Extra Problems for Chapter 13

1. A 75.0-kg sample of lead ($c = 0.160$ J/g·°C) starts out at 16.0 °C. If it ends up at 24.1 °C, how much energy was involved in the change? Did the sample gain or lose that energy?

2. 150.0 g of water in its liquid phase gains 1,600 J of heat. If it started at a temperature of 25.0 °C, what is its final temperature?

3. A 17.8-gram sample of an unknown metal loses 1.2 kJ of heat. The metal's temperature lowers from 94.3 °C to 24.6 °C. What is the specific heat capacity of the metal in J/g·°C?

4. A 150.0-g sample of metal is heated to a temperature of 100.0 °C and put in a calorimeter that contains 250.0 g of water. If the water's temperature rises from 24.4 °C to 28.1 °C, what is the specific heat capacity of the metal? Ignore the calorimeter in your calculation.

5. A 115.0-g sample of glass ($c = 0.840$ J/g·°C) is dropped in a calorimeter that contains 150.0 grams of water. If the water starts out at 24.0 °C and ends up at 29.0 °C, what was the initial temperature of the glass? Ignore the calorimeter in your calculations.

6. An object has a heat capacity of 11.1 J/°C. If it starts out at 25.1 °C and ends up at 45.7 °C, how much energy was involved in the change? Did the object gain or lose that energy?

7. A 225.0-gram sample of metal is heated to 125.0 °C and dropped into a calorimeter that has a heat capacity of 1,170 J/°C. The calorimeter contains 250.0 grams of water at an initial temperature of 24.4 °C. If the water's temperature rises to 28.5 °C by the end of the experiment, what is the specific heat capacity of the metal?

8. A 275.0-gram sample of silver ($c = 0.240$ J/g·°C) is heated to 100.0 °C and dropped into a calorimeter whose heat capacity has not been measured. The calorimeter contains 300.0 grams of water at a temperature of 25.3 °C. If the final temperature of the water is 28.5 °C by the end of the experiment, what is the heat capacity of the calorimeter?

9. How much energy is required to melt 2.21 kg of copper ($L_f = 205$ J/g, $L_v = 4{,}730$ J/g)?

10. How much energy is required to vaporize a 115.0-g ice cube that is initially at a temperature of -11.0 °C? ($c_{ice} = 2.093$ J/g·°C, $L_f = 334$ J/g, $L_v = 2{,}260$ J/g.)