EXAMPLE 1 Determine the equilibrium constant expression for each of the following reactions:

(*a*) $2\ CO(g) + O_2(g) \rightleftharpoons 2\ CO_2(g)$

(*b*) $2\ C(s) + O_2(g) \rightleftharpoons 2\ CO(g)$

(*c*) $CH_3OH + HCOOH \rightleftharpoons HCOOCH_3 + H_2O$ (all in alcohol solution)

EXAMPLE 2 (*a*) Write equilibrium constant expressions for equations 1 to 3 below. (*b*) Determine the relationship of the K value for equation 3 to those of equations 1 and 2.

1. $X + Y \rightleftharpoons Z$
2. $Z \rightleftharpoons W + Q$
3. $X + Y \rightleftharpoons W + Q$

EXAMPLE 3 Calculate the value of the equilibrium constant for the reaction

$$A + 2\ B \rightleftharpoons C$$

if the concentrations at equilibrium are [A] = 2.0 M, [B] = 1.5 M, and [C] = 0.010 M.

EXAMPLE 4

(*a*) Using the data of Example 3, calculate the value of the equilibrium constant for the reaction

$$C \rightleftharpoons A + 2\ B$$

(*b*) What is the relationship between the value of K in Example 3 and the value of this K?

$$HC_2H_3O_2(aq) \rightleftharpoons H^+(aq) + C_2H_3O_2^-(aq)$$

K_{eq} = _____

$$AgBr(s) \rightleftharpoons Ag^+(aq) + Br^-(aq)$$

K_{sp} = _____

$$CaF_2(s) \rightleftharpoons Ca^{2+}(aq) + 2F^-(aq)$$

K_{sp} = _____

$$Bi_2S_3(s) \rightleftharpoons 2Bi^{3+}(aq) + 3S^{2-}(aq)$$