NS G5 (pg 1 of 1) Ionic Compounds with Polyatomic Ions

Name_____Per___

Beyond Binary Ionic Compounds – Using Polyatomic Ions

As you know, binary ionic compounds contain only two different elements. But many ionic compounds contain more than two different elements. Two or more different elements hook together to make an ion (usually an anion) - since this ion is made of many atoms, it is called a polyatomic ion.

For example SO_4^{2-} which is called sulfate or SO_3^{2-} called sulfite

You have a list of polyatomic ions on the back of your laminated periodic table. In this course you will NOT be required to memorize them. You can always refer to the chart. You are expected to know that when you here particular names, that you should go to the chart.

What's going on with the names?

Notice the naming scheme; single element anions carry the name of the element with an -ide on the end.
Most of the polyatomic ions end in -ite, or -ate.

- nitrite, nitrate NO_2^- NO_3^-
- chlorite, chlorate (hypochlorite, perchlorate) ClO_2^- ClO_3^- (ClO^- ClO_4^-)

There are a few polyatomic ion exceptions that end in -ide

- hydroxide OH^-
- cyanide CN^-
- ferricyanide $Fe(CN)_6^-$
- ferrocyanide $Fe(CN)_6^{4-}$

Problems to avoid

Be alert for the need with parentheses when the compound contains more than one polyatomic

- magnesium nitrate should be $Mg(NO_3)_2$ not $MgNO_{32}$
- aluminum cyanide must be $Al(CN)_3$ not $AlCN_3$ leaving the ( ) off would mean 3 N's and 1 C, but you need 3 CN's

When you are working backwards and trying to figure a Roman numeral, polyatomic ions sometimes can be tricky.

- Suppose you are given the formula $Co_2(SO_4)_3$ and asked for the name.
  - You could use either the "uncriss-cross and check" or the "start with the negative ion to determine the total charge" method, and hopefully you will end up with cobalt(III) sulfate.
- What if you were to determine the name of $CuNO_3$?
  - Be careful with the "3". You may be tempted to think of having 3 nitrates, but there is only one polyatomic ion there, so the negative charge is $1-$ not $3-$.
  - Thus the copper has a 1+ charge and the Roman numeral (I)
  - In other words, don't uncross-cross the 3.

Ammonium – Be alert for the positive polyatomic ion

Look on your polyatomic ion chart and see that there is one important exception on the polyatomic ion chart:
the positive polyatomic ammonium NH_4^+ we will treat NH_4^+ just like the metallic ions.

- ammonium nitrate NH_4NO_3
- ammonium sulfate $(NH_4)_2SO_4$
- ammonium chloride NH_4Cl