

A **limiting reactant** is the reactant that limits the amounts of the other reactants that can combine—and the amount of product that can form—in a chemical reaction. Essentially, the limiting reactant is the reactant that you run out of first. When you run out of the limiting reactant you cannot make any more products and the other reactant is left over as excess reactant.

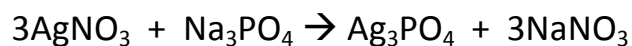
**Follow these general steps to determine which reactant is the limiting reactant.**

- 1) Use the given amount of both reactants to calculate the amount of the other reactant necessary.
- 2) Use reaction stoichiometry to calculate the amount of the other reactant needed to complete the reaction.
- 3) Compare the amounts needed to complete the reaction with the amounts actually in the problem.

**Answer the following questions related to limiting reactants. Set up and show all your work for full credit and make sure you report your answers to the correct number of significant figures.**

1. The reaction for the synthesis of ammonia is  $\text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3$ .
  - a. In this reaction, 28.0 g of  $\text{N}_2$  and 25.0 g of  $\text{H}_2$  are reacted together. Which reactant is the limiting reactant and which reactant is the excess reactant?
  
  
  
  
  
  
  
  
  
  
  - b. How much of the excess reactant is left? \_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
  - c. If this reaction proceeds with the amounts from part A, how many grams of  $\text{NH}_3$  can be produced by the reaction?
  
  
  
  
  
  
  
  
  
  
2. Magnesium and hydrochloric acid react according to the following equation:  $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ 
  - a. If you react 50.0 g of Mg and 75.0 g of HCl together, which reactant is the limiting reactant and which reactant is the excess reactant?
  
  
  
  
  
  
  
  
  
  
  - b. How much of the excess reactant is left? \_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
  - c. How many grams of hydrogen ( $\text{H}_2$ ) are produced from the reaction?

3. Silver(I) nitrate and sodium phosphate undergo a double replacement reaction as follows:



- If both reactants combine in equal amounts of 200. g each, which reactant is the limiting reactant and which reactant is the excess reactant?
- How much of the excess reactant is left? \_\_\_\_\_
- If this reaction proceeds with 200. G of each reactant, how many grams of silver phosphate are produced?

4. Potassium and iodine combine to form potassium iodide.  $2\text{K} + \text{I}_2 \rightarrow 2\text{KI}$

- This synthesis reaction begins with 150. grams of iodine and 45.6 grams of potassium, which reactant is the limiting reactant and which reactant is the excess reactant?
- How many grams of the excess reactant will be left over?
- How many grams of potassium iodide can be produced by the reaction with the amounts from part a?

5. Copper(I) Chloride and hydrogen sulfide gas react in the following way:  $2\text{CuCl} + \text{H}_2\text{S} \rightarrow \text{Cu}_2\text{S} + 2\text{HCl}$

- If 9.90 grams of CuCl and 10.2 grams of H<sub>2</sub>S are reacted together, which reactant is the limiting reactant and which reactant is the excess reactant?
- What is the excess reactant and how much is left over?
- How much Cu<sub>2</sub>S will form if the reaction proceeds with the amounts from part a?