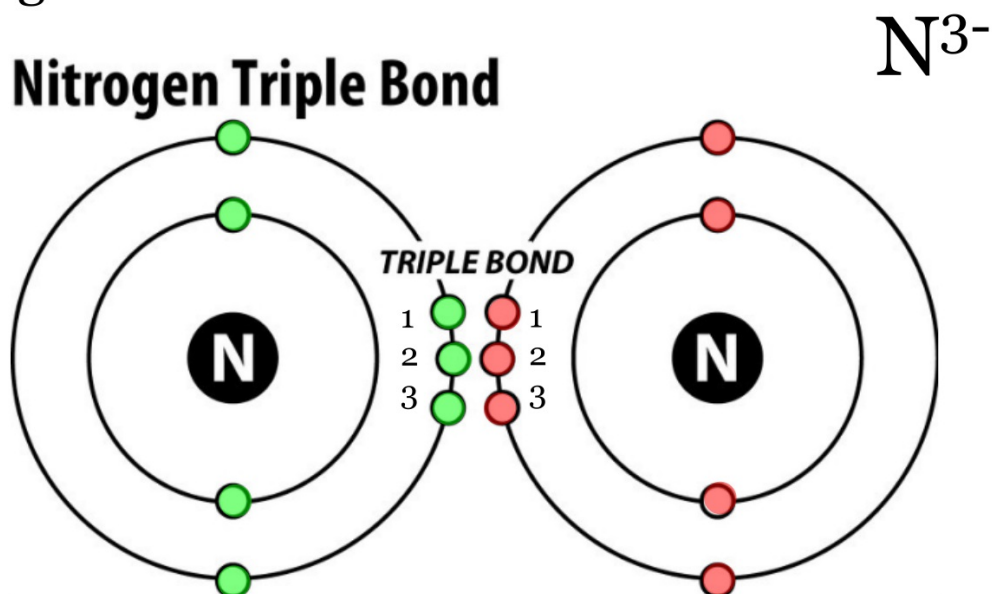
## Answers:

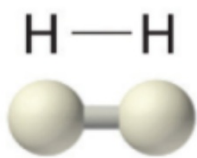
1.  $\text{CuO}_2$
2.  $\text{AlCl}_3$
3.  $\text{BaF}_2$
4.  $\text{CaCl}_2$
5.  $\text{Cr}_2\text{O}_3$
6.  $\text{FeS}$
7.  $\text{MgCl}_2$

## *Diatomic Molecules*

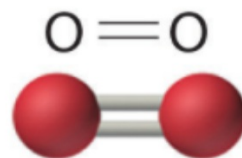
$H_2$ ,  $O_2$ ,  $F_2$ ,  $Cl_2$ ,  $Br_2$ ,  $I_2$ ,  $N_2$

Bond Types (single, double or triple) depends on the charge of the ion.

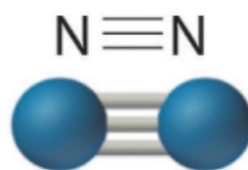




Single bond



Double bond



Triple bond

*More bonds make the diatomic molecule more stable than the atom alone.*

## Polyatomic Ions

a positively or group of atoms negatively charged covalently bonded

- ❖ **The prefix poly** means “many”, so the term polyatomic means “having many atoms”

POLYATOMIC IONS		
Charged	Name	Formula
1+	Ammonium	$\text{NH}_4^+$
1-	Acetate	$\text{C}_2\text{H}_3\text{O}_2^-$
1-	Chlorate	$\text{ClO}_3^-$
1-	Hydroxide	$\text{OH}^-$
1-	Nitrate	$\text{NO}_3^-$
2-	Carbonate	$\text{CO}_3^{2-}$
2-	Sulfate	$\text{SO}_4^{2-}$
3-	Phosphate	$\text{PO}_4^{3-}$

When more than one is needed to balance the formula, parentheses are used to indicate that a polyatomic ion and comes as a "package deal."



*Practice*

Ammonium Phosphate

Aluminum Carbonate

Now write the names of these formulas in your journal.

1. Potassium Nitrate
2. Magnesium Hydroxide
3. Aluminum Sulfate
4. Copper (II) Sulfate
5. Lead (IV) Acetate
6. Zinc Nitrate
7. Potassium Chlorate

## Answers

1.  $\text{KNO}_3$
2.  $\text{Mg}(\text{OH})_2$
3.  $\text{Al}_2(\text{SO}_4)_3$
4.  $\text{CuSO}_4$
5.  $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_4$
6.  $\text{Zn}(\text{NO}_3)_2$
7.  $\text{KClO}_3$



## Hydrate

–a compound that has water chemically attached to its ions and written into chemical formula.

$\text{CaSO}_4 \cdot \underline{2} \text{H}_2\text{O}$  Calcium Sulfate dihydrate

$\text{CoCl}_2 \cdot \underline{6} \text{H}_2\text{O}$  Cobalt Chloride hexahydrate



### Covalent compounds

- can form more than one compound with each other. Scientist use Greek prefixes to indicate # of atoms of each element in binary compound.

Prefixes For Binary Covalent Compounds								
#atoms	1	2	3	4	5	6	7	8
prefix	Mono-	di-	tri-	tetra	<u>penta</u>	<u>hexa</u>	<u>hepta</u>	<u>octa</u>



## *Using Prefixes*

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

$\text{NO}$     nitrogen oxide (mono prefix not  
needed)

$\text{NO}_2$     nitrogen dioxide

$\text{N}_2\text{O}_5$     dinitrogen pentoxide

