

## CHE 101 Chapter 6 - Study Guide

Terms: Polyatomic Ions, Molecular/Covalent, Ionic, Cation, Anion

The main focus of this chapter is naming compounds from formula and writing chemical formulas from compound names. In order to do this you need to grasp the following concepts.

1. **Metal vs Nonmetal:** You will need to be able to identify Metals and Nonmetals. The best way to do this is memorize the Metalloids (B = Boron, Si = Silicon, Ge = Germanium, As = Arsenic, Sb = Antimony, Te = Tellurium, Po = Polonium, At = Astatine) and remember that anything to the left = Metal and anything to the right = Nonmetal.
2. **Ionic vs Molecular bonding:** Ionic bonds are formed between Metal-Nonmetal, while Molecular bonds are formed between Nonmetal-Nonmetal. How the compound is classified tells you which naming system to use.
3. **Charges on atoms:** In order to make proper chemical formulas and to properly name compounds you will need to be familiar with the charges on common atoms. Remember that all compounds have a neutral charge, ie the sum of the positive and negative charges must equal zero.
4. **Fixed Charge:** Many atoms have a fixed charge and memorizing them is useful. There are several trends in the periodic table that can help you with this. Alkali metals (Li, Na, K, Rb, Cs) = +1 (always), Alkali Earth metals (Mg, Ca, Sr, Ba) = +2 (always), Aluminum = +3, Halogens (F, Cl, Br, I) = -1 (always), O, S, Se = -2 (always), N and P = -3.
5. **Variable charge:** Some atoms can commonly be found in compounds with two or more charges. In order to properly name compounds you will need to be able to know which atoms can have variable charges and to be able to calculate the proper charge based on the anions or name given. A short list of the most common metals with variable charge is (Fe<sup>+2</sup>/Fe<sup>+3</sup>, Cr<sup>+2</sup>/Cr<sup>+3</sup>, Cu<sup>+1</sup>/Cu<sup>+2</sup>, Pb<sup>+2</sup>/Pb<sup>+4</sup>, Sn<sup>+2</sup>/Sn<sup>+4</sup>, Co<sup>+1</sup>/Co<sup>+2</sup>). For a complete list see the handout given in class.
6. **Polyatomic Ions:** You should be familiar with the formula, name and charge on the common polyatomic ions. See handout for a list of the most common ones.
7. **Naming schemes:** There are several ways to remember how to name compounds. The flow chart given in class shows one way to remember, but there are several other ways one can remember how to name compounds. Find the method that works best for you and stick with it. I will list some general rules below.
  - a. **Ionic Compounds (Metal-Nonmetal):**
    - i. **Fixed charge:** Name the metal, name the nonmetal stem + "ide". Ex. AgCl = Silver Chloride, MgF<sub>2</sub> = Magnesium Fluoride.
    - ii. **Variable charge:** Name the metal, Use (Roman Numeral) to give charge on metal, name the nonmetal + "ide". Ex. FeCl<sub>3</sub> = Iron (III) Chloride
    - iii. **Polyatomic Ions:** Use "a" or "b" above but don't use the "ide", just use the name of the polyatomic ion. Ex. Ba(NO<sub>3</sub>)<sub>2</sub> = Barium Nitrate
  - b. **Molecular/Covalent Compounds (Nonmetal-Nonmetal):** Name the first element, name the second element. Use prefix's to show the number of atoms. The common prefix's are: 1 = mono, 2 = di, 3 = tri, 4 = tetra, 5 = penta, 6 = hexa, 7 = hepta, 8 = octa, 9 = nona, 10 = deca. We drop the "mono" from the first element if there is only one atom of it. Ex. CO = Carbon Monoxide, P<sub>4</sub>O<sub>7</sub> = Tetraphosphorus Heptoxide.
  - c. **Acids:** (Start with H): Just memorize HCl, HBr, HI, HF, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, H<sub>3</sub>PO<sub>4</sub>, H<sub>2</sub>CO<sub>3</sub> and HClO<sub>4</sub>, HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>.