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 (C_3H_8) produces 248 kJ of energy per mole of propane burned. How much heat energy will be released when 1 000 dm^3 of propane are burned at STP?

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

$$2\ CO(g)\ +\ O_2(g)\ \rightarrow\ 2\ CO_2(g)\ +\ 566\ kJ$$
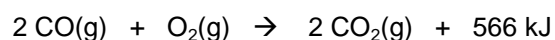
How many grams of carbon monoxide are needed to yield 185 kJ of energy?

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

$$N_2(g)\ +\ 2\ O_2(g)\ +\ 67.8\ kJ\ \rightarrow\ 2\ NO_2(g)$$
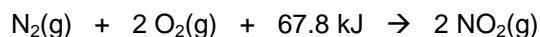
Assuming that you have excess nitrogen, how much heat energy must be added to 540 g of oxygen in order to use up all of that oxygen?

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

$$C_2H_5OH(l)\ +\ 3\ O_2(g)\ \rightarrow\ 2\ CO_2(g)\ +\ 3\ H_2O(g)\ +\ 1\ 364\ kJ$$

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 10^{24} molecules H_2O