# KEY

# Chemistry: *Percent Yield*

*Directions*: *Solve each of the following problems. Show your work, including proper units, to earn full credit.*

1. “Slaked lime,” Ca(OH)2, is produced when water reacts with “quick lime,” CaO. If you start with 2 400 g of quick lime, add excess water, and produce 2 060 g of slaked lime, what is the percent yield of the reaction? **2060 g = actual yield**

**CaO + H2O 🡪 Ca(OH) 2**

**2400 g excess x g = theoretical yield**





2. Some underwater welding is done via the thermite reaction, in which rust (Fe2O3) reacts with aluminum to produce iron and aluminum oxide (Al2O3). In one such reaction, 258 g of aluminum and excess rust produced 464 g of iron. What was the percent yield of the reaction?

**464 g = actual yield**

**Fe2O3 + 2 Al 🡪 Al2O3 + 2 Fe**

**excess 258 g x g = theoretical yield**





3. Use the balanced equation to find out how many liters of sulfur dioxide are actually produced at STP if 1.5 x 1027 molecules of zinc sulfide are reacted with excess oxygen and the percent yield is 75%.

2 ZnS(s) + 3 O2(g) 🡪 2 ZnO(s) + 2 SO2(g)

**1.5**x**1027 molecules excess x L = theoretical yield**





4. The Haber process is the conversion of nitrogen and hydrogen at high pressure into ammonia, as follows:

**700 g = actual yield**

N2(g) + 3 H2(g) 🡪 2 NH3(g)

**x g excess x g = theoretical yield**

If you must produce 700 g of ammonia, what mass of nitrogen should you use in the reaction, assuming that the percent yield of this reaction is 70%?





Answers: 1. 65% 2. 87% 3. 4.19 x 104 L SO2 4. 824 g N2

# Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hour: \_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_

# Chemistry: *Energy and Stoichiometry*

*Directions*: *Solve each of the following problems. Show your work, including proper units, to earn full credit.*

1. The combustion of propane (C3H8) produces 248 kJ of energy per mole of propane burned. How much heat energy will be released when 1 000 dm3 of propane are burned at STP?

2. Carbon monoxide burns in air to produce carbon dioxide according to the following balanced equation:

2 CO(g) + O2(g) 🡪 2 CO2(g) + 566 kJ

How many grams of carbon monoxide are needed to yield 185 kJ of energy?

3. Nitrogen gas combines with oxygen gas according to the following balanced equation:

N2(g) + 2 O2(g) + 67.8 kJ 🡪 2 NO2(g)

Assuming that you have excess nitrogen, how much heat energy must be added to 540 g of oxygen in order to use up all of that oxygen?

4. Ethyl alcohol burns according to the following balanced equation:

C2H5OH(l) + 3 O2(g) 🡪 2 CO2(g) + 3 H2O(g) + 1 364 kJ

How many molecules of water are produced if 5 000 kJ of heat energy are released?

Answers: 1. 11 071 kJ 2. 18.3 g CO 3. 572 kJ 4. 6.62 x 1024 molecules H2O

# KEY

# Chemistry: *Energy and Stoichiometry*

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1. The combustion of propane (C3H8) produces 248 kJ of energy per mole of propane burned. How much heat energy will be released when 1 000 dm3 of propane are burned at STP?

**C3H8 + 5 O2 🡪 3 CO2 + 4 H2O + heat**

**1000 dm3 excess x kJ**



2. Carbon monoxide burns in air to produce carbon dioxide according to the following balanced equation:

2 CO(g) + O2(g) 🡪 2 CO2(g) + 566 kJ

How many grams of carbon monoxide are needed to yield 185 kJ of energy?

**2 CO + O2 🡪 2CO2 + 566 kJ**

**x g 185 kJ**



3. Nitrogen gas combines with oxygen gas according to the following balanced equation:

N2(g) + 2 O2(g) + 67.8 kJ 🡪 2 NO2(g)

Assuming that you have excess nitrogen, how much heat energy must be added to 540 g of oxygen in order to use up all of that oxygen?

N**2** + 2 O2 + 67.8 kJ 🡪 2 NO**2**

**540 g x kJ**



4. Ethyl alcohol burns according to the following balanced equation:

C2H5OH(*l*) + 3 O2(*g*) 🡪 2 CO2(*g*) + 3 H2O(*g*) + 1364 kJ

How many molecules of water are produced if 5 000 kJ of heat energy are released?

C2H5OH(*l*) + 3 O2(*g*) 🡪 2 CO2(*g*) + 3 H2O(*g*) + 1364 kJ

**x molecules 5000 kJ**



Answers: 1. 11 071 kJ 2. 18.3 g CO 3. 572 kJ 4. 6.62 x 1024 molecules H2O