Supplementary *Check for Understanding* Problems

Energy Changes

1. Indicate whether each of the following involves primarily kinetic energy or potential energy.

    a) a stretched rubber band
    b) running water
    c) a stack of books
    d) person riding a bike
    e) a car parked on a hill
    f) a pitched baseball

2. Which physical state involves constituent particles with the highest kinetic energy?

3. Is the condensation of a gas an exothermic or endothermic process? Explain.

4. How much energy (in kJ) is needed to heat 3.8 L of water from 22.3 °C to 100 °C?

5. When 25 g of water freezes 8.4 kJ of energy is released. How much energy is required to melt a pound of ice?

6. Calculate the specific heat of a solid (J/g·°C) if 118 kcal of energy are needed to raise the temperature of 12.7 kg of the solid from 24 °C to 327 °C?

7. If a 10-g sample of copper and a 10-g sample of aluminum are placed in a large container of boiling water for several minutes than then removed and quickly transferred to a large container of ice water, which metal will lose the greater amount of energy? Explain.

8. When you enter a room having a uniform temperature and touch a metal object it feels cooler than when you touch a wooden object in the room. What is your explanation (hypothesis) for this difference? What simple experiments could you do to test your hypothesis?

Chemical Reactions

1. Convert each of the following word equations into a chemical equation and then balance it. Indicate the physical state of each reactant and product.

    a) phosphoric acid + calcium hydroxide → water + calcium phosphate

    b) ammonium nitrate → nitrogen gas + water + oxygen gas

2.   Balance each of the following chemical equations.

   a) $CaC_2(s)$ + $H_2O(l)$ → $Ca(OH)_2(s)$ + $C_2H_2(g)$

   b) $NO_2(g)$ + $H_2O(l)$ → $HNO_3(aq)$ + $NO(g)$

   c) $Fe_2O_3(s)$ + $CO(s)$ → $Fe(s)$ + $CO_2(g)$

   d) $H_2O_2(aq)$ → $H_2O(l)$ + $O_2(g)$

3.   If ammonia gas and 0.128 g of hydrogen chloride gas react to form 0.188 g of ammonium chloride, what mass of ammonia reacted?

4.   What does the notation '(aq)' signify about a reactant or product in a chemical equation?

5.   Classify each of the following reactions as combination, decomposition, combustion, single displacement or double displacement, then complete and balance each equation. Indicate the physical state of each product.

   a) $K_3PO_4(aq)$ + $BaCl_2(aq)$ →

   b) $Al(s)$ + $H_2SO_4(aq)$ →

   c) $C_4H_9OH(l)$ + $O_2(g)$ →

   d) $CuO(s)$ + $HNO_3(aq)$ →

   e) $Al(s)$ + $Br_2(l)$ →

Solubility in water

1.   Which of the following substances are expected to dissolve readily in water? Explain.

   a) Li_2SO_4
   b) $Zn_3(PO_4)_2$
   c) $Ni(OH)_2$
   d) $Ba(C_2H_3O_2)_2$
   e) $(NH_4)_2S$