Answers for Assignment XI  
Answers due on November 1

OFB, p. 188, #80

Both Pb(OH)$_2$ and PbCO$_3$ are more soluble in acid than they are in water. The stomach contains hydrochloric acid which would convert the two salts to PbCl$_2$, a "slightly" soluble salt. Reaction with sulfuric acid converts PbCl$_2$ to the less soluble PbSO$_4$.

OFB, p. 433, #27

The formula mass of barium chromate is 327 g/mol so 6.3 mg is $2.66 \times 10^{-5}$ mols BaCrO$_4$.

$$K_{sp} = 2.1 \times 10^{-10} = s^2; s = 1.4 \times 10^{-5}$$

Although the solution holds somewhat solute than the $K_{sp}$ model predicts it should, the model often underestimates solubility. It is not possible to say with certainty that solid will separate from the solution when it is cooled to room temperature.

OFB, p. 433, #31

$$[\text{Sr}^{2+}] = (0.0010 \text{ M})(140 \text{ mL}/1000 \text{ mL}) = 1.4 \times 10^{-4}$$

$$[\text{F}^-] = (0.0050 \text{ M})(860 \text{ mL}/1000 \text{ mL}) = 4.3 \times 10^{-3}$$

$$Q = (1.4 \times 10^{-4})(4.3 \times 10^{-3})^2 = 2.6 \times 10^{-9}$$

$$K_{sp} = 2.8 \times 10^{-9}$$

Again, $Q \sim K_{sp}$ so we can’t predict reliably whether precipitation will occur or not.
OFB, p. 474, #15

a. \( q_{\text{surr}} = q_{\text{water}} + q_{\text{cal}} \)

\[ 1770 \, J = 200.0 \, g (4.18 \, J/\, g \, K)(1.67 \, K) + C_{\text{cal}}(1.67 \, K) \]

\[ C_{\text{cal}} = 224 \, J/K \]

b. \( q_{\text{surr}} = q_{\text{water}} + q_{\text{cal}} \)

\[ q_{\text{surr}} = (225.0 \, g) (4.18 \, J/\, g \, K)(2.64 \, K) + (224 \, J/K)(2.64 \, K) \]

\[ q_{\text{surr}} = 3074 \, J = 3.07 \, kJ \]

OFB, p. 475, #25

a. \( \text{H}_2\text{O} (l) \rightarrow \text{H}_2\text{O} (g) \) \( \Delta H \) is positive.
b. \( \text{Cl}_2 (g) \rightarrow \text{Cl}_2 (s) \) \( \Delta H \) is negative.
c. \( \text{Hg} (l) \rightarrow \text{Hg} (s) \) \( \Delta H \) is negative.

OFB, p. 475, #35

Burning a pound of graphite gives off more energy than burning a pound of diamonds. The value of \( \Delta H_f \) for the carbon is subtracted in finding the value of \( \Delta H_{\text{comb}} \). This value is zero for graphite (most stable form of carbon at 25°C); it is some positive number for diamond.

OFB, p. 476, #41

a. \( \text{CaCl}_2 (s) \rightarrow \text{Ca}^{2+} (aq) + 2 \text{Cl}^- (aq) \)

\[ \Delta H^o_{\text{rxn}} = \Delta H^o_{\text{sol,CaCl}_2} = -542.83 \, kJ + 2(-167.16) \, kJ - (-795.8) \, kJ \]

\[ \Delta H^o_{\text{sol,CaCl}_2} = -81.35 \, kJ/mol = -81.4 \, kJ/mol \]

b. 11.1 g \( \text{CaCl}_2 \) is 0.100 mol \( \text{CaCl}_2 \). The dissolution of 0.100 mol \( \text{CaCl}_2 \) releases 8.14 kJ.

\[ \Delta t = 8135 \, J/418J \, K^{-1} = 19.5 \, K = 19.5 \, ^\circ C; \, t_{\text{max}} = 39.5 \, ^\circ C \]