Chapter 6

(2) All terms in an equilibrium expression are divided by their standard state. Therefore, all units have been cancelled and the equilibrium constant has no dimensions

(3) Gibbs free energy and LeChâtlier's principle can only be used to predict whether a reaction will proceed toward reactants or products, which is a thermodynamic property. They cannot say anything about the speed of the reaction, which is kinetics.

(4) a. $$\frac{1}{[Ag^+]^3[PO_4^{3-}]} = K$$

b. $$\frac{(P_{CO_2})^6}{(P_{O_2})^{15/2}} = K$$

(6) ~~HOBr + ClO⁻~~

$HOBr + OCl^- \rightleftharpoons HOCl + OBr^-$ $K_1 = 1/15$

$HOCl \rightleftharpoons H^+ + OCl^-$ $K_2 = 3 \times 10^{-8}$

$HOBr \rightleftharpoons H^+ + OBr^-$ $K = K_1 K_2 = 2.0 \times 10^{-9}$

(9)

a. right

- to minimize pressure

b. right

- remove product

c. neither

- as long as graphite is not the limiting reagent

d. right

- to minimize pressure

e. becomes smaller

- exothermic reaction

(13)

$$\frac{[x]}{P_x} = K_h \qquad K_h = 1.71 \frac{M}{bar}$$

$P_x = ?$

$$P_x = [x] \frac{1}{K_h}$$

$$[x] = 100 ppm = 100 \frac{\cancel{\mu g}}{\cancel{mL}} \left| \frac{g}{10^6 \cancel{\mu g}} \right| \frac{mol}{88.15 g} \left| \frac{1000 \cancel{mL}}{L} \right| = 1.13 \times 10^{-3} M$$

$$= \frac{1.13 \times 10^{-3} \cancel{M}}{1.71 \cancel{M}/bar}$$

$$= 6.61 \times 10^{-4} bar$$

$$= 0.661 mbar$$