Equilibrium Worksheet

1. $2NH_3(g) \leftrightarrows N_2(g) + 3H_2(g)$
   At 500 K, the following concentrations were measured: $[N_2] = 3.0 \times 10^{-2}$ M, $[H_2] = 3.7 \times 10^{-2}$ M, $[NH_3] = 1.6 \times 10^{-2}$ M. What is K_c?

2. At 1000 K, the equilibrium partial pressures for the reaction below are: $CH_4 = 0.20$ atm, $H_2S = 0.25$ atm, $CS_2 = 0.52$ atm, and $H_2 = 0.10$ atm. What is K_p?
   $CH_4(g) + 2H_2S(g) \leftrightarrows CS_2(g) + 4H_2(g)$

3. $N_2(g) + 3H_2(g) \leftrightarrows 2\ NH_3(g)$ At 375 °C, $K_c = 2.79 \times 10^{-5}$.
   a) What is K_p?

   b) What is P_{NH_3} if $P_{H_2} = 1.24$ atm and $P_{N_2} = 2.17$ atm at equilibrium?

4. Given the equations:
   $H_2(g) + S(s) \leftrightarrows H_2S(g)$ $K_c = 1.0 \times 10^{-3}$
   $S(s) + O_2(g) \leftrightarrows SO_2(g)$ $K_c = 5.0 \times 10^{6}$
   Calculate the value of K_c for $H_2(g) + SO_2(g) \leftrightarrows H_2S(g) + O_2(g)$

5. For the reaction, $B \leftrightarrows 2A$, $K_c = 2$. Suppose 3.0 moles of A and 3.0 moles of B are introduced into a 2.00 L flask.

   [A] = [B] = Q =

   a) Is this system at equilibrium?

   b) In which direction will the reaction proceed to reach equilibrium?

   c) As the system moves towards equilibrium, what happens to the concentration of B? A?

6. a) Calculate the equilibrium concentrations of all species for the following reaction if the initial concentrations of H_2 and I_2 are both 1.00 M.

H_2 (g) + I_2 (g) ⇆ 2 HI (g) $K_c = 50.5$

b) For the reaction above, if $K_p = 50.5$ and the initial pressures are HI = 0.975 atm, H_2 = 0.105 atm and I_2 = 0.105 atm, what are the equilibrium pressures for all the substances?

7. Calculate the equilibrium concentrations for the reaction below if the initial $[N_2] = 0.80$ M and the initial $[O_2] = .20$ M

$N_2(g) + O_2(g) \leftrightarrows 2\ NO(g)$ $K_c = 1.0 \times 10^{-5}$

6. Calculate the equilibrium concentrations of all species if 3.000 moles of H_2 and 6.000 moles of F_2 are placed in a 3.000 L container.

$H_2(g) + F_2(g) \leftrightarrows 2HF(g)$, $K_c = 1.15 \times 10^2$