Practice Questions Section 3.2

The Equilibrium Constant

1. For the following system at equilibrium:

   $H_{2\,(g)} + I_{2\,(g)} \leftrightarrow 2\ HI_{\,(g)}$

   a. Predict the shift in equilibrium when more $HI_{(g)}$ is added to the system.

   b. How will the concentration of I_2 change?

2. For the reaction below, predict the direction the equilibrium will shift given the following changes. Temperature and volume are held constant.

   $2\ NO_{2\,(g)} + 7\ H_{2\,(g)} \leftrightarrow 2\ NH_{3\,(g)} + 4\ H_2O_{(g)}$

   a. addition of ammonia

   b. removal of nitrogen dioxide

   c. removal of water vapour

   d. addition of hydrogen

3. At a particular temperature, the following reaction has an equilibrium constant, K_{eq} of 0.18

   $PCl_{3\,(g)} + Cl_{2\,(g)} \leftrightarrow PCl_{5\,(g)}$

   More PCl_3 is added to the system. Will the value of K_{eq} increase or decrease?

Practice Questions Section 3.2

The Equilibrium Constant Answers

1. For the following system at equilibrium:

   $H_{2\,(g)} + I_{2\,(g)} \leftrightarrow 2\ HI_{\,(g)}$

   a. Predict the shift in equilibrium when more $HI_{(g)}$ is added to the system.

   b. How will the concentration of I_2 change?

   Solution:

   a. Adding something on the product side of the reaction will cause equilibrium to shift to the reactant side. In other words, the reverse reaction will be favored, or you could say that equilibrium shifts to the left.

   b. The concentration of I_2 will increase.

2. For the reaction below, predict the direction the equilibrium will shift given the following changes. Temperature and volume are held constant.

   $2\ NO_{2\,(g)} + 7\ H_{2\,(g)} \leftrightarrow 2\ NH_{3\,(g)} + 4\ H_2O_{(g)}$

   a. addition of ammonia — **reverse reaction is favored to use up the additional ammonia**

   b. removal of nitrogen dioxide — **reverse reaction is favored to replace the lost nitrogen dioxide**

   c. removal of water vapour — **forward reaction is favored to replace the lost water vapor**

   d. addition of hydrogen — **forward reaction is favored to use up the additional hydrogen**

3. At a particular temperature, the following reaction has an equilibrium constant, K_{eq} of 0.18

   $PCl_{3\,(g)} + Cl_{2\,(g)} \leftrightarrow PCl_{5\,(g)}$

   More PCl_3 is added to the system. Will the value of K_{eq} increase or decrease?

   Solution:

   Changing the concentration of a reaction participant will not change the value of K_{eq}. K_{eq} will still equal 0.18 after equilibrium becomes re-established.