Inspiring Greatness
ISD
INDEPENDENCE SCHOOL DISTRICT

High School Science Virtual Learning

Chemistry

Limiting Reactants

April 27, 2020

High School Chemistry
Lesson: April 27, 2020

Objective/Learning Target:

Students will be able to calculate theoretical yields in a limiting reactant problem.

Let's Get Started:

$$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4H_2O$$

1. How much carbon dioxide will be formed if 12.5 grams of oxygen reacts with 7.2 grams of propane (C_3H_8)?

2. Under normal conditions, which reactant would typically be limiting in this reaction? Under what conditions would the other reactant be limiting?

Let's Get Started: Answer Key

1. How much carbon dioxide will be formed if 12.5 grams of oxygen reacts with 7.2 grams of propane (C_3H_8)? 10.3 g CO_2

$$\frac{12.5\text{ g } O_2}{1} \left| \frac{1\text{ mol } O_2}{31.998\text{ g } O_2} \right| \frac{3\text{ mol } CO_2}{5\text{ mol } O_2} \left| \frac{44.009\text{ g } CO_2}{1\text{ mol } CO_2} \right. = \boxed{10.3\text{ g } CO_2}$$

$$\frac{7.2\text{ g } C_3H_8}{1} \left| \frac{1\text{ mol } C_3H_8}{44.097\text{ g } C_3H_8} \right| \frac{3\text{ mol } CO_2}{1\text{ mol } C_3H_8} \left| \frac{44.009\text{ g } CO_2}{1\text{ mol } CO_2} \right. = 22\text{ g } CO_2$$

Let's Get Started: Answer Key

2. Under normal conditions, C_3H_8 would be the limiting reactant because there is a very large amount of oxygen in any room. You rarely run out of oxygen when you burn something, and this reaction is a combustion reaction.

   You could make oxygen the limiting reactant (like Question 1) by performing this reaction in a closed container.

Lesson Activity:

Directions:

1. Watch this video and take notes on the example.

Practice

Complete the following questions using the information you learned during the lesson activity.

Questions: $Al + FeCl_3 \rightarrow Fe + AlCl_3$

1. 3.6 grams of aluminum are put in a container with 9.8 grams of $FeCl_3$. How many grams of iron can be produced?
2. In Question 1, identify the limiting reactant and the excess reactant.
3. If 2.5 g of Fe resulted from the reaction, what was the percent yield.

Once you have completed the practice questions check with the answer key.

1. 3.4 g Fe

$$\frac{3.6\text{ g Al}}{1}\left|\frac{1\text{ mol Al}}{26.982\text{ g Al}}\right|\frac{1\text{ mol Fe}}{1\text{ mol Al}}\left|\frac{55.845\text{ g Fe}}{1\text{ mol Fe}}\right. = 7.5\text{ g Fe}$$

$$\frac{9.8\text{ g } FeCl_3}{1}\left|\frac{1\text{ mol } FeCl_3}{162.204\text{ g } FeCl_3}\right|\frac{1\text{ mol Fe}}{1\text{ mol } FeCl_3}\left|\frac{55.845\text{ g Fe}}{1\text{ mol Fe}}\right. = 3.4\text{ g Fe}$$

Once you have completed the practice questions check with the answer key.

2. $FeCl_3$ was the limiting reagent. Al was the excess reagent.
3. 2.5 g/3.4 g x 100% = 73.5%

More Practice:

Follow the links below to do more practice.

1. Limiting Reactants Worksheet #1
2. Limiting Reactants Worksheet # 2

Additional Practice:
Click on this link for additional practice.