Ionic Nomenclature

Ionic nomenclature is the simplest of the three types of nomenclature here. Of course, the presumption is that you completed the summer assignment and remember the names of the common ions.

First identify the cation (positive ion) by name. Second, identify the anion by name. Then, put the two names together.

Examples:
$AlCl_3$ – The cation is aluminum. The anion is chloride. The compound is *aluminum chloride*.

Na_2SO_4 – The cation is sodium. The anion is sulfate. The compound is *sodium sulfate*.

Notice that there is no use of prefixes to denote the quantity of each ion. That is because the charge of the ions guarantees that there is only one proportion in which they can combine, so prefixes are unnecessary.

For metals that can have more than one oxidation state, it is important to identify the oxidation state in the name, using Roman numerals.

Examples:
$FeCl_3$ – Because the three chloride ions have a TOTAL charge of -3, so the iron must have a +3 charge. Therefore, the compound is *iron(III) chloride*.

$Cr(NO_3)_3$ – Three nitrate ions have a TOTAL charge of -3, so the chromium must have a +3 charge. Therefore, the compound is *chromium(III) nitrate*.

Binary Molecular Nomenclature

Rules for Binary Molecular Compounds	Prefixes
1. The naming system is for compounds composed of two nonmetallic elements. 2. The first element keeps its name a. The first element gets a prefix if it has a subscript in the formula 3. The second element gets the *–ide* suffix (ending) a. The second element ALWAYS gets a prefix	1 – mono 2 – di 3 – tri 4 – tetra 5 – penta 6 – hexa 7 – hepta 8 – octa 9 – nona 10 - deca

Compound Name	***Compound Formula***
Carbon dioxide	
Carbon monoxide	
Diphosphorus pentoxide	
Dinitrogen monoxide	
Silicon dioxide	
Carbon tetrafluoride	
Sulfur dioxide	
Phosphorus pentafluoride	
Oxygen difluoride	
Nitrogen dioxide	
Dinitrogen trioxide	

Compound Formula	***Compound Name***
N_2O_4	
SO_3	
NO	
NO_2	
As_2O_5	
PF_3	
CS_2	
H_2O	
SeF_6	
N_2O_4	
CH_4	

Naming Acids

Acids are divided into two groups: Binary and Oxyacids. Binary acids consist of two elements. Oxyacids consist of 3 elements, one of which is oxygen.

1. NAMING BINARY ACIDS: The name of the binary acid consists of two words. The first word has three parts:

the "hydro" prefix
the root of the nonmetal element
the "ic" ending

The second word is always "acid"

Examples:

HCl = hydro chlor ic acid = hydrochloric acid
HBr = hydro brom ic acid = hydrobromic acid
HF = hydro fluor ic acid = hydrofluoric acid

2. **NAMING OXYACIDS**: These are more difficult to name because these acids have hydrogen, a nonmetal, and may have varying numbers of oxygen atoms. For example, H_2SO_5, H_2SO_4, H_2SO_3, and H_2SO_2 are all acids. How do we name them? To begin, we need a point of reference. Our reference point is this:

The "ate" ions (sulfate, nitrate, etc) make the "ic" acids (sulfuric acid, nitric acid)

Examples:

SO_4^{2-} = sulfate ion H_2SO_4 = sulfuric acid
NO_3^- = nitrate ion HNO_3 = nitric acid

Once we have our point of reference, the acid with one more oxygen than the -ic acid is called the per-_____-ic acid. The acid with one less oxygen then the -ic acid is called the _____-ous acid. If the acid has one less oxygen than the -ous acid, it is called the hypo-_____-ous acid.

Examples:

H_2SO_5 = persulfuric acid HNO_4 = pernitric acid
H_2SO_4 = sulfuric acid HNO_3 = nitric acid
H_2SO_3 = sulfurous acid HNO_2 = nitrous acid
H_2SO_2 = hyposulfurous acid HNO = hyponitrous acid

The KEY: All you really need to know are the "ate" ions. After that, you can use the above scheme to name any oxyacid. To refresh your memory, here are some of the common "ate" ions:

sulfate = SO_4^{2-} nitrate = NO_3^-
chlorate = ClO_3^- bromate = BrO_3^-
phosphate = PO_4^{3-} carbonate = CO_3^{2-}

Naming Acids - Problems

Name these binary acids:

HF_____ HCl_____

H_2S_____ HBr_____

HI_____

Name these oxyacids:

H_2CO_4_____

H_2CO_3_____

H_2CO_2_____

H_2CO _____

$HClO_4$_____

$HClO_3$_____

$HClO_2$_____

$HClO$ _____

H_3PO_5_____

H_3PO_4_____

H_3PO_3_____

H_3PO_2_____

Write the formulas for these acids (they may or may not actually exist!):

perbromic acid_____

nitrous acid_____

hypobromous acid_____

chromic acid_____

chromous acid_____

pernitric acid_____

sulfurous acid_____

perchromic acid_____