

1) A 10.55 gram sample of SO_2F_2 liquid is placed in a sealed 1.50L container. The container is heated to 450K and the liquid first boils and then begins to break down according to the reaction given above.

a) If no decomposition had occurred what would be the pressure of the SO_2F_2 gas?

$$10.55 \text{ g } \text{SO}_2\text{F}_2 \cdot \frac{1 \text{ mol}}{102.06 \text{ g}} = 0.10337 \text{ mol}$$

$$P = \frac{0.1034 \cdot 0.0821 \cdot 450}{1.50 \text{ L}} = 2.55 \text{ atm}$$

b) The equilibrium constant for the decomposition at 450K, K_p , is $7.65 \cdot 10^{-6}$. Write the equilibrium expression for the reaction.

$$K_p = \frac{P_{\text{SO}_2} \cdot P_{\text{F}_2}}{P_{\text{SO}_2\text{F}_2}}$$

c) Once the system reaches equilibrium what will be the partial pressure of SO_2F_2 remaining in the container?

	SO_2F_2	\rightleftharpoons	SO_2	$+$	F_2
I	2.55		0		0
C	-x		+x		+x
E	$2.55 - x$		x		x

$$7.65 \cdot 10^{-6} = \frac{(x)(x)}{(2.55 - x)}$$

$$7.65 \cdot 10^{-6} = \frac{x^2}{2.55}$$

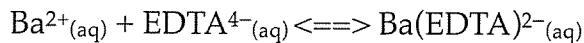
$$P_{\text{SO}_2\text{F}_2} = 2.545 \text{ or } 2.55$$

$$x = 4.42 \cdot 10^{-3} \text{ atm}$$

d) What will be the total pressure in the container at equilibrium?

$$P_T = P_{\text{SO}_2\text{F}_2} + P_{\text{SO}_2} + P_{\text{F}_2} = 2.545 + 4.42 \cdot 10^{-3} + 4.42 \cdot 10^{-3}$$

$$P_T = 2.55$$



$$K = 7.7 \times 10^7$$

2) Barium ions will react with the EDTA ion to form a complex according to the reaction given above. A student mixes a solution with an initial concentration of $\text{Ba}(\text{EDTA})^{2-}$ of 0.0237M.

A) Write the equilibrium expression for the reaction.

$$K = \frac{[\text{Ba}(\text{EDTA}^{2-})]}{[\text{Ba}^{2+}][\text{EDTA}^{4-}]}$$

B) What will be the concentration of the barium ions in the solution at equilibrium?

	Ba^{2+}	EDTA^{4-}	$\text{Ba}(\text{EDTA})^{2-}$
I	0	0	0.0237
C	+x	+x	-x
E	x	x	0.0237-x

$$[\text{Ba}^{2+}] = 1.75 \cdot 10^{-5} \text{ M}$$

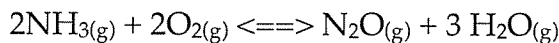
$$7.7 \cdot 10^7 = \frac{(0.0237-x)}{(x)(x)}$$

$$7.7 \cdot 10^7 = \frac{0.0237}{x^2}$$

$$x^2 = \frac{0.0237}{7.7 \cdot 10^7}$$

$$x = 1.75 \cdot 10^{-5}$$

assume x is small



3) Ammonia (NH_3) will react with oxygen to form dinitrogen monoxide (N_2O) and water as shown above. Researchers fill a 2.50L reaction vessel with ammonia to a pressure of 1.50 atm and oxygen gas to a pressure of 1.00 atm at 25°C. After the reaction comes to equilibrium they measure the pressure of the N_2O to be 0.0385 atm.

A) Write the equilibrium expression for K_p .

$$K_p = \frac{P_{\text{N}_2\text{O}} P_{\text{H}_2\text{O}}^3}{P_{\text{NH}_3}^2 P_{\text{O}_2}^2}$$

B) Calculate the value of the equilibrium constant, K_p , at 25°C.

	2NH_3	2O_2	N_2O	$3\text{H}_2\text{O}$
I	1.50	1.00	0	0
C	-2 · 0.0385	-2 · 0.0385	+0.0385	+3 · 0.0385
E	1.423	0.923	0.0385	0.1155

$$K_p = \frac{(0.0385)(0.1155)^3}{(1.423)^2 (0.923)^2}$$

$$K_p = 3.44 \cdot 10^{-5}$$