

Chemistry 12 – Dynamic Equilibrium
Learning Goal B6
Equilibrium Calculations: Problem Set E

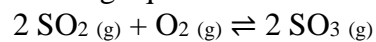
Solve each problem and show all of your work.

1. At equilibrium, a 5.0L flask contains:
0.75 mol of PCl_5 0.50 mol of H_2O 7.50 mol of HCl 5.00 mol of POCl_3
Calculate the K_{eq} for the reaction:
$$\text{PCl}_5 (\text{s}) + \text{H}_2\text{O} (\text{g}) \rightleftharpoons 2\text{HCl} (\text{g}) + \text{POCl}_3 (\text{g})$$

2. $K_{\text{eq}} = 798$ for the reaction at a particular temperature: $2 \text{SO}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightleftharpoons 2 \text{SO}_3 (\text{g})$.

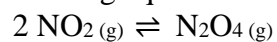
In a particular mixture at equilibrium, $[\text{SO}_2] = 4.20 \text{ M}$ and $[\text{SO}_3] = 11.0 \text{ M}$. Calculate the equilibrium $[\text{O}_2]$ in this mixture.

3. Consider the following equilibrium:



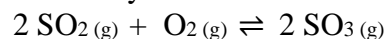
When 0.600 moles of SO_2 and 0.600 moles of O_2 are placed into a 1.00 L container and allowed to reach equilibrium, the equilibrium $[\text{SO}_3]$ is to be 0.250 M. Calculate K_{eq} .

4. Consider the following equilibrium:



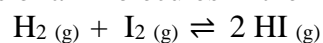
2.00 moles of NO_2 are placed in a 1.00 L flask and allowed to react. After equilibrium is established, 1.80 moles of NO_2 are present. Calculate K_{eq} .

5. Consider the chemical system below:

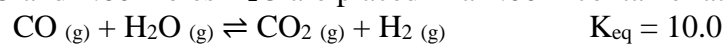


4.00 moles of SO_2 and 5.00 moles O_2 are placed in a 2.00 L container at 200°C and allowed to reach equilibrium. If the equilibrium $[\text{O}_2]$ is 2.00 M, calculate the value of K_{eq} .

6. If the initial $[\text{H}_2] = 0.200 \text{ M}$, $[\text{I}_2] = 0.200 \text{ M}$ and $K_{\text{eq}} = 55.6$ (at 250°C) calculate the equilibrium concentrations of all molecules in the following chemical system.



7. 1.60 moles CO and 1.60 moles H_2O are placed in a 2.00 L container at 690°C

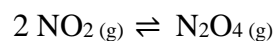


Calculate all equilibrium concentrations.



If 4.00 moles of each reactant are placed in a 2.00L container, calculate all equilibrium concentrations at 100°C for the chemical system shown above.

*9. Consider the following equilibrium system:



Two sets of equilibrium data are listed for the same temperature.

Container 1	2.00 L	0.12 moles NO_2	0.16 moles N_2O_4
Container 2	5.00 L	0.26 moles NO_2	? moles N_2O_4

Determine the number of moles N_2O_4 in the second container.