# 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

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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