NAME:

CHM 2046 **Practice Quiz 1**

Answer all questions. Give your final answer with the correct units, if any, and to the correct sig. figs. **Useful Information**: 0 °C ≈ 273 K, R = 0.0820 L. atm/mol. K

1. a) (3 points each) Balance the following reactions, if necessary, and write down their mass-action expression, