These compounds to follow **ARE NOT** binary compounds. They contain three or more elements, as opposed to only two in a binary compound.

The Greek method WILL NOT be used. That naming technique is used only for binary compounds of two nonmetals. That means, if you see a formula like $BaSO_4$, the name is not barium monosulfur tetraoxide. Many unaware students over the years have made this error and suffered for it.

Consequently, a warning: it is important that you learn to recognize the presence of a polyatomic ion in a name. Many students have made it their first priority to make a set of flashcards with the name on one side and the ion and its charge on the other. Then, carry them everywhere and use them.

The cations used will be a mix of fixed charges AND variable charges. You must know which are which.

Another warning: you must also know the formula and charge associated with each polyatomic ion' name. For example, NO^3 is called nitrate and it has a minus one charge. The formula and charge are not inherent in the name.

Use of Parenthesis

When more than one polyatomic ion is required, parenthesis are used to enclose the ion with the subscript going outside the parenthesis. For example, the very first name used is copper(II) chlorate. The correct formula will require the use of parenthesis.

When you say a formula involving parenthesis out loud, you use the word "taken" as in the formula for ammonium sulfide, which is $(NH_4)_2S$. Out loud, you say "N H four taken twice S." OR with the formula for copper(II) nitrate, which is $Cu(NO_3)_2$. You say " Cu N O three taken twice."

Example #1 - write the formula for **copper(II) chlorate**

Step #1 - the first word tells you the symbol of the cation. In this case it is Cu.

Step #2 - the Roman numeral **WILL** tell you the charge on the cation. In this case it is a positive two.

Step #3 - the polyatomic formula and charge comes from the second name. In this case, chlorate means ClO_3 .

Step #4 - remembering the rule that a formula must have zero total charge, you write the formula $Cu(ClO_3)_2$.

Example #2 - write the formula for silver cyanide

Step #1 - the first word tells you the symbol of the cation. In this case it is Ag^+.

Step #2 - silver has a constant charge of +1, it is not a cation with variable charge.

Step #3 - the polyatomic formula and charge comes from the second name. In this case, cyanide means CN .

Step #4 - remembering the rule that a formula must have zero total charge, you write the formula AgCN.

Example #3 - write the formula for **plumbic hydroxide**

Step #1 - the cation, Pb^{4+} , does show a variable charge. The "-ic" ending means the higher of the two, for this cation that means +4.

Step#2 - hydroxide is recognized as OH .

The formula of this compound is $Pb(OH)_4$. Notice that it is not PbOH4.

Example #4 - write the formula for **sodium phosphate**

Step #1 - the cation, sodium, is Na +, and it does not show a variable charge.

Step#2 - phosphate is PO_4^3 .

The formula of this compound is Na_3PO_4. Notice that no parenthesis are required since only one polyatomis is used.

Example #5 - write the formula for **mercurous nitrate**

Step #1 - the cation, mercurous, does show a variable charge and its formula is unusual. It is Hg_2^{2+} . The "-ous" ending indicates the lower of the two charges mercury shows and that is the +1 charge. Remember that, in this particular case, Hg^+ is wrong .

Step#2 - nitrate is NO_3 .

The formula of this compound is $Hg_2(NO_3)_2$. This formula is not reduced.

Example #6 - write the name for **barium carbonate**

Step #1 - the cation, barium, does not show a variable charge and its symbol is Ba^{2+} .

Step#2 - carbonate is CO_3^{2} .

The formula of this compound is $BaCO_3$.

Practice Problems

The cations in this first set are all of fixed oxidation state, so no Roman numerals are needed.

Write the correct formula for:

1) silver carbonate

2) potassium hydrogen phosphate

3) aluminum hydroxide

4) sodium hydrogen carbonate

5) calcium acetate

6) potassium permanaganate

7) calcium perchlorate

8) lithium carbonate

9) magnesium hydrogen sulfite

10) sodium hypochlorite

These formulas involve the use of a polyatomic ion. The cations are all of variable oxidation state, so Roman numerals are needed.

Write the correct formula for:

11) tin(IV) chlorite

12) mercury(II) phosphate

13) tin(II) carbonate

14) mercurous acetate

15) lead(II) chromate

16) copper(I) sulfite

17) stannous dichromate

18) iron(III) nitrate

19) ferric sulfate

20) ferrous hydroxide

These formulas mix the use of the two types of cations.

Write the correct formula for:

21) potassium perchlorate

22) lead(IV) hydrogen phosphate

23) aluminum sulfate

24) iron(II) bicarbonate

25) barium iodate

26) tin(II) hydrogen sulfide

27) magnesium dihydrogen phosphate

28) plumbous cyanide

29) silver phosphate

30) cobalt(III) nitrite

and two special additions:

31) ammonium sulfate

32) ammonium nitrate