Calorimetry Questions and Problems

1. The specific heats of water and iron are 4.184 J/g°C and 0.44 J/g°C respectively. Which substance will experience a larger temperature increase upon adding 10 J? Assume each sample weighs 5 grams. (0.478°C; 4.54°C)

2. How much energy is required to heat 120.0 g of water from 2.0 °C to 24.0 °C? (11.05 kJ)

3. If it takes 41.72 joules to heat a piece of gold weighing 18.69 g from 10.0 °C to 27.0 °C, what is the specific heat of the gold? (0.131 J/g°C)

4. A certain mass of water was heated with 41,840 Joules, raising its temperature from 22.0 °C to 28.5 °C. Find the mass of water. (1538.5 g)

5. The number of Joules needed to raise the temperature of 100 grams of water 10 °C. is the same as the number of Joules needed to raise the temperature of 1000 grams of water
   (a) 1 °C   (b) 0.1 °C   (c) 10 °C   (d) 100 °C

6. 10.0 g of a fuel are burned under a calorimeter containing 200.0 g of H_2O. The temperature of the water increases from 15.0 °C to 55.0 °C. Calculate the total heat produced (in joules) and the heat of combustion per gram of fuel. (3347.2 J/g)

7. It takes 333.51 joules to melt exactly 1 gram of H_2O. What is the *molar* heat of fusion (melting) for water, from this data?   (6.0 kJ/mol)

8. When solid ammonium chloride (NH_4Cl) dissolves in water, it breaks apart into aqueous ions and the water temperature drops. The ΔH of solution for this process is +20 kJ/mol. How many grams of ammonium chloride must be added to 100.0 grams of water to bring about a 5°C decrease?   (5.35 g)

9. An ace chemistry student conducts an experiment to determine the Δq for the reaction of calcium metal with HCl. Her data is summarized in the table below:

mass of water in calorimeter	=	123.50 g
heat capacity of calorimeter	=	25 J/°C
initial temperature of water	=	20.4 °C
final temperature of water	=	28.8 °C
mass of Ca	=	5.20 g

(a) Calculate the total heat (in kJ) released by this reaction.

(b) Calculate the ΔH for this reaction. Report your answer in kJ/mol Ca reacted.

10. When 80.0 grams of a certain metal at 90.0°C was mixed with 100.0 grams of water at 30.0°C, the final equilibrium temperature of the mixture was 36.0°C. What is the specific heat (J/g°C) of the metal?

11. Calculate the specific heat of a metal if a 55.0g sample of an unknown metal at 99.0°C causes a 1.7°C temperature rise when added to 225.0 g of water at 22.0°C.

12. Why does moisture condense on the outside of a glass of cold water?

13. Why does alcohol at room temperature feel cooler to the touch than does water at the same temperature?