

## CHAPTER FIVE

### Calorimetry

**5.1** What is the difference between specific heat and heat capacity? What are the units for these two quantities? Which is the intensive property and which is the extensive property?

**5.2** Consider two metals A and B, each having a mass of 100 g and an initial temperature of 20°C. The specific heat of A is larger than that of B. Under the same heating conditions, which metal would take longer to reach a temperature of 21°C?

**5.3** Define calorimetry and describe two commonly used calorimeters.

**5.4** In a calorimetric measurement, why is it important that we know the heat capacity of the calorimeter?

**5.5** A piece of silver of mass 362 g has a heat capacity of 85.7 J/°C. What is the specific heat of silver?

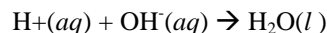
**5.6** A 6.22-kg piece of copper metal is heated from 20.5°C to 324.3°C. Calculate the heat absorbed (in kJ) by the metal.

**5.7** Calculate the amount of heat liberated (in kJ) from 366 g of mercury when it cools from 77.0°C to 12.0°C.

**5.8** A sheet of gold weighing 10.0 g and at a temperature of 18.0°C is placed flat on a sheet of iron weighing 20.0 g and at a temperature of 55.6°C. What is the final temperature of the combined metals? Assume that no heat is lost to the surroundings. (*Hint*: The heat gained by the gold must be equal to the heat lost by the iron.)

**5.9** A 0.1375-g sample of solid magnesium is burned in a constant-volume bomb calorimeter that has a heat capacity of 1769 J/°C. The calorimeter contains exactly 300 g of water, and the temperature increases by 1.126°C. Calculate the heat given off by the burning Mg, in kJ/g and in kJ/mol.

**5.10** A quantity of 2.00 x 10<sup>2</sup> mL of 0.862M HCl is mixed with 2.00 x 10<sup>2</sup> mL of 0.431M Ba(OH)<sub>2</sub> in a constant-pressure calorimeter that has a heat capacity of 453 J/°C. The initial temperature of the HCl and Ba(OH)<sub>2</sub> solutions is the same at 20.48°C. For the process



the heat of neutralization is -56.2 kJ. What is the final temperature of the mixed solution?