



CHEM 1300/1310

Limiting Reactant Problems

- Step 1:** Write down what is known. Write out and balance the reaction.
- Step 2:** Convert given values (reactants) to moles of product specified, using the mole to mole ratio.
- Step 3:** Determine limiting reactant (whichever one creates the least amount of product, in moles). This is the reactant that is going to determine how much product you can make (theoretical yield).
- Step 4:** Using the limiting reactant, calculate how many grams of product are produced (this will involve using the mole to mole ratio).

***different problems will ask for slightly different things. Make sure to read the question carefully!

Ex. Starting with 86.3 g NO and 25.6 g H₂, find the theoretical yield of ammonia in grams.

Write out and balance reaction: $2\text{NO}(\text{g}) + 5\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g}) + 2\text{H}_2\text{O}(\text{g})$

We know our reactants (in grams) and that we are concerned with the product ammonia (NH₃)

Convert grams of reactants into moles of ammonia (grams to moles using molar mass, and then moles of reactant to moles of product using mole to mole ratio):

$$86.3 \text{ g NO} * \frac{1 \text{ mol NO}}{30.01 \text{ g NO}} * \frac{2 \text{ mol NH}_3}{2 \text{ mol NO}} = 2.8757 \text{ mol NH}_3$$

$$25.6 \text{ g H}_2 * \frac{1 \text{ mol H}_2}{2.016 \text{ g H}_2} * \frac{2 \text{ mol NH}_3}{5 \text{ mol H}_2} = 5.0794 \text{ mol NH}_3$$

It can be seen that the **reactant, NO** forms the least amount of product. Therefore, it is the **limiting reactant**. We then convert the **moles of the product, NH₃**, found using grams of NO (the 2.8757 mol NH₃) to grams. This will be our **theoretical yield**; what we would expect for the amount of product produced by this reaction.

$$2.8757 \text{ mol NH}_3 * \frac{17.03 \text{ g NH}_3}{1 \text{ mol NH}_3} = 49.0 \text{ g NH}_3$$

Contact us via:

📍 Student Affairs Building,
2nd floor
📞 (954) 262-8350
📧 @nsu_ttc

Maximize your Success

NSU
Florida