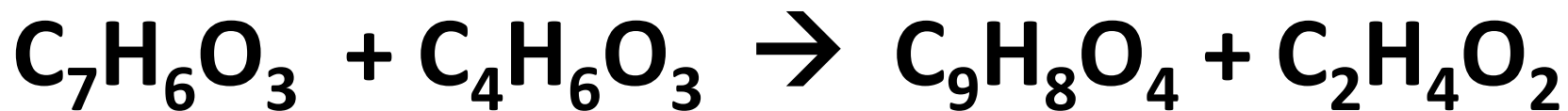


- 1) A student adds 200.0g of  $\text{C}_7\text{H}_6\text{O}_3$  to an excess of  $\text{C}_4\text{H}_6\text{O}_3$ , this produces  $\text{C}_9\text{H}_8\text{O}_4$  and  $\text{C}_2\text{H}_4\text{O}_2$ . Calculate the percent yield if 231 g of aspirin ( $\text{C}_9\text{H}_8\text{O}_4$ ) is produced in an experiment.



$$\frac{200 \text{ g C}_7\text{H}_6\text{O}_3}{138 \text{ g C}_7\text{H}_6\text{O}_3} \times \frac{1 \text{ mol C}_7\text{H}_6\text{O}_3}{1 \text{ mol C}_7\text{H}_6\text{O}_3} \times \frac{1 \text{ mol C}_9\text{H}_8\text{O}_4}{1 \text{ mol C}_7\text{H}_6\text{O}_3} \times \frac{180 \text{ g C}_9\text{H}_8\text{O}_4}{1 \text{ mol C}_9\text{H}_8\text{O}_4}$$

$$= 260.87 \text{ g C}_9\text{H}_8\text{O}_4$$

$$\text{C} - 7 \times 12 = 84$$

$$\text{H} - 6 \times 1 = 6$$

$$\text{O} - 3 \times 16 = 48$$

$$= 138 \text{ g/mol C}_7\text{H}_6\text{O}_3$$

$$\text{C} - 9 \times 12 = 108$$

$$\text{H} - 8 \times 1 = 8$$

$$\text{O} - 4 \times 16 = 64$$

$$= 180 \text{ g/mol C}_9\text{H}_8\text{O}_4$$

Actual Yield

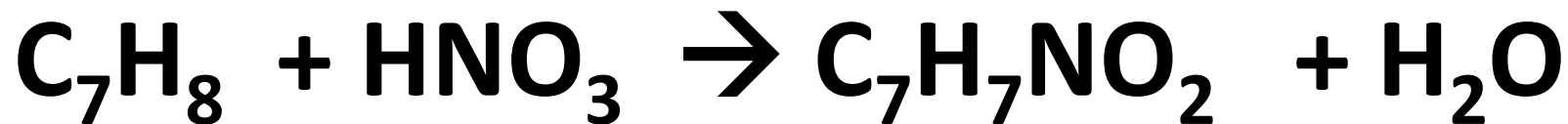
x 100 = % Yield

Theoretical Yield

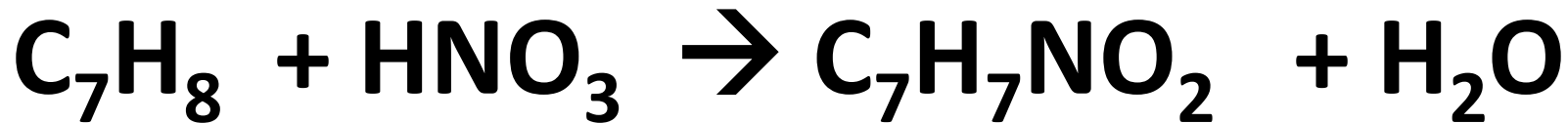
231 g C<sub>9</sub>H<sub>8</sub>O<sub>4</sub>

x 100 = **88.5 %**

260.87 g C<sub>9</sub>H<sub>8</sub>O<sub>4</sub>



- 2) According to the following equation, Calculate the percentage yield if 550.0 g of toluene ( $\text{C}_7\text{H}_8$ ) added to an excess of nitric acid ( $\text{HNO}_3$ ) provides 305 g of the p-nitrotoluene ( $\text{C}_7\text{H}_7\text{NO}_2$ ) product in a lab experiment.



