Naming Simple Compounds

Binary Ionic Compounds, where the metal ion has only one oxidation state
(Group 1A, alkali metals and group 2A, alkali earth metals)

1. the cation (positive ion) named first using the element name
2. monatomic cations take name from the corresponding element (i.e., cesium)
3. monatomic anions (negitive ions) named from the element root and adding *-ide* suffix (i.e., bromide)

For example, CsBr is named cesium bromide.

Binary Ionic Compounds, where the metal ion has variable oxidation state (Transition elements)

1. the oxidation state on the metal ion is specified by Roman Numeral in brackets
2. monoatomic anions are named as before

For example, CuCl and $CuCl_2$ are named as copper (I) chloride and copper (II) chloride, respectively. The older method of using the suffix *-ous* and *-ic* to indicate low and high oxidation states respectively is still encountered. Thus, the above compounds could appear as cuprous chloride and cupric chloride.

Binary Compounds involving only non-metals (Group 4A - 8A)

1. first element in the formula is named using element name (i.e., nitrogen)
2. second element named as if it were an anion (i.e., oxide)
3. prefixes (*mono, di, tri, tetra, penta, hexa* etc.) used to denote number of atoms
4. prefix *mono-* never used for naming the first element (i.e., nitrogen dioxide as opposed to mononitrogen dioxide)

For example, NO_2 is named nitrogen dioxide and P_2O_7 is named diphosphorous heptaoxide.

For compounds involving **polyatomic ions**, similar rules apply. The names of the following common polyatomic ions must be committed to memory.

CO_3^{2-} (carbonate) **HCO_3^-** (hydrogen carbonate; aka bicarbonate)

NH_4^+ (ammonium) **NO_2^-** (nitrite) **NO_3^-** (nitrate)

S^{2-} (sulfide) **SO_3^{2-}** (sulfite) **SO_4^{2-}** (sulfate) **HSO_4^-** (hydrogen sulfate)

PO_4^{3-} (phosphate) **HPO_4^{2-}** (hydrogen phosphate) **$H_2PO_4^-$** (dihydrogen phosphate)

CN^- (cyanide) **ClO^-** (hypochlorite) **$CH_3CO_2^-$** (ethanoate; aka acetate)

MnO_4^- (permanganate) **CrO_4^{2-}** (chromate)

Sample Exercises:

1. Name each of the following.

a) $Ca_3(PO_4)_2$

b) Cr_2O_3

c) ClO_2

2. Give the molecular formula for each of the following.

a) sodium hypochlorite

b) mercury (II) sulfate

Solutions:

1. a) calcium phosphate
   b) chromium (II) oxide
   c) chlorine dioxide

2. a) NaOCl
   b) $HgSO_4$