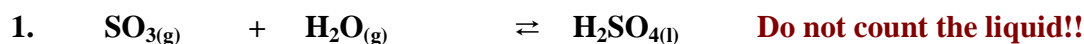


Worksheet #8 Equilibrium Calculations
Solve each problem and show all of your work.



At equilibrium $[\text{SO}_3] = 0.400\text{M}$ $[\text{H}_2\text{O}] = 0.480\text{M}$ $[\text{H}_2\text{SO}_4] = 0.600\text{M}$

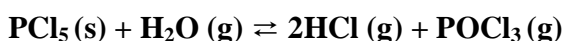
Calculate the value of the equilibrium constant.

$$\text{Keq} = \frac{1}{[\text{SO}_3][\text{H}_2\text{O}]}$$
$$\text{Keq} = \frac{1}{[0.400][0.480]}$$

$$\text{Keq} = 5.21$$

2. At equilibrium at 100°C , a 2.0L flask contains:
0.075 mol of PCl_5 0.050 mol of H_2O 0.750 mol of HCl 0.500 mol
of POCl_3

Calculate the Keq for the reaction:

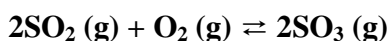


$$\text{Keq} = 1.4$$

3. Keq= 798 at 25°C for the reaction: $2\text{SO}_2(g) + \text{O}_2(g) \rightleftharpoons 2\text{SO}_3(g)$.
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 at 25°C .

$$[\text{O}_2] = 0.00860\text{M}$$

4. Consider the following equilibrium:



0.600 moles of SO_2 and 0.600 moles of O_2 are present in a 4.00 L flask at equilibrium at 100°C . If the Keq = 680, calculate the SO_3 concentration at 100°C .

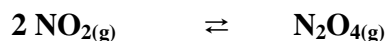
$$K_{eq} = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$$

$$680 = \frac{[SO_3]^2}{[0.150]^2[0.150]}$$

$$[SO_3]^2 = (0.150)(0.150)^2(680)$$

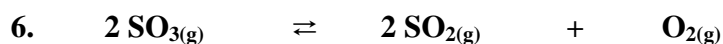
$$[SO_3] = 1.51 \text{ M}$$

5. Consider the following equilibrium:



2.00 moles of NO_2 and 1.60 moles of N_2O_4 are present in a 4.00 L flask at equilibrium at 20°C . Calculate the K_{eq} at 20°C .

$$K_{eq} = 1.60$$

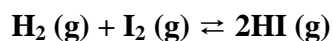


4.00 moles of SO_2 and 5.00 moles O_2 are present in a 2.00 L container at 100°C and are at equilibrium. Calculate the equilibrium concentration of SO_3 and the number of moles SO_3 present if the $K_{eq} = 1.47 \times 10^{-3}$.

$$[SO_3] = 82.5 \text{ M}$$

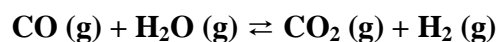
$$165 \text{ moles } SO_3$$

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



$$[\text{HI}] = 1.49 \text{ M}$$

8. 1.60 moles CO , 1.60 moles H_2O , 4.00 moles CO_2 , 4.00moles H_2 are found in a 8.00L container at 690°C at equilibrium.



Calculate the value of the equilibrium constant.

Keq = 6.25