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| **Calculation of Keqand Concentrations** |
| After you have finished this you should be able to:  1) Calculate the equilibrium constant.  2) Calculate the equilibrium concentration of a participant when the value of Keqis known as well as the concentrations of the other participants.  3) Determination of the net direction of a reaction prior to establishing an equilibrium.  4) Calculation of equilibrium []'s when initial []'s and the equilibrium constant are known.  5) Calculation of the % dissociation and the % yield of a reaction. |
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| **Problem #1** |
| When 0.40 moles of PCl5is heated in a 10.0 L container, an equilibrium is established is which 0.25 moles of Cl2is present. |
| PCl5(g) <====>  PCl3(g) + Cl2(g) |
| a) What is the number of moles of PCl5and PCl3 at equilibrium?  b) What are the equilibrium concentrations of all three components? |

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| **Problem #2** |
| When 1.00 mole of NH3gas and 0.40 moles of N2gas are placed in a 5.0 L container and allowed to reach equilibrium at a certain temperature, it is found that 0.78 moles of NH3 is present. The reaction is:       2 NH3(g)  <======>   3 H2(g) + N2(g) |
| a) What is the number of moles of H2 and N2 at equilibrium?  b) What is the concentration in moles/L of each species? |
| **Problem #3** |
| A mixture of H2 and I2 is allowed to react at 448oC. When equilibrium is established, the concentrations of the participants are found to be [H2] = 0.46 mol/L, [I2] = 0.39 mol/L, and [HI] = 3.0 mol/L.  Calculate the value of the Keqat 448oC.             H2(g) + I2(g) <=====>  2 HI(g) |

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| **Problem #4** |
| Assume that in the analysis of another equilibrium mixture of the same reaction as above, **at the same temperature of 448oC**, the equilibrium concentrations of I2 and H2 are both 0.50 mol/L.  What are the equilibrium concentrations of HI? |

**Problem #5**  
The equilibrium constant for the reaction represented below is 50 at 448oC

       H2(g) + I2(g) <=====>  2 HI(g)

a) How many moles of HI are present at equilibrium when 1.0 moles of H2 is mixed with 1.0 moles of I2 in a 0.50 L container and allowed to react at 448oC?

b) How many moles of H2 and I2 are left unreacted?

c) If the conversion of H2 and I2 to HI is essentially complete, how many moles of HI would be present?

d) What is the percent yield of the equilibrium mixture?