

# **Pre-AP Chemistry**

Summer  
**Summer**



Assignment  
**Assignment**

**Carroll High School**



Dear Students,

Welcome to the exciting world of chemistry! I know you are feeling a little anxiety about the upcoming year and perhaps a little apprehensive about what will be expected of you. I can speak from experience when I say that if you start early with memory work and practice with the skills, your experiences in chemistry will not be so frightening.

I am including for your summer enjoyment, a list of ions that **MUST BE MEMORIZED** and a formula writing activity found on the Internet. Mastering these two topics early will make your life much easier next year. We will have a quiz over the memorized ions within the first week of school. If you make a set of flash cards with the names and symbols you can use these all year to help keep your memory fresh.

It is important that you memorize the ions **EXACTLY** as they are typed. This includes capital or lowercase letters, subscripts, +/- charge and magnitude of charge. The spelling of the ion name must also be exactly correct- watch for subtle differences. Look for patterns (especially on the periodic table included) to make the memorization easier.

I would suggest that you learn the ions before you attempt the Internet activity. The chemistry site assumes that you already know the ions when it teaches you formula writing. Completion of this activity will be your first chemistry grade so bring it with you the first day of class.

The compounds we will be naming and writing formulas for will fall into three categories: ionic, molecular, and acids. Use the periodic table and the Internet site to give you a head start with this skill. I promise you won't be sorry.

Have a GREAT summer and I look forward to having you in class next year☺

Sincerely,

Mrs. Larriba

# Pre-AP Chemistry

## Formulas and Charges of Ions

### Positive Ions

1+	2+	3+	4+	5+
<b>Group IA (1)</b>	<b>Group IIA (2)</b>	<b>Group IIIA (13)</b>	<b>Group IVA (14)</b>	<b>Group VA (15)</b>
H <sup>+</sup> Hydrogen	Be <sup>2+</sup> Beryllium	Al <sup>3+</sup> Aluminum	Si <sup>4+</sup> Silicon (IV)	As <sup>5+</sup> Arsenic (V)
Li <sup>+</sup> Lithium	Mg <sup>2+</sup> Magnesium	Ga <sup>3+</sup> Gallium (III)	Ge <sup>4+</sup> Germanium (IV)	Bi <sup>5+</sup> Bismuth (V)
Na <sup>+</sup> Sodium	Ca <sup>2+</sup> Calcium		Sn <sup>4+</sup> Tin (IV)	
K <sup>+</sup> Potassium	Sr <sup>2+</sup> Strontium		Pb <sup>4+</sup> Lead (IV)	
Rb <sup>+</sup> Rubidium	Ba <sup>2+</sup> Barium			
Cs <sup>+</sup> Cesium	Ra <sup>2+</sup> Radium			
Fr <sup>+</sup> Francium				

1+	2+	3+
Ag <sup>+</sup> Silver	Cd <sup>2+</sup> Cadmium	Bi <sup>3+</sup> Bismuth (III)
Cu <sup>+</sup> Copper (I)	Zn <sup>2+</sup> Zinc	Ni <sup>3+</sup> Nickel (III)
H <sub>3</sub> O <sup>+</sup> Hydronium	Cr <sup>2+</sup> Chromium (II)	Cr <sup>3+</sup> Chromium (III)
NH <sub>4</sub> <sup>+</sup> Ammonium	Co <sup>2+</sup> Cobalt (II)	Co <sup>3+</sup> Cobalt (III)
	Cu <sup>2+</sup> Copper (II)	Fe <sup>3+</sup> Iron (III)
	Fe <sup>2+</sup> Iron (II)	Mn <sup>3+</sup> Manganese (III)
	Pb <sup>2+</sup> Lead (II)	
	Mn <sup>2+</sup> Manganese (II)	
	Hg <sub>2</sub> <sup>2+</sup> Mercury (I)	
	Hg <sup>2+</sup> Mercury (II)	
	Ni <sup>2+</sup> Nickel (II)	
	Sn <sup>2+</sup> Tin (II)	

