

Honors 203/Chemistry 110  
Homework 7 (10 pts)

*Due Tuesday, April 5th.*

*Spring 2011*

1. **CIC 4.2.**

(a) Write the chemical equation for the complete combustion of heptane,  $C_7H_{16}$ .

(b) The heat of combustion for heptane is 4817 kJ/mol. How much heat is released if 250 kg of n-heptane burns completely?

2. **CIC 4.9** An energy consumption of 650,000 kcal per person per day is equivalent to an annual consumption of 65 barrels of oil or 16 tons of coal. Calculate the amount of energy available in kilocalories for each of these.

(a) 1 barrel of oil

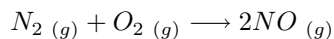
(b) 1 gallon of oil (42 gallons per barrel)

(c) 1 ton of coal

(d) 1 pound of coal (2000 pounds per ton)

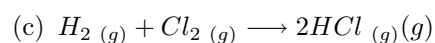
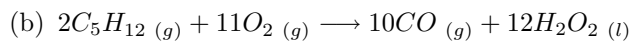
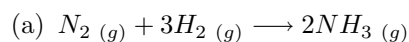
3. **CIC 4.21** Use Figure 4.6 to compare the sources of U.S. energy consumption. Arrange the sources in order of decreasing percentage and comment on the relative rankings.

4. **CIC 4.13** Figure 4.17 shows energy differences for the combustion of hydrogen, an exothermic chemical reaction. The combination of nitrogen gas and oxygen gas to form nitrogen monoxide is an example of an endothermic reaction:



The bond energy in NO is 607 kJ/mol. Sketch an energy diagram for this reaction, and calculate the overall energy change.

5. **CIC 4.19** Use the bond energies in Table 4.4 to calculate the energy changes associated with each of these reactions. Label each reaction as endothermic or exothermic. Hint: Draw Lewis structures of the reactants and products to determine the number and kinds of bonds.



6. A power plant operates with a maximum temperature of 1,080°C. It dumps waste heat at 10°C. What is the overall thermodynamic efficiency of this plant?