# Chapter 2 - Atoms, Molecules & Ions

#### Section 2.2 Fundamental Chemical Laws

- 1. Law of conservation of mass Mass is neither created nor destroyed by chemical reactions.
- 2. Law of definite proportion a given compound always contains exactly the same proportion of elements by mass.
- 3. **Law of multiple proportions** when two elements form a series of compounds, the ratios of the masses of the second element that combine with 1 gram of the first element can always be reduced to small whole numbers.

## **Section 2.3 Dalton's Atomic Theories**

# **Section 2.4 Early Experiments to Characterize the Atom**

- 1. **J.J. Thomson** using cathode-ray tubes.
- 2. Henri Becquerel use of photographic plates to help discover radioactivity.
- 3. Ernest Rutherford alpha particles and gold foil experiment.

## Section 2.5 Modern view of Atomic Structure

- 1. **Isotopes** atoms with the same number of protons but different numbers of neutrons.
- 2. **Atomic number** number of protons in an element.
- 3. Mass number the total number of protons and neutrons in an element.

#### Section 2.6 Molecules and Ions

- 1. Chemical bonds forces that hold atoms together in compounds.
- 2. Covalent bonds bonds in which electrons are shared (with in molecules).
- 3. **Ionic bonds** force of attraction between oppositely charged ions.
  - a. cation positively charged ion.
  - b. anion negatively charged ion.

#### Section 2.7 Introduction to the Periodic Table

- 1. Know **families** (or vertical groups) and **periods** (or series, vertical rows).
- 2. Know nonmetals, metalloids (or semimetals) and metals.

# **Section 2.8 Naming Simple Compounds**

- 1. Binary ionic compounds (type I)
  - a. the cation is always named first and the anion second.
  - b. a monatomic cation takes its name from the name of the element it represents.
  - c. a monatomic anion is named by taking the root of the element name and adding -ide.

see table 2.3 p.60

- 2. Binary ionic compounds (type II)
  - a. the charge on the metal ion must be specified. (systematic name)

see table 2.4 p.61

## 3. Polyatomic ions (table 2.5 p.65)

- 4. Binary compounds (type III) covalent
  - a. the first element in the formula is named first, using the full element name.
  - b. the second element is named as if it were an anion.
  - c. prefixes are used to denote the numbers of atoms present.
  - d. the prefix mono- is not used for naming the first element.

#### see table 2.6 p.66

- 5. **Acids** molecules with produce a solution which contains H+ ions.
  - a. if the anion name ends in -ate, the suffix -ic is used in its place.
  - b. if the anion has an -ite ending, the suffix -ous is used in its place.
  - c. if the anion does not contain oxygen, the acid is named with the prefix hydro- and the suffix -ic.

see tables 2.7 and 2.8 on p. 70

\*\*Notes have been derived from Zumdahl 4th ed. - All page and table references are made to this edition.