### Negative Ions

1-	2-	3-	4-
<b>Group VII (17)</b>	<b>Group VI (16)</b>	<b>Group VA (15)</b>	<b>Group IV (14)</b>
F <sup>-</sup> Fluoride	O <sup>2-</sup> Oxide	N <sup>3-</sup> Nitride	C <sup>4-</sup> Carbide
Cl <sup>-</sup> Chloride	S <sup>2-</sup> Sulfide	P <sup>3-</sup> Phosphide	Si <sup>4-</sup> Silicide
Br <sup>-</sup> Bromide	Se <sup>2-</sup> Selenide	As <sup>3-</sup> Arsenide	
I <sup>-</sup> Iodide	Te <sup>2-</sup> Telluride		
At <sup>-</sup> Astatide			

1-	2-	3-
C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup> Acetate	CO <sub>3</sub> <sup>2-</sup> Carbonate	
CN <sup>-</sup> Cyanide	CrO <sub>4</sub> <sup>2-</sup> Chromate	PO <sub>4</sub> <sup>3-</sup> Phosphate
H <sup>-</sup> Hydride	Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup> Dichromate	PO <sub>3</sub> <sup>3-</sup> Phosphite
OH <sup>-</sup> Hydroxide	C <sub>2</sub> O <sub>4</sub> <sup>2-</sup> Oxalate	AsO <sub>4</sub> <sup>3-</sup> Arsenate
NO <sub>3</sub> <sup>-</sup> Nitrate	O <sub>2</sub> <sup>2-</sup> Peroxide	
NO <sub>2</sub> <sup>-</sup> Nitrite	SiO <sub>3</sub> <sup>2-</sup> Silicate	
MnO <sub>4</sub> <sup>-</sup> Permanganate	SO <sub>4</sub> <sup>2-</sup> Sulfate	
ClO <sub>4</sub> <sup>-</sup> Perchlorate	SO <sub>3</sub> <sup>2-</sup> Sulfite	
ClO <sub>3</sub> <sup>-</sup> Chlorate	HPO <sub>4</sub> <sup>2-</sup> Hydrogen Phosphate	
ClO <sub>2</sub> <sup>-</sup> Chlorite		
ClO <sup>-</sup> Hypochlorite		

\*Similar for bromine and Iodine:

e.g., BrO <sub>3</sub> <sup>-</sup> Bromate	
HCO <sub>3</sub> <sup>-</sup> Hydrogen Carbonate (Bicarbonate)	
HSO <sub>4</sub> <sup>-</sup> Hydrogen Sulfate (Bisulfate)	
HSO <sub>3</sub> <sup>-</sup> Hydrogen Sulfite (Bisulfite)	
H <sub>2</sub> PO <sub>4</sub> <sup>-</sup> Dihydrogen Phosphate	

**Pre-AP Chemistry  
Internet Nomenclature Worksheet**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

You may link from Summer Packet page, or type in following address,  
<http://dbhs.wvusd.k12.ca.us/webdocs/ChemTeamIndex.html> or search for “ChemTeam” and click on  
“Nomenclature.”

These are the only tutorials you will be required to learn:

- Binary compounds with fixed charge cation
- Binary compounds with variable charge cation: Stock System
- Covalent Binary Compound: Greek Prefix System
- Polyatomics
- Miscellaneous

For each of these sections you should be able to work both directions:  
name to formula & formula to name

*Click on Nomenclature Definition List (located under resources)*

1. Define OXIDATION STATE

2. Define METAL and NONMETAL

3. Define CATION and ANION

4. Define ION

5. Define POLYATOMIC ION

**Binary Compound with Fixed Charge Cations:**  
**1. Given Formula, Write the Name**

These compounds contain \_\_\_\_\_ elements. Elements involved in this lesson have \_\_\_\_\_.

