

**Chapter 16 Thermodynamics: Energy & Chemical Change**

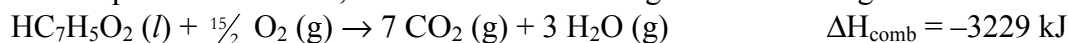
Be able to answer the following questions or explain the following concepts:

1. What is energy? What are the units for energy?
2. What is heat? What is specific heat?
3. What is a calorimeter? How do we use one to measure the heat given off or absorbed in a process?
4. What is the “universe” and its two components? What happens when heat is lost by one component?
5. What is enthalpy? What is the enthalpy change (heat) of reaction,  $\Delta H_{\text{rxn}}$ ?
6. What does a positive  $\Delta H_{\text{rxn}}$  indicate? A negative one? Which is favored in nature?
7. What is Heat of Combustion? Given  $\Delta H_{\text{comb}}$ , calculate  $\text{mass}_{\text{reactant}}$  or heat released given the other.
8. What is entropy? What does a positive change in entropy ( $\Delta S$ ) indicate? Negative? Which is favored?
9. What processes or changes lead to an increase in entropy? A decrease?
10. What is Gibb’s Free Energy?
11. How do we determine  $\Delta G$ ? What does a positive  $\Delta G$  indicate? Negative?
12. Under what conditions is a reaction always spontaneous? Never? Sometimes?

- Chapter 16 Assessment pp. 524-525 #53, 54, 57, 58, 60, 66, 67, 73, 74, 84, 90, 92.

**Extra Problems**

1. The heat of combustion for benzoic acid ( $\text{HC}_7\text{H}_5\text{O}_2$ ),  $\Delta H_{\text{comb}} = -3229 \text{ kJ/mol}$ . What mass of benzoic acid would be required to release 4,184 kJ of heat according to the following reaction?



2. If 0.860 g copper(II) bromide is dissolved in 100.0 mL of water, the temperature changes from 23.10°C to 23.41°C. Calculate the molar  $\Delta H_{\text{rxn}}$  for the process, in kJ/mol. [Remember the conversion of mL  $\text{H}_2\text{O}$  to g  $\text{H}_2\text{O}$  and watch the sign of  $\Delta H$ !]



(a)  $q_{\text{water}} =$

(b)  $\text{mol}_{\text{reactant}} =$

(c)  $\Delta H_{\text{rxn}} =$

## Chapter 17 Kinetics: Reaction Rates

Be able to do or answer the following:

1. What is a reaction rate? What happens to the concentrations of the reactants as the reaction proceeds? The products?
  2. What happens to the rate of the reaction as the reaction proceeds? Why?
  3. What is collision theory? How does it account for reactions between chemicals?
  4. Draw and label the important points on a reaction diagram (such as Fig. 17-4 and 17-5).
  5. What is an activated complex? Where on the reaction diagram does it appear?
  6. What is the activation energy ( $E_a$ )? How does collision theory explain  $E_a$ ? How does  $E_a$  affect the rate of a reaction?
  7. What are the factors affecting reaction rates? Briefly describe the effect of each.
  8. What is a catalyst? An inhibitor? How do they work?
- Chapter 17 Chapter Assessment pp. 554-556 #33, 36, 38, 40, 42, 44, 45, 48, 49, 64
  - Reminder: Review all worksheets, labs and quizzes; any question or problem could show up on this test or the final. Answer keys are on the website. The answer key for this packet will be posted by the afternoon of the day prior to the test.

Ch. 16 Answers: 84) 29,200 kJ released; 90) a) 87.8 kJ; b) -270. kJ; c) 84.1 kJ; 92) -32.0 kJ. Extra problems: 1) 158.2 g; 2a)  $q = 130 \text{ J}$ ; b)  $0.00385 \text{ mol}$ ; c)  $\Delta H = -34 \text{ kJ/mol}$ .