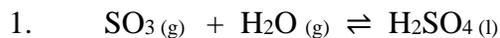
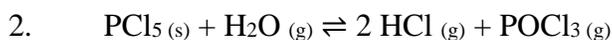


**Chemistry 12 – Dynamic Equilibrium**  
**Learning Goal B5**  
**Equilibrium Calculations: Problem Set D**



At equilibrium (25 °C):  $[\text{SO}_3] = 0.400 \text{ M}$      $[\text{H}_2\text{O}] = 0.480 \text{ M}$      $[\text{H}_2\text{SO}_4] = 0.600 \text{ M}$   
Calculate the value of the equilibrium constant,  $K_{\text{eq}}$ .



At equilibrium a 2.0L flask contains:  
0.45 mol of  $\text{PCl}_5$             0.26 mol of  $\text{H}_2\text{O}$             1.35 mol of  $\text{HCl}$             0.96 mol of  $\text{POCl}_3$

Calculate the  $K_{\text{eq}}$  for the reaction.



In a particular mixture at equilibrium,  $[\text{SO}_2] = 3.80 \text{ M}$  and  $[\text{SO}_3] = 9.60 \text{ M}$ . Calculate the equilibrium  $[\text{O}_2]$  in this mixture at 25°C.

4. Consider the following equilibrium system, shown below.



0.800 moles of  $\text{SO}_2$  and 0.800 moles of  $\text{O}_2$  are present in a 2.00 L flask at equilibrium.

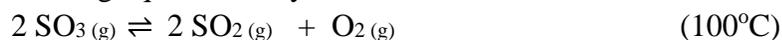
If the  $K_{\text{eq}} = 680.0$ , calculate the  $[\text{SO}_3]$  at 100°C.

5. Consider the following equilibrium:



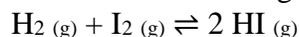
2.00 moles of  $\text{NO}_2$  and 1.60 moles of  $\text{N}_2\text{O}_4$  are present in a 4.00 L flask at equilibrium. Calculate the value of  $K_{\text{eq}}$  at  $20^\circ\text{C}$ .

6. Consider the following equilibrium system below:



4.00 moles of  $\text{SO}_2$  and 5.00 moles of  $\text{O}_2$  are present in a 2.00 L container at equilibrium. Calculate the equilibrium concentration of  $\text{SO}_3$  and the number of moles  $\text{SO}_3$  present if the value  $K_{\text{eq}} = 1.47 \times 10^{-3}$  at  $100^\circ\text{C}$ .

7. If at equilibrium  $[\text{H}_2] = 0.200\text{M}$  and  $[\text{I}_2] = 0.200\text{M}$  and  $K_{\text{eq}} = 55.6$  at  $250^\circ\text{C}$ , calculate the equilibrium concentration of  $\text{HI}$  for the following system:



8. 1.60 moles  $\text{CO}$ , 1.60 moles  $\text{H}_2\text{O}$ , 4.00 moles  $\text{CO}_2$ , 4.00 moles  $\text{H}_2$  are found in an 8.00 L container at  $690^\circ\text{C}$  at equilibrium for the following chemical system:  $\text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{CO}_2(\text{g}) + \text{H}_2(\text{g})$

Calculate the value of the equilibrium constant.