1. Complete the following points:

- The order for names in a binary compound is \_\_\_\_\_.
- Use the name of cation with a fixed oxidation state \_\_\_\_\_.
- The name of the anion will be made from the \_\_\_\_\_.

2. Try these practice problems, then check your answers:

- MgS \_\_\_\_\_
- KBr \_\_\_\_\_
- Ba<sub>3</sub>N<sub>2</sub> \_\_\_\_\_
- Al<sub>2</sub>O<sub>3</sub> \_\_\_\_\_
- NaI \_\_\_\_\_
- SrF<sub>2</sub> \_\_\_\_\_
- Li<sub>2</sub>S \_\_\_\_\_
- RaCl<sub>2</sub> \_\_\_\_\_
- CaO \_\_\_\_\_
- AlP \_\_\_\_\_

**2. Given Name, Write the Formula**

1. Complete these points to remember:

- The order in a formula is \_\_\_\_\_.
- You must know the charges associated with \_\_\_\_\_.
- The sum of the positive charge and the sum of the negative charges \_\_\_\_\_.
- You \_\_\_\_\_ of the cations or anions to get a total charge of zero.
- You \_\_\_\_\_ to get a total charge of zero.

2. There are two methods to writing a formula: *Charge-Crossing* and *Least-Common-Multiple*.

- Write the formula for strontium phosphide using the Charge Crossing technique.

- b. Write the formula for strontium phosphide again but this time use the Least Common Multiple technique.
3. Using the method you prefer, practice with these problems then check your answers:
- a. magnesium oxide
  - b. lithium bromide
  - c. calcium nitride
  - d. aluminum sulfide
  - e. potassium iodide
  - f. strontium chloride
  - g. sodium sulfide
  - h. radium bromide
  - i. magnesium sulfide
  - j. aluminum nitride

***Binary Compounds with Variable Charge Cation: Stock System***

***1. Given Formula, Write the Name***

Here you will learn how to name compounds with variable charges involved. The \_\_\_\_\_ involved in this lesson have \_\_\_\_\_ but the anions will have only one charge.

1. Complete the following steps:

Step #1: first part of the name is the \_\_\_\_\_.

Step #2: result from step one \_\_\_\_\_.

Here is how to determine its value:

a. multiply \_\_\_\_\_

b. divide this result by \_\_\_\_\_

**This is the value of the Roman numeral to use.**

c. The value of the Roman number represents \_\_\_\_\_

Step #3: anion is named in the usual manner of stem plus “-ide”

**\*Remember, all metals EXCEPT for those in column IA, IIA,  $Al^{+3}$ ,  $Cd^{+2}$ ,  $Al^{+2}$  and  $Ag^{+1}$  require roman numerals in their names. The reason the above metals do not have roman numerals is because they only have one charge.**

2. Practice with these then check the answers:

a. CuS \_\_\_\_\_

b. PbBr<sub>4</sub> \_\_\_\_\_

c. Pb<sub>3</sub>N<sub>2</sub> \_\_\_\_\_

d. Fe<sub>2</sub>O<sub>3</sub> \_\_\_\_\_

e. FeI<sub>2</sub> \_\_\_\_\_

f. Sn<sub>3</sub>P<sub>4</sub> \_\_\_\_\_

g. Cu<sub>2</sub>S \_\_\_\_\_

h. SnCl<sub>2</sub> \_\_\_\_\_

i. HgO \_\_\_\_\_

j. Hg<sub>2</sub>F<sub>2</sub> \_\_\_\_\_

3. What is unusual about Mercury I? Peroxide?

**2. Given Name, Write the Formula**

1. What are the following steps:

Step#1: the first word tells you the \_\_\_\_\_.

Step #2: the Roman numeral WILL tell you \_\_\_\_\_.

Step #3: the anion symbol and charge comes from the second name \_\_\_\_\_.

Step #4: remembering the rule that a formula \_\_\_\_\_.

