

WORKSHEETS ARE DUE AT THE BEGINNING OF CLASS ON THE DATE GIVEN ON THE WORKSHEET. LATE WORKSHEETS WILL NOT BE ACCEPTED.

NAME _____

Panther ID _____

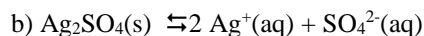
For problems involving calculations you must show your work for credit.

1) Give the expression for K_C for the following reactions. Also give the expressions for K_p , when appropriate. Otherwise, write $K_p = n/a$.



$$K_C = [\text{NH}_3] [\text{H}_2\text{S}] \quad K_p = (p_{\text{NH}_3}) (p_{\text{H}_2\text{S}})$$

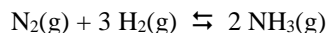
Everything appearing in K_C is a gas, so you can also write an expression for K_p .



$$K_C = [\text{Ag}^+]^2 [\text{SO}_4^{2-}] \quad K_p = n/a$$

K_C expression contains solutes, which do not have a partial pressure, so K_p cannot be written.

2) For the chemical reaction



the numerical value for the equilibrium constant is $K_C = 3.4 \times 10^8$ at $T = 25.0 \text{ }^\circ\text{C}$.

A system initially contains approximately 0.1 mol/L of N_2 , H_2 , and NH_3 . At equilibrium, the system

- a) will contain close to the maximum possible concentration of N_2 for the given starting conditions
- b) will contain close to the maximum possible concentration of H_2 for the given starting conditions
- c) will contain close to the maximum possible concentration of NH_3 for the given starting conditions
- d) both a and b
- e) both a and b and c

_____ C _____

The equilibrium constant is much larger than 1, so products are greatly favored over reactants. Because of this, you will have close to the maximum possible amount of NH_3 in the system (and close to the minimum amounts of N_2 and H_2) for the given initial conditions.

3) The equilibrium constant for the reaction



is $K_p = 0.14$ at $T = 700. \text{ K}$.

A system initially has $p_{\text{ClF}_3} = p_{\text{ClF}} = 0.200 \text{ atm}$. There is initially no F_2 in the system. Find the values for p_{ClF_3} , p_{ClF} , and p_{F_2} that will be present when equilibrium is reached.

$$K_p = \frac{(p_{\text{ClF}})(p_{\text{F}_2})}{(p_{\text{ClF}_3})} = 0.14$$

	Initial	Change	Equilibrium
ClF	0.200	x	0.200 + x
F ₂	0.	x	x
ClF ₃	0.200	- x	0.200 - x

$$\frac{(0.200 + x)(x)}{(0.200 - x)} = 0.14$$

$$x^2 + 0.200x = 0.028 - 0.14x$$

$$x^2 + 0.340x - 0.028 = 0$$

$$x = \frac{-0.340 \pm [(0.340)^2 - 4(1)(-0.028)]^{1/2}}{2(1)} = +0.069, -0.408$$

The root - 0.408 would give a negative partial pressure for ClF and F₂ and so can be discarded. Using $x = 0.069$ gives

$$p_{\text{ClF}} = 0.269 \text{ atm}$$

$$p_{\text{F}_2} = 0.069 \text{ atm}$$

$$p_{\text{ClF}_3} = 0.131 \text{ atm}$$

As a check, if we insert these values into the expression for K_p , we get

$$K_p = \frac{(0.269)(0.069)}{(0.131)} = 0.142, \text{ within roundoff error of the correct value.}$$

Note that if we assumed $x \ll 0.200$, we would get $x = 0.14$, which would clearly violate the assumption that x is small. So in this problem we have to solve the quadratic.