

Percentage Yield



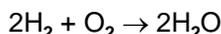
Assignment: Read 5.6 up to sample (238-9)

1. Define the following terms: yield, theoretical yield, actual yield, percentage yield.
2. Based on your reading, give 4 reasons why the actual yield in a chemical reaction often falls short of the theoretical yield.
3. Read the sample problem on the next slide and try the practice problem on slide number 5
4. When 5.00 g of KClO_3 is heated it decomposes according to the equation: $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$
 - a) Calculate the theoretical yield of oxygen.
 - b) Give the % yield if 1.78 g of O_2 is produced.
 - c) How much O_2 would be produced if the percentage yield was 78.5%?

Sample problem

Q - What is the % yield of H_2O if 138 g H_2O is produced from 16 g H_2 and excess O_2 ?

Step 1: write the balanced chemical equation



Step 2: determine actual and theoretical yield.

Actual is given, theoretical is calculated:

$$\# \text{ g H}_2\text{O} = 16 \text{ g H}_2 \times \frac{1 \text{ mol H}_2}{2.02 \text{ g H}_2} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 143 \text{ g}$$

Step 3: Calculate % yield

$$\% \text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100\% = \frac{138 \text{ g H}_2\text{O}}{143 \text{ g H}_2\text{O}} \times 100\% = 96.7\%$$

Practice problem

Q - What is the % yield of NH_3 if 40.5 g NH_3 is produced from 20.0 mol H_2 and excess N_2 ?

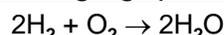
Step 1: write the balanced chemical equation

Step 2: determine actual and theoretical yield.

Actual is given, theoretical is calculated:

Step 3: Calculate % yield

Challenging question



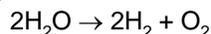
What is the % yield of H_2O if 58 g H_2O are produced by combining 60 g O_2 and 7.0 g H_2 ?

Hint: determine limiting reagent first

More Percent Yield Questions

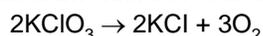
Note: try "shortcut" for limiting reagent problems

1. The electrolysis of water forms H_2 and O_2 .



What is the % yield of O_2 if 12.3 g of O_2 is produced from the decomposition of 14.0 g H_2O ?

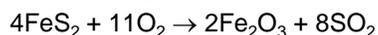
2. 107 g of oxygen is produced by heating 300 grams of potassium chlorate. Calculate % yield.



3. What is the % yield of ferrous sulphide if 3.00 moles of Fe reacts with excess sulfur to produce 220 grams of ferrous sulphide? $\text{Fe} + \text{S} \rightarrow \text{FeS}$

More Percent Yield Questions

4. Iron pyrites (FeS_2) reacts with oxygen according to the following equation:



If 300 g of iron pyrites is burned in 200 g of O_2 , 143 grams of ferric oxide is produced. What is the percent yield of ferric oxide?

5. 70 grams of manganese dioxide is mixed with 3.5 moles of hydrochloric acid. How many grams of Cl_2 will be produced from this reaction if the % yield for the process is 42%?