2. Practice with these, then check your answers:

a. iron (II) chloride \_\_\_\_\_

b. copper (I) sulfide \_\_\_\_\_

c. lead (IV) iodide \_\_\_\_\_

d. tin (II) fluoride \_\_\_\_\_

- e. mercury (I) bromide \_\_\_\_\_
- f. tin (II) oxide \_\_\_\_\_
- g. chromium (III) oxide \_\_\_\_\_
- h. gold (I) iodide \_\_\_\_\_
- i. manganese (II) nitride \_\_\_\_\_
- j. cobalt (III) phosphide \_\_\_\_\_

3. What about Mercury?

***Covalent Binary Compound: Greek Prefix System***  
***1. Given Formula, Write the Name***

- 1. How will you recognize these compounds?
- 2. Write the Greek prefixes for 1-10.
- 3. Write rules for naming binary molecular compounds.
- 4. Practice with these, then check your answers.
  - a.  $As_4O_{10}$  \_\_\_\_\_
  - b.  $BrO_3$  \_\_\_\_\_
  - c.  $BN$  \_\_\_\_\_
  - d.  $N_2O_3$  \_\_\_\_\_
  - e.  $NI_3$  \_\_\_\_\_
  - f.  $SF_6$  \_\_\_\_\_

- g. XeF<sub>4</sub> \_\_\_\_\_  
h. PCl<sub>9</sub> \_\_\_\_\_  
i. CO \_\_\_\_\_  
j. PCl<sub>5</sub> \_\_\_\_\_

**2. Given Name, Write the Formula**

1. Write yourself steps for determining formulas of these compounds.

2. What rule can you make about the use of the prefix MONO-?

3. Practice with these, then check your answers.

- a. chlorine monoxide \_\_\_\_\_  
b. oxygen difluoride \_\_\_\_\_  
c. boron phosphide \_\_\_\_\_  
d. dinitrogen monoxide \_\_\_\_\_  
e. nitrogen trifluoride \_\_\_\_\_  
f. sulfur tetrachloride \_\_\_\_\_  
g. xenon trioxide \_\_\_\_\_  
h. carbon dioxide \_\_\_\_\_  
i. diphosphorous pentoxide \_\_\_\_\_  
j. phosphorous trichloride \_\_\_\_\_

**POLYATOMICS**  
**Given formula, Write the Name**

1. How will you recognize this type of compound?

2. How should parentheses be used?

3. Write two steps for determining the formula:

Step 1:

Step 2:

4. Practice with these, then check your answers:

a.  $\text{AlPO}_4$  \_\_\_\_\_

b.  $\text{KNO}_2$  \_\_\_\_\_

c.  $\text{NaHCO}_3$  \_\_\_\_\_

d.  $\text{CaCO}_3$  \_\_\_\_\_

e.  $\text{Mg(OH)}_2$  \_\_\_\_\_

f.  $\text{Na}_2\text{CrO}_4$  \_\_\_\_\_

g.  $\text{Ba(CN)}_2$  \_\_\_\_\_

h.  $\text{K}_2\text{SO}_4$  \_\_\_\_\_

i.  $\text{NH}_4\text{NO}_3$  \_\_\_\_\_

**2. Given Name, Write the Formula**

1. When are parenthesis used?

2. Write yourself a set of steps for determining the formula.

3. Practice with these, then check your answers:

a. Silver carbonate \_\_\_\_\_

b. potassium hydrogen phosphate \_\_\_\_\_

c. aluminum hydroxide \_\_\_\_\_

d. sodium hydrogen carbonate \_\_\_\_\_

e. calcium acetate \_\_\_\_\_

f. potassium permanganate \_\_\_\_\_

- g. calcium perchlorate \_\_\_\_\_
- h. lithium carbonate \_\_\_\_\_
- i. magnesium hydrogen sulfite \_\_\_\_\_
- j. sodium hypochlorite \_\_\_\_\_

<i>Miscellaneous Acid Nomenclature</i>
--

1. How do you recognize an acid?
  
2. Fill in the steps for naming a BINARY ACID
  - a. \_\_\_\_\_ is used.
  - b. \_\_\_\_\_ is used.
  - c. \_\_\_\_\_ is used.
  - d. The word “acid” is used as the second word in the name.
  
