Unit 4 - Chemical Changes

Chemical Quantities

- Moles and Particles (atoms/molecules)
- Mass and Moles
- Volume and Moles
- Percent Composition
- Empirical and Molecular Formulas

Chemical Reactions

- Formation
- Decomposition
- Combustion
- Single Replacement
- Double Replacement

Determine the number of atoms found in 3.18 moles of iron.

$$3.18 \text{ mol Fe} \times \frac{6.02 \times 10^{23} \text{ atoms Fe}}{1 \text{ mol Fe}} = 1.914 \times 10^{24} \text{ atoms Fe}$$

Determine the number of molecules found in 6.09 moles of NH_3.

Determine the number of atoms found in 10.2 moles of CO_2.

$$10.2 \text{ mol } CO_2 \times \frac{6.02 \times 10^{23} \text{ molecules } CO_2}{1 \text{ mol } CO_2} \times \frac{3 \text{ atoms}}{1 \text{ molecule } CO_2}$$

$$= 1.84 \times 10^{25} \text{ atoms}$$

Calculate the number of moles contained in 45.0g of $LiNO_3$.

$$45.0\,g\,LiNO_3 \times \frac{1\ mol\ LiNO_3}{68.95\ g\ LiNO_3} = 0.652\ mol\ LiNO_3$$

Calculate the volume of 4.58 moles of oxygen gas at STP conditions.

$$4.58\ \text{mol}\ O_2 \times \frac{22.4\ \text{L}\ O_2}{1\ \text{mol}\ O_2} = 103\ \text{L}\ O_2$$

Determine the percent composition of Na_2SO_4.

$Na_2SO_4 \rightarrow (2 \times 22.99) + (1 \times 32.06) + (4 \times 16.00)$ (Na, S, O)

$= 142.04\ g/mol$

$\%\,Na = \frac{2 \times 22.99\ g/mol}{142.04\ g/mol} \times 100\%$

$= 32.3\%$

$\%\,S = \frac{32.06\ g/mol}{142.04\ g/mol} \times 100\%$

$= 22.6\%$

$\%\,O = \frac{4 \times 16.00\ g/mol}{142.04\ g/mol} \times 100\%$

$= 45.0\%$