550.0 g C <sub>7</sub> H <sub>8</sub>	1 mol C <sub>7</sub> H <sub>8</sub>	1 mol C <sub>7</sub> H <sub>7</sub> NO <sub>2</sub>	137g C <sub>7</sub> H <sub>7</sub> NO <sub>2</sub>
	92g C <sub>7</sub> H <sub>8</sub>	1 mol C <sub>7</sub> H <sub>8</sub>	1 mol C <sub>7</sub> H <sub>7</sub> NO <sub>2</sub>

$$= 819 \text{ g C}_7\text{H}_7\text{NO}_2$$

$$\text{C} - 7 \times 12 = 84$$

$$\text{H} - 8 \times 1 = 8$$

$$= 92 \text{ g/mol C}_7\text{H}_8$$

$$\text{C} - 7 \times 12 = 84$$

$$\text{H} - 7 \times 1 = 7$$

$$\text{N} - 1 \times 14 = 14$$

$$\text{O} - 2 \times 16 = 32$$

$$= 137 \text{ g/mol C}_7\text{H}_7\text{NO}_2$$

Actual Yield

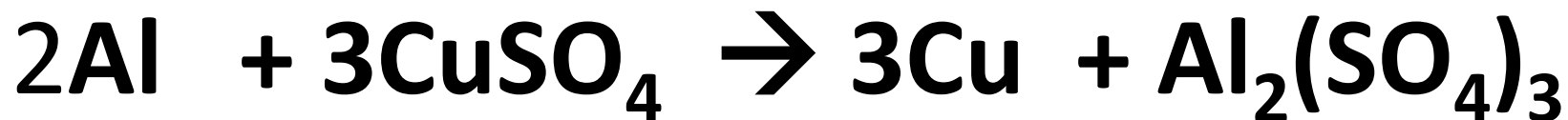
x 100 = % Yield

Theoretical Yield

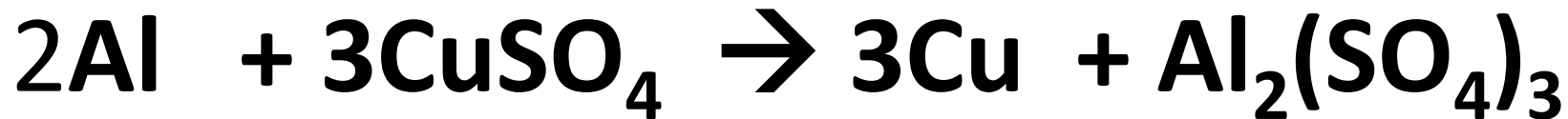
305 g C<sub>7</sub>H<sub>7</sub>NO<sub>2</sub>

x 100 = **37.2%**

819 g C<sub>7</sub>H<sub>7</sub>NO<sub>2</sub>



- 3) Aluminum reacts with an aqueous solution containing excess copper (II) sulfate. If 1.85 g Al reacts and the percentage yield of Cu is 56.6%, what mass of Cu is produced?



1.85 g Al	1 mol Al	1 mol Cu	63.5 g Cu	
23 g Al	1 mol Al	1 mol Cu	1 mol Cu	= 6.52 g Cu

$$\text{Al} - 1 \times 23 = 23$$

$$= 23 \text{ g/mol Al}$$

$$\text{Cu} - 1 \times 63.5 = 63.5$$

$$= 63.5 \text{ g/mol Cu}$$

Actual Yield

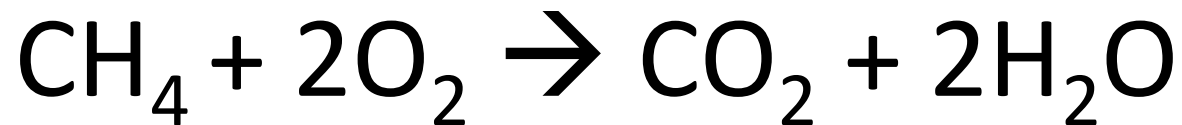
$$\text{_____} \times 100 = \% \text{ Yield}$$