3. What are the changes to be made if the acid is ternary (contains a polyatomic ion)?
  - ate ion → \_\_\_\_\_ acid
  - ite ion → \_\_\_\_\_ acid
  
4. Practice with these, then check answers.
  - a.  $\text{H}_3\text{PO}_4$  \_\_\_\_\_
  - b.  $\text{H}_2\text{CO}_3$  \_\_\_\_\_
  - c.  $\text{H}_2\text{SO}_4$  \_\_\_\_\_
  - d.  $\text{HIO}_3$  ( $\text{IO}_3$  is iodate ion) \_\_\_\_\_
  - e.  $\text{HF}$  \_\_\_\_\_
  - f.  $\text{HNO}_2$  \_\_\_\_\_
  
5. Write the formula for these acids:
  - a. hydrobromic acid \_\_\_\_\_
  - b. hydrocyanic acid (cyanide is  $\text{CN}^-$ ) \_\_\_\_\_
  - c. nitric acid \_\_\_\_\_

- d. sulfurous acid \_\_\_\_\_
  - e. phosphorous acid \_\_\_\_\_
  - f. acetic acid \_\_\_\_\_
- 

**Now try it on your own.** (Hint: First determine whether the compound is an acid, molecular or ionic compound.)

1. Write the formulas for the following compounds:
  - a. sulfurous acid \_\_\_\_\_
  - b. sodium bromide \_\_\_\_\_
  - c. calcium chloride \_\_\_\_\_
  - d. phosphorus pentafluoride \_\_\_\_\_
  - e. hydrochloric acid \_\_\_\_\_
  - f. iron II oxide \_\_\_\_\_
  
2. Write the name of the following compounds:
  - a.  $Mg_3PO_4$  \_\_\_\_\_
  - b.  $H_2S$  \_\_\_\_\_
  - c.  $CO$  \_\_\_\_\_
  - d.  $NH_4NO_3$  \_\_\_\_\_
  - e.  $H_2O_2$  \_\_\_\_\_
  - f.  $Hg_2O$  \_\_\_\_\_
  - g.  $Ag_2SO_4$  \_\_\_\_\_

# An Updated Traditional Flat Periodic Table

1 H 1.01																	2 He 4.00
3 Li 6.94	4 Be 9.01															9 F 19.0	10 Ne 20.2
11 Na 23.0	12 Mg 24.3															17 Cl 35.5	18 Ar 40.0
19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zn 65.4	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8
37 Rb 85.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc 98	44 Ru 101	45 Rh 103	46 Pd 106	47 Ag 108	48 Cd 112	49 In 115	50 Sn 119	51 Sb 122	52 Te 128	53 I 127	54 Xe 131
55 Cs 133	56 Ba 137	57 La 139	72 Hf 178	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	81 Tl 204	82 Pb 207	83 Bi 209	84 Po 210	85 At 210	86 Rn 222
87 Fr 223	88 Ra 226	89 Ac 227	104 Rf 261	105 Db 262	106 Sg 263	107 Bh 264	108 Hs 265	109 Mt 268	110 Ds 271	111 Rg 272	112 Uub 285	113 Uut 284	114 Uuq 289	115 Uup 288	116 Uuh 292	117 Uus ?	118 Uuo ?
58 Ce 140	59 Pr 141	60 Nd 144	61 Pm 147	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175				
90 Th 232	91 Pa 231	92 U 238	93 Np 237	94 Pu 244	95 Am 243	96 Cm 247	97 Bk 247	98 Cf 251	99 Es 254	100 Fm 257	101 Md 258	102 No 255	103 Lr 256				

light metals - brittle metals - ductile metals - low melting metals - non-metals - noble gases - lanthanides - actinides

Updated 1/20/05, by periodictable.com, home of the patented 3D Alexander Arrangement of the Elements