

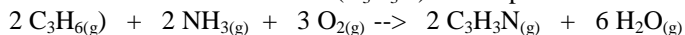
### 3.7 Chemical Equations: See The *Ultimate Chemical Equations Handbook*

### 3.8 Balancing Equations:

### 3.9 Stoichiometric Calculations o: Amounts of Reactants and Products

Coefficients represent the *number* of moles, not masses. However, counting is performed by weighing. So masses of reactants are used to determine masses of products.

Ex. What mass of acrlonitrile (C<sub>3</sub>H<sub>3</sub>N) can be produced from 100.0 grams of propylene (C<sub>3</sub>H<sub>6</sub>)? The reaction is:



- convert mass of reactant to moles
- using mole ratio (coefficients) find moles of desired product (or reactant)
- convert the moles to mass
- Answer:

$$\frac{100.0 \text{ g C}_3\text{H}_6}{42 \text{ g C}_3\text{H}_6} \quad \text{a.) } \frac{1 \text{ mol C}_3\text{H}_6}{42 \text{ g C}_3\text{H}_6} \quad \text{b.) } \frac{2 \text{ mol C}_3\text{H}_3\text{N}}{2 \text{ mol C}_3\text{H}_6} \quad \text{c.) } \frac{53.0 \text{ g C}_3\text{H}_3\text{N}}{1 \text{ mol C}_3\text{H}_3\text{N}} = 126 \text{ g}$$

Discuss stoichiometric ratios if multi-step process. See P.131 #116

### 3.10 Calculations Involving a Limiting Reactant

Limiting reactant is the one that is consumed first and therefore determines how much product can be formed.

Theoretical yield: of a product is the maximum amount of a product that can be produced from a given amount of limiting reactant. The actual yield is the amount of product actually produced in a given experiment and is always less than the theoretical yield. So the theoretical yield is represented as a percent yield: actual yield / theoretical yield x100

In Class: P. 122 #109 and P. 123 #126

In class:  $\text{Mg} + \text{I}_2 \rightarrow \text{MgI}_2$

- equal
- iodine
- magnesium
- magnesium
- equal
- iodine
- equal
- iodine
- magnesium

Ex. For the Haber Process:  $2 \text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \rightarrow 2 \text{NH}_3(\text{g})$

- What mass of ammonia can be produced from the reaction of 25.0g of N<sub>2</sub> with 3.00g of H<sub>2</sub>? **15.2 g**
- Which reactant is limiting? (test reactant to reactant) Ans: **nitrogen is limiting**
- What is the Percent Yield if actually 12.7 g was produced? **83.6 %**
- What mass of the in excess reactant is left over? **0.32 g of H<sub>2</sub> in excess**

**Practice Problems for Homework: P. 121 (In Class P.123 #126) #89, 92, 93, 94, 96, 97, 99, 102, 104, 106, 118, 122, 132, 134, 137**