

## Chapter 2

### **Chemical Formulas and Composition Stoichiometry**

## Chapter 2 Outline

- I. Molecular Compounds
- II. Ionic Compounds
- III. Atomic Mass, Molecular Mass and Formula Mass
- IV. The Mole and Molar Mass
- V. Percent Composition and Empirical Formulas

## I. Molecular Compounds

- *Molecule*  
Combination of atoms bounded together so strongly that they behave as a single particle
- *Ways of Representing Molecules*
  - Chemical Formula
  - Condensed Formula
  - Structural Formula

## I. Molecular Compounds (cont.)

- Ball-and-Stick Model



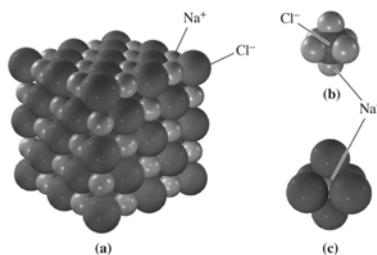
- Space-Filling Model



## II. Ionic Compounds

### *Ionic Compounds*

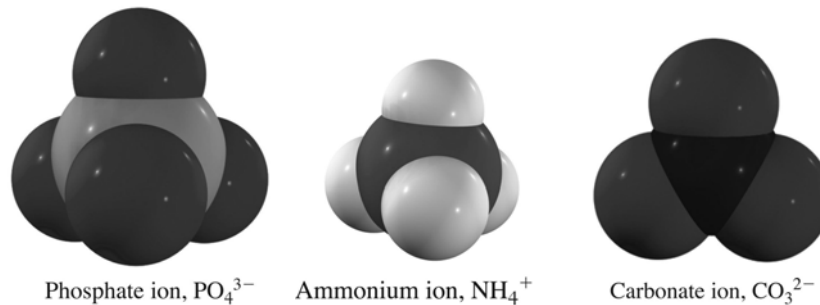
- Composed of positive ions (cations) and negative ions (anions)
- They DO NOT exist as single molecules
- They DO exist as extended 3-D crystals



## II. Ionic Compounds (cont.)

### *Polyatomic Ions*

- Group of atoms with a non-zero overall charge that acts like a single ionic particle



### III. Atomic Mass, Molecular Mass, and Formula Mass

#### *Atomic Mass (Atomic weight)*

- Average mass of a single atom of a given element
- Can be obtained from the periodic table
- Unit is the amu (atomic mass unit)

### III. Atomic Mass, Molecular Mass, and Formula Mass (cont.)

#### *Molecular Mass (Molecular weight)*

- Average mass of a single molecule of a given compound
- Sum of the atomic masses of all the atoms in the molecule
- Unit is the amu
- Term is technically only correct for molecular compounds

### III. Atomic Mass, Molecular Mass, and Formula Mass (cont.)

#### *Formula Mass (Formula weight)*

- Average mass of a single formula unit
- Sum of the atomic masses of all the atoms in the formula unit
- Unit is the amu
- Can refer to either molecular or ionic compounds

### IV. The Mole and Molar Mass

#### *The mole:*

One mole is defined as the number of atoms in exactly 12 g of pure carbon-12

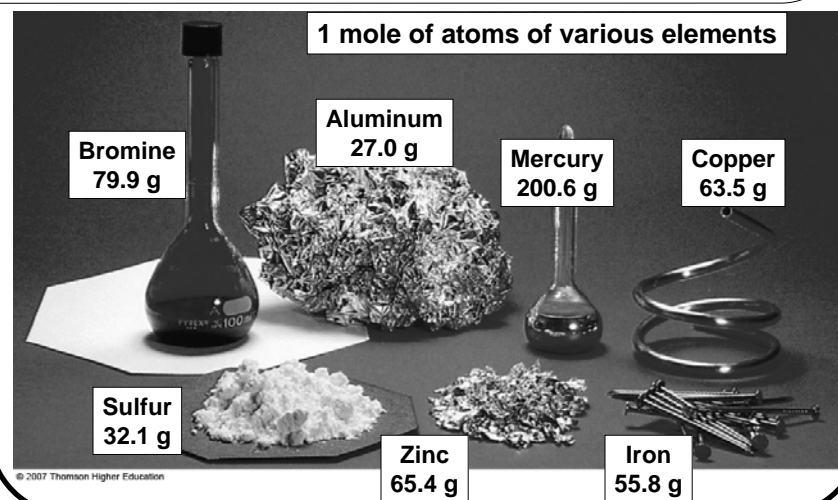
#### *Molar mass:*

Molar mass = the mass of 1 mole of a substance

Atoms: molar mass = atomic mass in grams

Compounds: molar mass = formula mass in grams

## IV. The Mole and Molar Mass (cont.)



## V. Percent Composition and Empirical Formulas

- A. Percent Composition
- B. Empirical Formula (Simplest Formula)
- C. Combustion Analysis

