Chemistry 12
EQUILIBRIUM EXPRESSION & EQUILIBRIUM CONSTANT

Complete the following on a separate page.

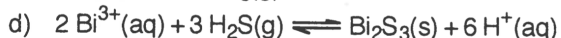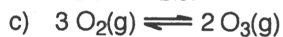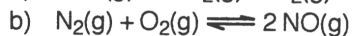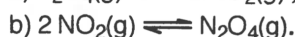31. Write the equilibrium expressions for the following.

   a) $2\,ICl(g) \rightleftharpoons I_2(g) + Cl_2(g)$

   b) $N_2(g) + O_2(g) \rightleftharpoons 2\,NO(g)$

   c) $3\,O_2(g) \rightleftharpoons 2\,O_3(g)$

   d) $2\,Bi^{3+}(aq) + 3\,H_2S(g) \rightleftharpoons Bi_2S_3(s) + 6\,H^+(aq)$

   e) $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$

   f) $CaC_2(s) + 2\,H_2O(l) \rightleftharpoons C_2H_2(g) + Ca(OH)_2(s)$

   g) $C_6H_6(l) + Br_2(l) \rightleftharpoons C_6H_5Br(l) + HBr(g)$

   h) $Cu(s) + 2\,Ag^+(aq) \rightleftharpoons Cu^{2+}(aq) + 2\,Ag(s)$

   i) $4\,NH_3(g) + 5\,O_2(g) \rightleftharpoons 6\,H_2O(g) + 4\,NO(g)$

   j) $H_2(g) + 1/2\,O_2(g) \rightleftharpoons H_2O(l)$
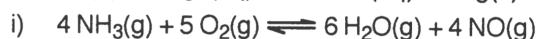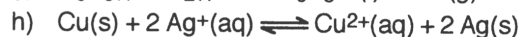
32. Write the K_{eq} expression for: a) $N_2O_4(g) \rightleftharpoons 2\,NO_2(g)$, and
   b) $2\,NO_2(g) \rightleftharpoons N_2O_4(g)$.

   Examine the relationship between the K_{eq} expressions for equations (a) and (b) of this question.
   If $K_{eq} = 10.0$ for equation (a), what would be the value of K_{eq} for equation (b)?

33. Write the K_{eq} expression for: a) $SO_2(g) + 1/2\,O_2(g) \rightleftharpoons SO_3(g)$, and
   b) $2\,SO_2(g) + O_2(g) \rightleftharpoons 2\,SO_3(g)$.
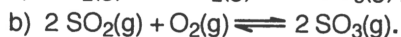
   Examine the relationship which exists between the K_{eq} expressions for equations (a) and (b) of this question. If $K_{eq} = 3$ for equation (a), what would be the value of K_{eq} for equation (b)?

34. Which way will the equilibrium $CaCO_3(s) + CO_2(g) + H_2O(l) \rightleftharpoons Ca^{2+}(aq) + 2\,HCO_3^-(aq) + 40\,kJ$ shift if

   (a) more $CO_2(g)$ is added?

   (b) more $CaCO_3(s)$ is added?

   (c) $Ca^{2+}(aq)$ is removed?

   (d) heat is added?

35. Rearrange the following equations to solve in terms of the concentrations indicated in bold.

   (a) $K_{eq} = \dfrac{[\mathbf{H_3O^+}][\mathbf{F^-}]}{[HF]}$

   (b) $K_{eq} = \dfrac{[H_3O^+][F^-]}{[\mathbf{HF}]}$

   (c) $K_{eq} = \dfrac{[\mathbf{NO_2}]^2}{[NO]^2[O_2]}$

   (d) $K_{eq} = \dfrac{[NO_2]^2}{[\mathbf{NO}]^2[O_2]}$

   (e) $K_{eq} = \dfrac{[NH_3]^2}{[N_2][\mathbf{H_2}]^3}$

   (f) $K_{eq} = \dfrac{[N_2O_4]}{[\mathbf{NO_2}]^2}$

   (g) $K_{eq} = \dfrac{[\mathbf{NH_3}]^2}{[N_2][H_2]^3}$

   (h) $K_{eq} = \dfrac{[PCl_3]^4}{[\mathbf{P_4}][Cl_2]^6}$