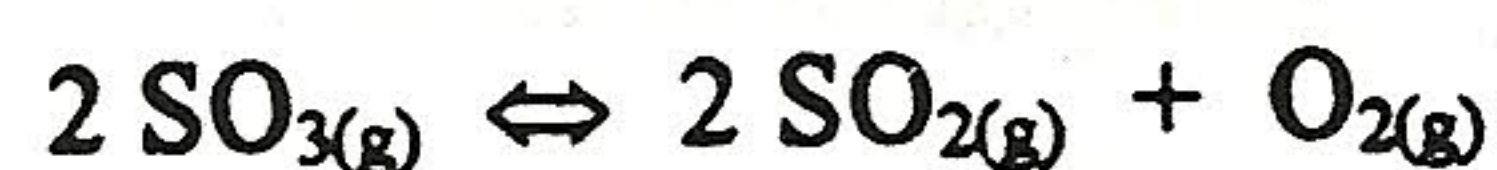


Equilibrium Problems I

1. A one liter container initially contains 0.777 mol of SO_3 gas. Some of the sulfur trioxide decomposes into sulfur dioxide and oxygen:



If 0.520 mol of SO_3 remain at equilibrium, what is the value of K for this equilibrium system ?
(answer: 0.031)

2. Consider the following equilibrium: $2 \text{HI}_{(g)} \rightleftharpoons \text{H}_{2(g)} + \text{I}_{2(g)}$

When two moles of HI are placed in a 10 liter vessel and the system is allowed to reach equilibrium, it is found that the vessel contains 0.50 mol of H_2 . Calculate the equilibrium constant for this reaction. (answer: 0.25)

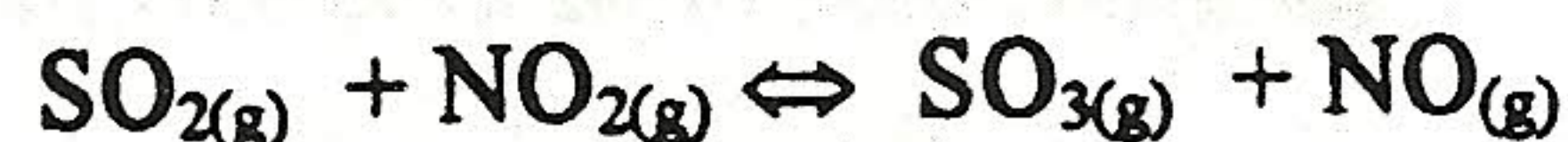
3. Consider the following equilibrium: $2 \text{NOBr}_{(g)} \rightleftharpoons 2 \text{NO}_{(g)} + \text{Br}_{2(g)}$

Two moles of NOBr are placed in an empty two liter flask. After equilibrium is established 0.25 moles of Br_2 are found to be present. Calculate the equilibrium constant (K) for this reaction. (answer: 0.0139)

4. Given: $2 \text{HI}_{(g)} \rightleftharpoons \text{H}_{2(g)} + \text{I}_{2(g)}$ and $K = 0.01$. Starting with 4.20 mol of HI in a 9.6 L container, calculate the equilibrium concentrations of H_2 , I_2 , and HI. Start by setting up the appropriate data table. (answers: $[\text{HI}] = 0.364\text{M}$; $[\text{H}_2] = [\text{I}_2] = 0.037\text{M}$)

5. For the reaction $2 \text{NO}_{(g)} \rightleftharpoons \text{N}_{2(g)} + \text{O}_{2(g)}$ suppose 5 mole of pure NO gas is placed in a 10 liter container and allowed to come to equilibrium. Given that $K = 0.4$ calculate the equilibrium concentrations for all the components. (answer: $[\text{NO}] = 0.22\text{M}$; $[\text{N}_2] = [\text{O}_2] = .14\text{M}$)

6. A mixture of 3 mol SO_2 , 4 mol of NO_2 , 1 mol of SO_3 , and 4 mol of NO is placed in a two liter vessel. The following equilibrium is reached:



When equilibrium is obtained the vessel is found to contain 2 mol of SO_2 . Calculate the equilibrium concentration of all the components. Given: $K = 1.66$

(answers; $[\text{SO}_2] = 1.0\text{M}$; $[\text{NO}_2] = 1.5\text{M}$; $[\text{SO}_3] = 1.0\text{M}$; $[\text{NO}] = 2.5\text{M}$)