Percent Yield Calculations Practice Problems

1) A reaction with a calculated yield of 9.23 g produced 7.89 g of product. What is the percent yield for this reaction?

2) 5.96 g of ammonia (17.031 g/mol) react completely according to the following reaction:

$$2\ NH_3(g) + CO_2(g) \rightarrow CN_2OH_4(s) + H_2O(l)$$

What is the theoretical yield of urea (CN_2OH_4 60.056) for this reaction?

3) 9.87 g of ammonia (17.031 g/mol) react completely according to the following reaction:

$$2\ NH_3(g) + CO_2(g) \rightarrow CN_2OH_4(s) + H_2O(l)$$

If 13.74 g of urea (CN_2OH_4 60.056 g/mol) are produced, what is the percent yield for this reaction?

4) 85.4 g of chlorine (70.91 g/mol) reacts completely according to the following reaction:

$$P_4(s) + 6\ Cl_2(g) \rightarrow 4\ PCl_3(l)$$

If 104 g of phosphorus trichloride (137.3 g/mol) is produced, what is the percent yield for this reaction?

5) 15.4 g of methanol (CH_3OH 32.042 g/mol) reacts completely according to the following reaction:

$$CH_3OH\ (g) \rightarrow CH_2O(g) + H_2(g)$$

If 12.35 g of formaldehyde (30.026 g/mol) is produced, what is the percent yield for this reaction?

KEY

Percent Yield Calculations Practice Problems

1) A reaction with a calculated yield of 9.23 g produced 7.89 g of product. What is the percent yield for this reaction?

$$\%\ \text{YIELD} = \frac{\text{ACTUAL YIELD}}{\text{THEORETICAL YIELD}} \times 100 \Rightarrow \frac{7.89\text{ g}}{9.23\text{ g}} \times 100 = 85.5\%$$

2) 5.96 g of ammonia (17.031 g/mol) react completely according to the following reaction:

$$2\ NH_3(g) + CO_2(g) \longrightarrow CN_2OH_4(s) + H_2O(l)$$

What is the theoretical yield of urea (CN_2OH_4 60.056) for this reaction?

$$5.96\text{g} \times \frac{\text{mol } NH_3}{17.031\text{ g}} \times \frac{1\text{ mol } CN_2OH_4}{2\text{ mol } NH_3} \times \frac{60.056\text{ g}}{\text{mol } CN_2OH_4} = 10.5\text{ g}$$

3) 9.87 g of ammonia (17.031 g/mol) react completely according to the following reaction:

$$2\ NH_3(g) + CO_2(g) \longrightarrow CN_2OH_4(s) + H_2O(l)$$

If 13.74 g of urea (CN_2OH_4 60.056 g/mol) are produced, what is the percent yield for this reaction?

ACTUAL YIELD ↑ THEORETICAL YIELD ↓

$$9.87\text{g} \times \frac{\text{mol } NH_3}{17.031\text{ g}} \times \frac{\text{mol } CN_2OH_4}{2\text{ mol } NH_3} \times \frac{60.056\text{g}}{\text{mol } CN_2OH_4} = 17.4\text{ g} \qquad \%\ \text{YIELD} = \frac{13.74\text{ g}}{17.4\text{ g}} \times 100 = 79.0\%$$

4) 85.4 g of chlorine (70.91 g/mol) reacts completely according to the following reaction:

$$P_4(s) + 6\ Cl_2(g) \longrightarrow 4\ PCl_3(l)$$

If 104 g of phosphorus trichloride (137.3 g/mol) is produced, what is the percent yield for this reaction?

ACTUAL YIELD ↑ THEORETICAL YIELD ↓

$$85.4\text{g} \times \frac{\text{mol } Cl_2}{70.91\text{ g}} \times \frac{4\text{ mol } PCl_3}{6\text{ mol } Cl_2} \times \frac{137.3\text{g}}{\text{mol } PCl_3} = 110.\text{ g} \qquad \%\ \text{YIELD} = \frac{104}{110.} \times 100 = 94.5\%$$

5) 15.4 g of methanol (CH_3OH 32.042 g/mol) reacts completely according to the following reaction:

$$CH_3OH\ (g) \longrightarrow CH_2O(g) + H_2(g)$$

If 12.35 g of formaldehyde (30.026 g/mol) is produced, what is the percent yield for this reaction?

ACTUAL YIELD ↑ THEORETICAL YIELD ↓

$$15.4\text{g} \times \frac{\text{mol } CH_3OH}{32.042\text{ g}} \times \frac{\text{mol } CH_2O}{\text{mol } CH_3OH} \times \frac{30.026\text{g}}{\text{mol } CH_2O} = 14.4\text{ g} \qquad \%\ \text{YIELD} = \frac{12.35\text{ g}}{14.4\text{ g}} \times 100 = 85.8\%$$