

Equilibrium Study Problems

- Answer the following three questions for the reaction of HF gas decomposing into hydrogen gas and fluorine gas at 78.5 °C.
 - Write out the balanced reaction and the K_c and K_p expressions.
 - Given $K_p = 4.25 \times 10^{-4}$ calculate K_c .
 - If I begin the reaction with 0.224 g of pure hydrogen fluoride in a 1550 mL closed flask, calculate all the equilibrium concentrations for each species in the reaction in units of moles/L.
- A 0.0240 mol sample of $N_2O_4(g)$ is allowed to reach equilibrium with $NO_2(g)$ in a 0.372 L flask at 25.0°C. Calculate the concentration of $N_2O_4(g)$ at equilibrium. $N_2O_4(g) \rightleftharpoons 2 NO_2(g)$ $K_c = 4.61 \times 10^{-3}$

3. Consider the reaction $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2 \text{NO}_2(\text{g})$, where $K_c = 5.7$ at 250°C . If the initial concentration of N_2O_4 is 0.350 M and that of NO_2 is 1.20 M in a flask at 250°C , will the reaction go forwards or backwards to reach equilibrium? (*Must show work for credit*)
4. A quantity of 2.40 moles of pure SO_2Cl_2 gas was placed in an 8.00 L sealed flask. At 500 K , after equilibrium is established, there are 1.60 moles of the product gas SO_2 present. Calculate K_c for the reaction.
- $$\text{SO}_2\text{Cl}_2(\text{g}) \rightleftharpoons \text{SO}_2(\text{g}) + \text{Cl}_2(\text{g})$$
5. Consider this endothermic reaction: $\text{CO}_2(\text{g}) + \text{C}(\text{s}) \rightleftharpoons 2 \text{CO}(\text{g})$. To make the most CO gas:
- You could increase the pressure. (true or false?) _____
 - You could increase the volume. (true or false?) _____
 - You could add more carbon monoxide gas. (true or false?) _____
 - You could decrease the temperature. (true or false?) _____
 - You could add more carbon. (true or false?) _____
 - You could add a catalyst. (true or false?) _____
6. Write the equilibrium constant expressions K_c and K_p and the balanced reaction for the reaction between aqueous potassium sulfate and aqueous calcium nitrate.
7. Calculate K_p for the formation of steam reaction if at equilibrium at 150°C the gas pressures are 0.145 atm for hydrogen, 0.108 atm for oxygen, and 15.4 atm for steam.