Theoretical Yield

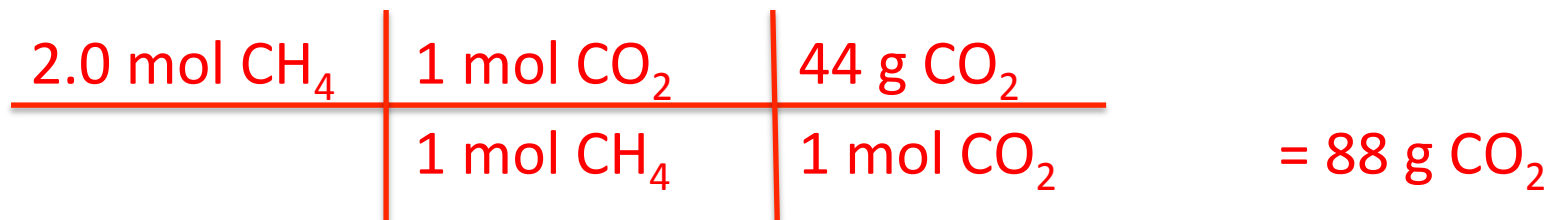
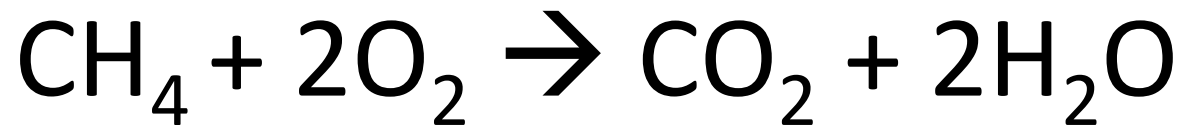
$$\text{Actual Yield} = \frac{\% \text{ Yield}}{100} \times \text{Theoretical Yield}$$

$$\text{Actual Yield} = \frac{56.6}{100} \times 6.52 \text{ g Cu}$$

$$\text{Actual Yield} = 3.69 \text{ g Cu}$$



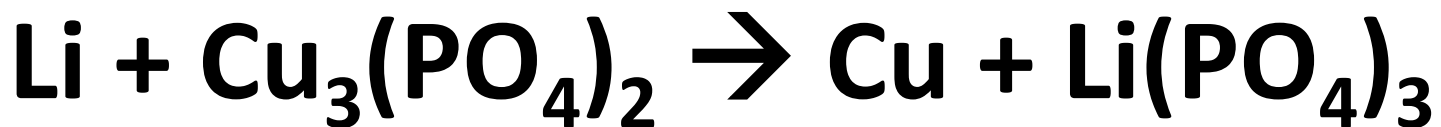
- 4) The combustion of methane( $\text{CH}_4$ ) produces carbon dioxide and water. Assume that 2.0 mol of  $\text{CH}_4$  burned in the presence of excess air. What is the percentage yield if in an experiment the reaction produces 87.0 g of  $\text{CO}_2$ ?



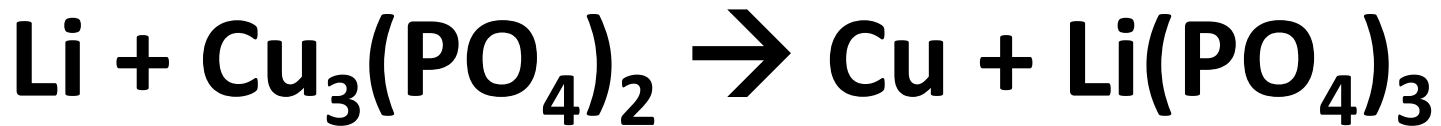
$$\begin{aligned} \text{C} &- 1 \times 12 = 12 \\ \text{O} &- 2 \times 16 = 32 \\ &= 44 \text{ g/mol CO}_2 \end{aligned}$$

$$\frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100 = \% \text{ Yield} \quad \frac{87 \text{ g CO}_2}{88 \text{ g CO}_2} \times 100 = \mathbf{98.86\%}$$





- 5) 15.3 grams of Lithium is dropped into a solution containing excess copper II phosphate. When the reaction is completed, 1.25 grams of copper is formed. What is the percent yield?



15.3 g Li	1 mol Li	1 mol Cu	63.5 g Cu	
7 g Li	1 mol Li	1 mol Cu		= 138.8 g Cu

$$\begin{aligned} \text{Li} - 1 \times 7 &= 7 \\ &= 7 \text{ g/mol Li} \end{aligned}$$

$$\begin{aligned} \text{Cu} - 1 \times 63.5 &= 63.5 \\ &= 63.5 \text{ g/mol Cu} \end{aligned}$$

$$\frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100 = \% \text{ Yield}$$

$$\frac{1.25 \text{ g Cu}}{138.8 \text{ g Cu}} \times 100 = \mathbf{0.9 \%}$$