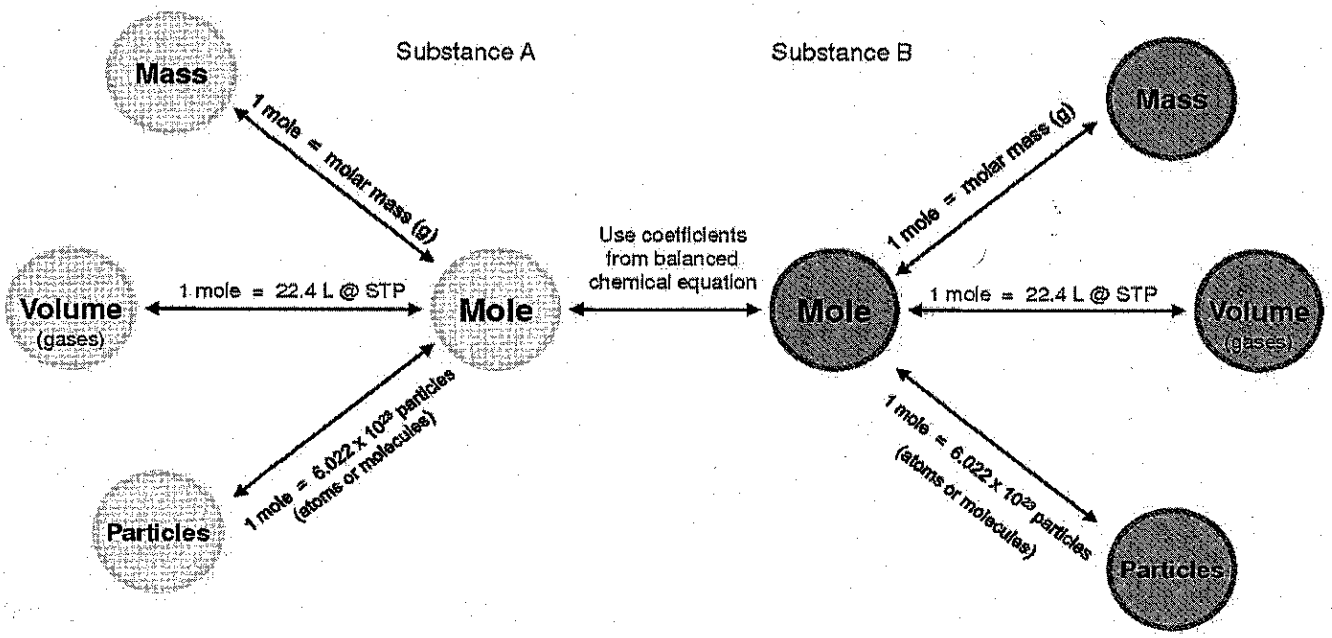
Stoichiometry

Stoichiometry involves the study of the relationships between reactants and products in a chemical reaction.

- The equation that is describing the reaction must be balanced.
- The coefficients in a chemical equation can describe individual molecules or amounts in moles of the products and reactants.

Mole Ratios and Molar Mass as Conversion Factors: A mole ratio is a conversion factor that relates the amounts in moles of any two chemical species involved in a chemical reaction.



Basic Stoichiometry: Gram/Mole/Particle Conversions

1. How many total moles of product are produced if 3.25 g of LiOH reacts with excess H_2SO_4?

$$2\ LiOH(aq) + \_\_\ H_2SO_4(aq) \rightarrow 2\ H_2O(l) + 1\ Li_2SO_4(aq)$$

$$3.25\text{ g LiOH} \times \frac{1\text{ mol LiOH}}{23.95\text{ g LiOH}} \times \frac{3\text{ mol products}}{2\text{ mol LiOH}} = 0.204\text{ mol products}$$

2. Consider the following reaction: $Ba(NO_3)_2\,(aq) + 2\,KOH\,(aq) \rightarrow Ba(OH)_2\,(aq) + 2\,KNO_3\,(aq)$

   a. What mass of barium hydroxide could be formed from 1.0 kg of barium nitrate?

$$1.0\text{ kg } Ba(NO_3)_2 \times \frac{1000\text{ g}}{1\text{ kg}} \times \frac{1\text{ mol } Ba(NO_3)_2}{261.35\text{ g } Ba(NO_3)_2} \times \frac{1\text{ mol } Ba(OH)_2}{1\text{ mol } Ba(NO_3)_2} \times \frac{171.35\text{ g } Ba(OH)_2}{1\text{ mol } Ba(OH)_2} = 660\text{ g } Ba(OH)_2$$

   b. How many hydroxide ions would be in this sample?

$$660\text{ g } Ba(OH)_2 \times \frac{1\text{ mol } Ba(OH)_2}{171.35\text{ g } Ba(OH)_2} \times \frac{2\text{ mol } OH^-}{1\text{ mol } Ba(OH)_2} \times \frac{6.022\times10^{23}\text{ ions } OH^-}{1\text{ mol } OH^-} = 4.6\times10^{24}\ OH^-\text{ ions}$$