Stoichiometry Notes (Read Chapter 10 in your text book for more background)

Mole Ratio- whole number relationship of moles of one substance to moles of another substance in a balanced chemical equation

Limiting Reactant- the reactant that is used completely in a chemical reaction.

Stoichiometry- mass and mole relationships between reactants and products in a chemical rxn.

PURPOSES

$A + B \rightarrow C + D$

1. To find the amount of substance C a given amount of A will yield.
2. To find the amount of substance B that will react with a given amount of A.

GENERAL FORMS

Grams A → Mol A → Mol B → Grams B

$$\boxed{\text{Grams A}} \rightarrow \frac{1 \text{ mol A}}{\text{m.m. A (g)}} \rightarrow \boxed{\text{Mol A}} \rightarrow \frac{\text{\# moles B}}{\text{\# moles A}} \rightarrow \boxed{\text{Mol B}} \rightarrow \frac{\text{m.m. B (g)}}{1 \text{ mol B}} \rightarrow \boxed{\text{Grams B}}$$

$$\text{grams A} \times \frac{1 \text{ mol A}}{\text{m.m. A (g)}} \times \frac{\text{\# moles B}}{\text{\# moles A}} \times \frac{\text{m.m. B (g)}}{1 \text{ mol B}} = \text{grams B}$$

MOLES-MOLES PROBLEMS

1. How many moles of oxygen are necessary in the combustion of 7.50 moles of butane (C_4H_{10})?

$C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

Balance: $\underline{2}\ C_4H_{10} + \underline{13}\ O_2 \rightarrow \underline{8}\ CO_2 + \underline{10}\ H_2O$

Given: 7.50 mol of butane (C_4H_{10}) Asked for: moles of O_2

$$\text{moles A} \times \frac{\text{\# moles B}}{\text{\# moles A}} = \text{moles B}$$

(# = number of moles, coefficients, from balanced equation)

$$7.5 \text{ mol } C_4H_{10} \times \frac{13 \text{ mol } O_2}{2 \text{ mol } C_4H_{10}} = 48.75 \text{ mol } O_2$$

MASS-MASS PROBLEMS

2. How many grams of water would be produced by the combustion of 3.75 g butane?

$\underline{2}\ C_4H_{10} + \underline{13}\ O_2 \rightarrow \underline{8}\ CO_2 + \underline{10}\ H_2O$

Given: 3.75 g butane (C_4H_{10}) Asked for: grams of H_2O

$$\text{grams A} \times \frac{1 \text{ mol A}}{\text{m.m. A (g)}} \times \frac{\text{\# moles B}}{\text{\# moles A}} \times \frac{\text{m.m. B (g)}}{1 \text{ mol B}} = \text{grams B}$$

(m.m. = molar mass)

$$3.75 \text{ g } C_4H_{10} \times \frac{1 \text{ mol } C_4H_{10}}{58 \text{ g } C_4H_{10}} \times \frac{10 \text{ moles } H_2O}{2 \text{ moles } C_4H_{10}} \times \frac{18 \text{ g } H_2O}{1 \text{ mol } H_2O} = 5.82 \text{ g } H_2O$$

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