

## Calculating Excess Reagent and Percent Yield

By the end of today's class, you will be able to do the following:

- 1.) Write and balance chemical equations.
- 2.) Determine which reactant is the limiting reagent using stoichiometry
- 3.) Identify the limiting and excess reagents.
- 4.) Calculate theoretical yield
- 5.) Calculate percent yield

### Practice 1: (Worked with Teacher)

When ammonia reacts with oxygen, nitrogen monoxide and water are produced.  
In an experiment, 3.25 g of  $\text{NH}_3$  reacts with 3.50 g of  $\text{O}_2$ .

a. Write and balance the equation.

b. Determine which reactant is the limiting reagent using stoichiometry.

c. Identify the limiting and excess reagents.

Limiting reagent: \_\_\_\_\_ Excess reagent: \_\_\_\_\_

d. Calculate the theoretical yield of nitrogen monoxide.

e. You run the above experiment and only make 2.21 grams of NO.

What is the percent yield?



**PRACTICE 3: Work by yourself or in small groups!**

When copper(II) chloride reacts with sodium nitrate, copper(II) nitrate and sodium chloride is formed. If 15 grams of copper(II) chloride reacts with 20 grams of sodium nitrate, what mass of sodium chloride is produced?

a. Write and balance the equation.

b. Determine which reactant is the limiting reagent using stoichiometry.

c. Identify the limiting and excess reagents.

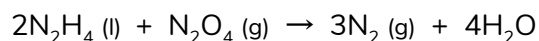
Limiting reagent: \_\_\_\_\_ Excess reagent: \_\_\_\_\_

d. Calculate the theoretical yield of sodium chloride.

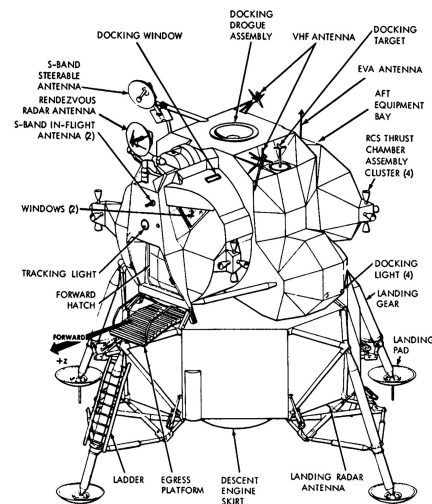
e. If 11.3 grams of sodium chloride are actually formed in the reaction, what is the percent yield of this reaction?

### PRACTICE 4: Work by yourself!

One of the components of the fuel mixture on the Apollo lunar module involved a reaction with hydrazine ( $\text{N}_2\text{H}_4$ ) and dinitrogen tetroxide. These propellants are hypergolic; that is, they ignite spontaneously when brought together in the rocket's combustion chamber.



What volume of  $\text{N}_2$  gas (assume gas is at STP) would result from the reaction of 1,876,000 g of hydrazine (4135.87 pounds) and 1,250,670 g of dinitrogen tetroxide (2757.26 pounds)?



a. Determine which reactant is the limiting reagent using stoichiometry by converting mass to volume!

b. Identify the limiting and excess reagents.

Limiting reagent: \_\_\_\_\_ Excess reagent: \_\_\_\_\_

c. Calculate the theoretical yield in grams.

d. If 971,110.87 grams of nitrogen ( $\text{N}_2$ ) are actually formed in the reaction, what is the percent yield of this reaction?