

Stoichiometry 3.5

Limiting Reactant
% Yield

Limiting Reactant

If you have set quantities of two different reactants, one will get used up and some amount of the other will be leftover.

Limiting Reactant

- The reactant that is used up limits how far the reaction will proceed.

Excess Reactant

- The reactant that is leftover when the reaction is complete.

Ex1) Limiting Reactant Problem

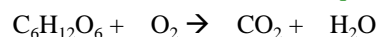
- Ex1) (a) What is the limiting reactant when 28 g of Glucose reacts with 14 g of Oxygen gas?
(b) What mass of CO₂ is produced?

Step 1. Write a Balanced Chemical Equation

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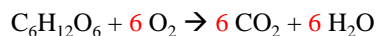
Step 1. Write a Balanced Chemical Equation



Ex1) Limiting Reactant Problem

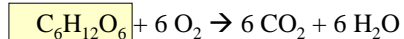
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Step 1. Write a Balanced Chemical Equation



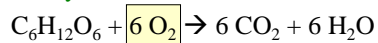
Ex1) Limiting Reactant Problem (cont.)

Step 2. Find the mass of CO₂ that would be produced by each reactant.



Ex1) Limiting Reactant Problem (cont.)

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Ex1) Limiting Reactant Problem (cont.)

Step 3. Compare the two masses produced.
The reactant that produced the smallest quantity of product is the limiting reactant.

$$19 \text{ g} < 41 \text{ g}$$

- (a) Thus, O₂ is the limiting reactant.
(b) 19 g of CO₂ is produced in theory.

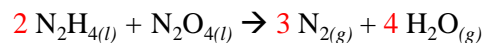
Ex2) Percent Yield

Ex2) Find the percent yield if only 15 grams of CO₂ were produced in the previous problem.

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

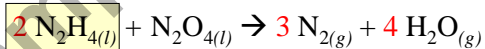
Ex3) Limiting Reactant

Ex3) (a) Find the limiting reactant 155 g of N₂H_{4(l)} react with 175 g N₂O_{4(l)}.
(b) What mass of H₂O_(g) is produced?



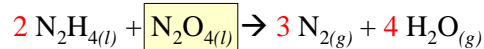
Ex3) Limiting Reactant (cont.)

Step 1. Find the mass of H₂O that could be produced by each reactant.



Ex3) Limiting Reactant (cont.)

Step 1. Find the mass of H₂O that could be produced by each reactant.



Ex3) Limiting Reactant (cont.)

Step 3. Compare the two masses produced. The reactant that produced the smallest quantity of product is the limiting reactant.

$$137 \text{ g} < 174 \text{ g}$$

- (a) Thus, N_2O_4 is the limiting reactant.
- (b) 137 g of H_2O is produced in theory.

Ex4) Percent Yield

Ex2) Find the percent yield if only 129 grams of H_2O were produced in the previous problem.

Sample Copy of Students' Lecture Notes