

17

THERMOCHEMISTRY

Practice Problems

In your notebook, solve the following problems.

SECTION 17.1 THE FLOW OF ENERGY—HEAT AND WORK

Use the three-step problem-solving approach you learned in Chapter 1.

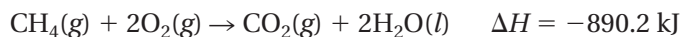
1. How many kilojoules of energy are in a donut that contains 200.0 Calories?
2. What is the specific heat of a substance that has a mass of 25.0 g and requires 525.0 calories to raise its temperature by 15.0°C?
3. Suppose 100.0 g of H₂O(s) absorbs 1255.0 J of heat. What is the corresponding temperature change? The specific heat capacity of H₂O(s) is 2.1 J/g·°C.
4. How many joules of heat energy are required to raise the temperature of 100.0 g of aluminum by 120.0°C? The specific heat capacity of aluminum is 0.90 J/g·°C.

SECTION 17.2 MEASURING AND EXPRESSING ENTHALPY CHANGES

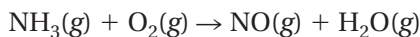
1. A student mixed 75.0 mL of water containing 0.75 mol HCl at 25°C with 75.0 mL of water containing 0.75 mol of NaOH at 25°C in a foam cup calorimeter. The temperature of the resulting solution increased to 35°C. How much heat in kilojoules was released by this reaction?

$$C_{\text{water}} = 4.18 \text{ J/g}\cdot^{\circ}\text{C}$$

2. Calculate the amount of heat evolved when 15.0 g of Ca(OH)₂ forms from the reaction of CaO(s) + H₂O(l).
3. Calculate the amount of heat produced when 52.4 g of methane, CH₄, burns in an excess of air, according to the following equation.

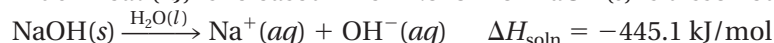


4. Balance the following equation, then calculate the enthalpy change for the reaction given that the standard heat of combustion of NH₃(g) is -226 kJ/mol.



SECTION 17.3 HEAT IN CHANGES OF STATE

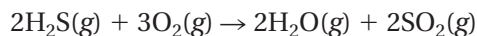
1. Calculate the amount of heat needed to melt 35.0 g of ice at 0°C. Express your answer in kilojoules.
2. Calculate the amount of heat needed to convert 190.0 g of liquid water at 18°C to steam at 100.0°C.
3. How much heat (kJ) is released when 2.543 mol NaOH(s) is dissolved in water?



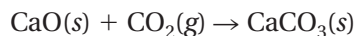
4. Calculate the amount of heat needed to convert 96 g of ice at -24°C to water at 28°C . The specific heat capacity of $\text{H}_2\text{O}(s)$ is $2.1 \text{ J/g}\cdot^{\circ}\text{C}$.

SECTION 17.4 CALCULATING HEATS OF REACTION

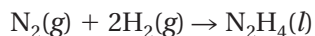
1. What is the standard heat of reaction for the combustion of hydrogen sulfide? Refer to Table 17.4 in your textbook.



2. Calculate the enthalpy change (in kJ) for the following reaction. State whether the reaction is exothermic or endothermic. Refer to Table 17.4 in your textbook.



3. What is the enthalpy change for the formation of hydrazine, $\text{N}_2\text{H}_4(l)$, from its elements?



Use the following reactions and enthalpy changes:

