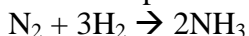


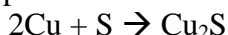
Limiting Reagent and Percent Yield**Limiting Reagent**

In a limiting reagent problem you will be given amounts of two of your reagents. The goal is to determine which you will run out of first. The only way to do this is to solve the stoichiometry problem using each reagent and its value. The reagent that produces **less** of the same product is the one you would run out of first, and thus your **limiting reagent**. The other reagent, the one you will have extra of when finished, is your **excess reagent**.

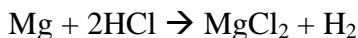
1. Nitrogen gas reacts with hydrogen gas to form ammonia, NH_3 , gas. If Stella is given 50.0 liters of hydrogen gas and 18.0 liters of nitrogen gas, what is her limiting reagent? How many liters of ammonia can she produce?



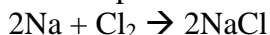
2. Solid copper reacts with solid sulfur to form solid cuprous sulfide. If Susie is given 80.0 grams of copper and 25.0 grams of sulfur, what is her limiting reagent? How many grams of cuprous sulfide can be produced?



3. Solid magnesium reacts with aqueous hydrogen chloride to produce aqueous magnesium chloride and hydrogen gas. If Shannon is given 6.00 grams of hydrogen chloride and 5.00 grams of magnesium, what is her limiting reagent? What is the greatest amount of hydrogen gas (in liters) she can produce?



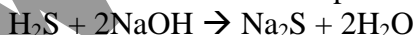
4. Solid sodium reacts with chlorine gas to form solid sodium chloride. If Lily is given 6.10 grams of sodium and 3.00 liters of chlorine gas, what is her limiting reagent? How many grams of sodium chloride can be produced?



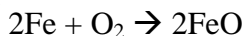
5. Liquid hydrazine, N_2H_4 , reacts with oxygen gas to produce nitrogen gas and water vapor. How many liters of nitrogen gas form when Julie reacts 1.000 kg of hydrazine with 700.0 liters of oxygen gas?



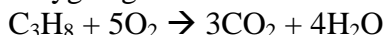
6. Hydrogen sulfide gas reacts with aqueous sodium hydroxide to produce aqueous sodium sulfide and water. If Sarah is given 2.5 liters of hydrogen sulfide and 1.85 grams of sodium hydroxide, how many grams of sodium sulfide can she produce?



7. Solid iron reacts with oxygen gas to form solid ferrous oxide. Determine the amount of ferrous oxide produced if Anne Marie is given 30.0 grams of iron and 6.25 liters of oxygen.



8. Determine the amount of water vapor and carbon dioxide, CO_2 , gas produced if Katie is given 33.0 liters of oxygen gas and 21.0 liters of propane gas, C_3H_8 .



Percent Yield

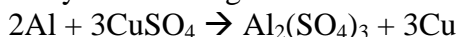
The percent yield equation is used to determine the efficiency of a chemical procedure. When you perform a percent yield calculation you will be comparing how much product you **actually** produce in a lab situation with how much should theoretically be produced if the situation was ideal. The theoretical yield is what you determine in a stoichiometry problem. The percent yield equation is listed below.

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

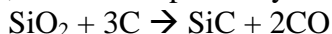
1. Solid calcium carbonate decomposes to form solid calcium oxide and carbon dioxide gas. What is the percent yield of this reaction if 24.8 grams of calcium carbonate produced 3.1 g of calcium oxide **in the lab**?



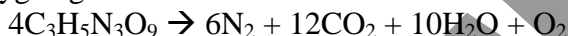
2. Solid aluminum reacts with aqueous copper(II) sulfate in a single displacement reaction. What is the percent yield if 1.87 grams of aluminum **actually** produced 4.65 grams of solid copper?



3. Solid silicon dioxide, SiO_2 , reacts with solid carbon, C, to produce solid silicon carbide, SiC, and carbon monoxide gas, CO. If 50.0 grams of silicon dioxide **actually** produce 32.2 grams of silicon carbide, what is the percent yield?

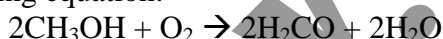


4. Solid nitroglycerine, $\text{C}_3\text{H}_5\text{N}_3\text{O}_9$, decomposes to form nitrogen gas, carbon dioxide gas, liquid water and oxygen gas:



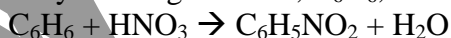
- If 49.0 grams of $\text{C}_3\text{H}_5\text{N}_3\text{O}_9$ are used, how many grams of water will be produced?
- If only 6.9 grams of water are actually captured, what is the percent yield?

5. Methanol, CH_3OH , reacts with oxygen to produce formaldehyde, H_2CO and water according to the following equation:



- If the above reaction is carried out in a laboratory and you have 270.0 grams of methanol and 48.6 liters of oxygen, what is your limiting reagent?
- How many grams of formaldehyde can be produced?
- If 82.34 grams of formaldehyde are actually produced, what is your percent yield?

6. Nitrobenzene is used in the production of perfumes. Nitrobenzene, $\text{C}_6\text{H}_5\text{NO}_2$, along with water, is produced by reacting benzene, C_6H_6 , with nitric acid, HNO_3 .



- If you have 109.5 grams of C_6H_6 and 102.2 grams of HNO_3 , how many grams of nitrobenzene can be produced?
- What is your limiting reagent?
- If only 159.7 grams of nitrobenzene are actually produced, what is your percent yield?

7. Aluminum oxide is produced in a single replacement reaction between aluminum and chromium(II) oxide. Calculate the percent yield if 225.0 grams of chromium(II) oxide were used with 125.0 grams of aluminum and 100.0 grams of aluminum oxide were actually produced.

