Equilibrium Questions - Set VI

1. What changes in equilibrium composition of the reaction

$$2\ SO_{2(g)} + O_{2(g)} \Leftrightarrow 2\ SO_{3(g)} \qquad \Delta H = -197\ kJ$$

will occur if it experiences the following stresses ?

(a) At time = 10 seconds the partial pressure of $SO_{3(g)}$ is increased.

(b) At time = 20 seconds some inert Ar gas is added.

(c) At time = 30 seconds the temperature of the system is decreased.

(d) At time = 40 seconds the total pressure of system is increased.

(e) At time = 50 seconds some $O_{2(g)}$ is removed form the system.

(f) Construct a concentration versus time diagram that represents the above changes.

2. For the chemical equilibrium $PCl_{5(g)} + 92\ kJ \Leftrightarrow PCl_{3(g)} + Cl_{2(g)}$

(a) What is the effect on K of lowering the temperature ?

(b) What is the effect on the equilibrium concentration of PCl_3 of adding Cl_2 ?

(c) What is the effect on the equilibrium concentrations of compressing the mixture to a smaller volume ?

(d) What is the effect on the equilibrium pressure of Cl_2 of removing PCl_3 ?

3. For the decomposition of calcium carbonate : $CaCO_{3(s)} \Leftrightarrow CaO_{(s)} + CO_{2(g)} \qquad \Delta H = 175\ kJ$
how will the amount of $CaCO_3$ solid change with the following stresses ?

(a) $CO_{2(g)}$ is removed.

(b) $CaO_{(s)}$ is added.

(c) The temperature is raised.

(d) The volume of the container is decreased.

4. Copper can be extracted from its ores by heating Cu_2S in air.

$$Cu_2S_{(l)} + O_{2(g)} \Leftrightarrow 2\ Cu_{(l)} + SO_{2(g)} + 250\ kJ$$

Predict the direction of the equilibrium position in response to each of the following changes:

(a) Adding $O_{2(g)}$

(b) Compressing the vessel volume in half

(c) Raising temperature