

Percent Yield Calculations

(Honors Chemistry)



1. Magnesium metal, with a mass of 4.67×10^2 grams, reacts with an excess of nitric acid in a single replacement reaction at STP. Determine the theoretical yield, in grams, of hydrogen gas.

$4.67 \times 10^2 \text{ -g Mg}$	1 mol Mg	1 mol H_2	2 -g H_2
	24 -g	1 mol Mg	1 mol H_2

$$3.89 \times 10^1 \text{ g H}_2$$

2. Using the information in question #1, determine the percent yield of hydrogen gas if only 2.04×10^1 grams was actually produced during the reaction.

$$\frac{2.04 \times 10^1 \text{ -g}}{3.89 \times 10^1 \text{ -g}} \times 100 = 52.4 \%$$



3. Solid sodium hydrogen carbonate decomposes into solid sodium hydroxide and carbon dioxide gas. Determine the theoretical yield of sodium hydroxide if 3.50×10^4 grams of carbon dioxide was produced.

$3.50 \times 10^4 \text{ -g CO}_2$	1 mol CO_2	1 mol NaOH	40 -g NaOH
	44 -g	1 mol CO_2	1 mol NaOH

$$3.18 \times 10^4 \text{ -g NaOH}$$

4. Using the information in question #3, determine the percent yield of sodium hydroxide if 2.18×10^4 grams was actually produced during the reaction.

$$\frac{2.18 \times 10^4}{3.18 \times 10^4} \times 100 = 68.6 \%$$



5. Determine the theoretical yield of iron (III) sulfate when 6.87×10^2 grams of iron (III) phosphate reacts with an excess of sodium sulfate in a double replacement reaction.

$6.87 \times 10^2 \text{ -g FePO}_4$	1 mol FePO ₄	1 mol Fe ₂ (SO ₄) ₃	400-g
	151 g	2 mol FePO ₄	1 mol Fe ₂ (SO ₄) ₃

$$9.10 \times 10^2 \text{ g Fe}_2(\text{SO}_4)_3$$

6. Using the information in question #5, determine the percent yield of iron (III) sulfate if 1.15×10^3 grams were actually produced during the reaction.

$$\frac{1.15 \times 10^3 \text{ -g}}{9.10 \times 10^2 \text{ -g}} \times 100 = 126.4 \%$$

7. What is unusual about problem #6? Could this scenario actually happen? Explain.

NO! The percent yield cannot be greater than 100%.



8. The actual yield of potassium chloride was 31.4 grams when you started with 34.5 grams of potassium carbonate and an excess of hydrochloric acid. What was the percent yield of potassium chloride?

34.5-g K ₂ CO ₃	1 mol K ₂ CO ₃	2 mol KCl	74.5-g KCl
	138-g	1 mol K ₂ CO ₃	1 mol KCl

Theoretical
37.3 -g KCl

$$\frac{\text{Actual} = 31.4 \text{ -g}}{\text{Theoretical} = 37.3 \text{ -g}} \times 100 = 84.2 \%$$

Theoretical = 37.3-g



9. The percent yield of water was 75.6% when you started with 34.5 grams of potassium carbonate and an excess of hydrochloric acid. What was the actual yield of water?

34.5-g K ₂	1 mol K ₂ CO ₃	1 mol H ₂ O	18-g H ₂ O
	138-g	1 mol K ₂ CO ₃	1 mol H ₂ O

Theoretical
4.5 -g H₂O

$$\text{Theoretical} \times \% \text{ yield} =$$

$$4.5 \text{ -g} \times .756 = \text{Actual} = 3.4 \text{ -g H}_2\text{O}$$