Using Chemical Formulas

- In this section we will review:
  - Formula Mass
  - Molar Mass
  - Percentage Composition

Formula Mass

- Knowing a chemical formula we can identify the number of atoms involved.
- The mass of a molecule can be determined by adding the masses of each atom included.
- Remember the mass of an element's atom can be identified by looking at the periodic table, typically at the bottom of the box.

Formula Mass

- Sum of the average atomic masses of all atoms represented in its formula.
- Units: Atomic Mass Units (amu)
- Referred to as the molecular mass when referring to molecular compounds (covalent).
- Subscripts provide a ratio between the number of atoms for each element involved.

Practice Formula Mass

- H_2SO_4
- $Ca(NO_3)_2$
- $MgCl_2$

Molar Mass

- Numerically equal to formula mass.
- Units: grams/mole
- Total molar mass identified per formula depending on the number of atoms (moles) involved.

Moles (measurement)

- A mole is the measurement of a substance
- One mole = 6.02 x 10^23 objects
- In chemistry, object are atoms and molecules

How large is a mole?

- A mole of marshmallows would cover planet earth 12 miles high.
- A mole of seconds would last longer than it will take for the universe to burn out.
- A mole of hockey pucks would have equal mass to the moon.

Practice Molar Mass

- Al_2S_3
- $NaNO_3$
- $Ba(OH)_2$

Molar Mass used as a conversion factor.

- Molar mass uses units of grams per mole.

- The mass of a substance can be determined by taking the number of moles and multiplying it by the molar mass.

$$\frac{\text{Amount of substance (mol)}}{1} \times \frac{\text{Molar mass (g)}}{\text{1 amount of substance (mol)}} = \text{Mass of substance (g)}$$

- The number of moles of a substance can be determined by taking the mass of the material and dividing it by the molar mass.

$$\frac{\text{Mass of substance (g)}}{1} \times \frac{\text{1 amount of substance (mol)}}{\text{Molar mass (g)}} = \text{Amount of substance (mol)}$$

Percent Composition

- Percentage by mass of each element in a compound.

$$\frac{\text{Mass of element in 1 mol of compound}}{\text{Molar mass of compound}} \times 100 = \%\ \text{element in the compound}$$

- An element's percentage is not dependent on the sample size of the compound (coefficient)

Percent Composition

- Consistent for any amount of a compound.
- Identifying characteristic to the compound

Percentage Practice

- Find the mass percentage of water in ZnSO4*7H20.
- Find the percentage composition of the following:
  - PbCl2
  - Ba(NO3)2
- Magnesium hydroxide is 54.87% by oxygen by mass.
  - How many grams of oxygen are in 175 g of the compound?
  - How many moles of oxygen is this?