LESSON MAKER PRO

Yield Detective

Connect predicted product, collected product, and percent yield.

HIGH SCHOOL · CHE.4.c

CHE.4.c "Use mathematical models to reveal the relationships among the theoretical, actual, and percent yields of chemical reactions."

NAME _____ DATE _____

THREE KINDS OF YIELD

Theoretical yield is the most product a reaction could make. Actual yield is the product collected. Percent yield = actual yield / theoretical yield × 100%; rearrange this relationship when you need to find a missing yield.

WORKED EXAMPLE

A reaction has a theoretical yield of 45 g and an actual yield of 36 g. What is its percent yield?

1. Percent yield = actual yield / theoretical yield × 100%.
2. Substitute: 36 g / 45 g × 100%.
3. Simplify: 4/5 × 100% = 80%.

Answer: 80%

PRACTICE 6 problems

1 A reaction could produce 60 g of product, but 30 g is collected. Find the percent yield.

ANSWER _____

2 The theoretical yield is 25 g, and the actual yield is 15 g. Find the percent yield.

ANSWER _____

3 The theoretical yield is 40 g, and the percent yield is 75%. Find the actual yield.

ANSWER _____

4 The theoretical yield is 70 g, and the percent yield is 90%. Find the actual yield.

ANSWER _____

5 A reaction produces 18 g at a 75% yield. Find the theoretical yield.

ANSWER _____

6 A reaction produces 12 g at a 40% yield. Find the theoretical yield.

ANSWER _____

APPLY IT Show your work

1 A student team tests a reaction that makes biodegradable plastic. The reaction could produce 200 g of plastic, but the team collects 150 g. What is the percent yield?

WORK SPACE

ANSWER _____

2 An art club tests a reaction that makes dye for T-shirts. The club collects 42 g of dye at a 60% yield. What is the theoretical yield?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Magnesium reacts with excess hydrochloric acid: $Mg + 2HCl \rightarrow MgCl_2 + H_2$. A lab uses 12 g of Mg and collects 0.75 g of H_2. One mole of Mg has a mass of 24 g, and one mole of H_2 has a mass of 2 g. Find the theoretical yield of H_2 in grams and the percent yield. Show how the equation helps you.

WORK SPACE AND ANSWER

Yield Detective

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A reaction could produce 60 g of product, but 30 g is collected. Find the percent yield.	**50%**
2	The theoretical yield is 25 g, and the actual yield is 15 g. Find the percent yield.	**60%**
3	The theoretical yield is 40 g, and the percent yield is 75%. Find the actual yield.	**30 g**
4	The theoretical yield is 70 g, and the percent yield is 90%. Find the actual yield.	**63 g**
5	A reaction produces 18 g at a 75% yield. Find the theoretical yield.	**24 g**
6	A reaction produces 12 g at a 40% yield. Find the theoretical yield.	**30 g**

PART 2 · APPLY IT

1. **75%** Divide the actual yield by the theoretical yield: 150 / 200 × 100% = 75%.
2. **70 g** Use actual yield = theoretical yield × 0.60. Divide 42 g by 0.60 to get 70 g.

CHALLENGE

Theoretical yield: 1 g H_2; percent yield: 75%. The equation shows that 1 mole of Mg produces 1 mole of H_2. The 12 g of Mg is 0.5 mole, so it could produce 0.5 mole, or 1 g, of H_2. Percent yield = 0.75 g / 1 g × 100% = 75%.

Accept equivalent calculation setups with correct units. For the challenge, look for the 1:1 mole relationship between Mg and H_2.