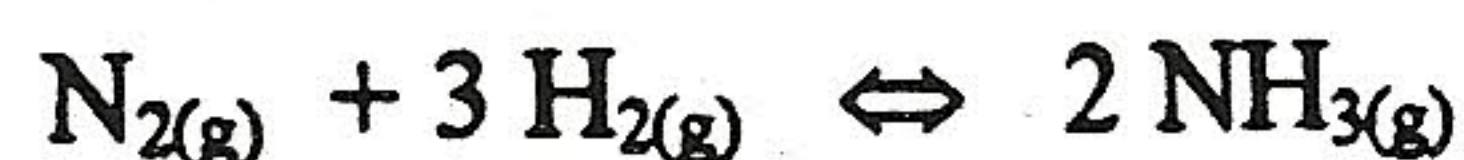


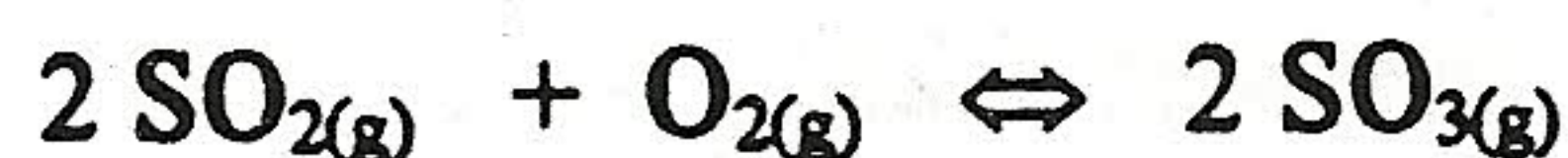
Equilibrium Problems - Set II

1. A 3.5 liter container is found to have 0.249 mol of N_2 , 0.0321 mol of H_2 , and 0.000642 mol of NH_3 . The equation reaction is:



The K for this reaction is 0.65. Decide whether the system is at equilibrium. If not, predict which way (towards products or towards reactants) the reaction is proceeding.

2. Sulfur trioxide, used to make sulfuric acid, is obtained commercially from sulfur dioxide.



The equilibrium constant K for this reaction is 0.047. What is the direction of reaction when a mixture that is 0.2 M SO_2 , 0.1 M O_2 and 0.4 M SO_3 approaches equilibrium?

3. Given the equilibrium: $NO_{2(g)} + O_{2(g)} \rightleftharpoons 2 NO_{(g)}$ and $K = 0.0025$. Decide whether the following mixture is at equilibrium, or if a net forward or reverse reaction, will take place: $[NO] = 0.005 M$; $[O_2] = 0.25 M$; $[NO_2] = 0.02 M$.

4. Given: $FeO_{(s)} + CO_{(g)} \rightleftharpoons Fe_{(s)} + CO_{2(g)}$ and $K = 0.403$.

If 1 mole of CO gas and excess iron oxide is placed in a one container and allowed to come to equilibrium, what will be the equilibrium concentrations of CO and CO_2 ?

(answer: $[CO] = 0.713 M$; $[CO_2] = 0.287$)

5. Consider the reaction $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$. Suppose we start with 1 mol of CO and with one mol of water in a 50 liter container. For this reaction $K = 0.58$. Calculate the equilibrium concentrations for each component.

(answer: 0.0114 M CO ; 0.0114 M H_2O ; 0.0086 M CO_2 ; 0.0086 M H_2)

6. Under certain conditions, the equilibrium constant for the decomposition of PCl_5 into PCl_3 and Cl_2 is 0.0211. What are the equilibrium concentrations of all the components, when the initial concentration of PCl_5 is 1.0 M? (answer: 0.86 M PCl_5 ; 0.135 M PCl_3 ; and 0.135 M Cl_2)