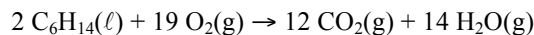


## CH 221 Limiting Reactant Example

Hexane (C<sub>6</sub>H<sub>14</sub>) burns in air (O<sub>2</sub>) to give CO<sub>2</sub> and H<sub>2</sub>O.

- Write a balanced equation for this reaction.
- If 215 g of C<sub>6</sub>H<sub>14</sub> is mixed with 215 g of O<sub>2</sub>, what masses of CO<sub>2</sub> and H<sub>2</sub>O are produced in the reaction?
- What mass of excess reactant remains at the end of the reaction?
- If 151.3 g of CO<sub>2</sub> are collected, what is the percent yield of CO<sub>2</sub>?



$$215 \text{ g C}_6\text{H}_{14} \cdot (\text{mol}/86.18 \text{ g}) \cdot (12 \text{ mol CO}_2 / 2 \text{ mol C}_6\text{H}_{14}) \cdot 44.01 \text{ g/mol} = 658 \text{ g CO}_2$$

$$215 \text{ g O}_2 \cdot (\text{mol}/32.00 \text{ g}) \cdot (12 \text{ mol CO}_2 / 19 \text{ mol O}_2) \cdot 44.01 \text{ g/mol} = 187 \text{ g CO}_2 \text{ (Theo. yield)}$$

*Excess Reactant* = C<sub>6</sub>H<sub>14</sub>, ***Limiting Reactant*** = O<sub>2</sub>

$$215 \text{ g O}_2 \cdot (\text{mol}/32.00 \text{ g}) \cdot \frac{12 \text{ mol CO}_2}{19 \text{ mol O}_2} \cdot \frac{44.01 \text{ g}}{1 \text{ mol CO}_2} = \mathbf{187 \text{ g CO}_2}$$

$$215 \text{ g O}_2 \cdot (\text{mol}/32.00 \text{ g}) \cdot \frac{14 \text{ mol H}_2\text{O}}{19 \text{ mol O}_2} \cdot \frac{18.02 \text{ g}}{1 \text{ mol H}_2\text{O}} = \mathbf{89.2 \text{ g H}_2\text{O}}$$

$$215 \text{ g O}_2 \cdot (\text{mol}/32.00 \text{ g}) \cdot \frac{2 \text{ mol C}_6\text{H}_{14}}{19 \text{ mol O}_2} \cdot \frac{86.18 \text{ g}}{1 \text{ mol C}_6\text{H}_{14}} = \mathbf{60.9 \text{ g C}_6\text{H}_{14} \text{ used}}$$

$$215 \text{ g C}_6\text{H}_{14} \text{ available} - 60.9 \text{ g C}_6\text{H}_{14} \text{ used} = \mathbf{154 \text{ g C}_6\text{H}_{14} \text{ remains}}$$

$$\% \text{yield} = (151.3 / 187) \cdot 100\% = \mathbf{80.9\% \text{ CO}_2}$$

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*Try it yourself:*

Calcium oxide and ammonium chloride can be combined to give ammonia (NH<sub>3</sub>), water and calcium chloride.

- Write a balanced equation for this reaction.
- If 112 g of calcium oxide is mixed with 224 g of ammonium chloride, what mass of NH<sub>3</sub> should be produced in the reaction?
- What mass of excess reactant remains at the end of the reaction?
- If only 16.3 g of NH<sub>3</sub> are collected, what is the percent yield of NH<sub>3</sub>?

*Answers appear on the next page.*

### CH 221 Limiting Reactant Example - Answers

Calcium oxide and ammonium chloride can be combined to give ammonia (NH<sub>3</sub>), water and calcium chloride.

- Write a balanced equation for this reaction.



- If 112 g of calcium oxide is mixed with 224 g of ammonium chloride, what mass of NH<sub>3</sub> should be produced in the reaction?

**Theoretical yield of NH<sub>3</sub> = 68.0 g**

- What mass of excess reactant remains at the end of the reaction?

**10. g of excess reactant remains at the end of the reaction.**

- If only 16.3 g of NH<sub>3</sub> are collected, what is the percent yield of NH<sub>3</sub>?

**Percent yield = 24.0%**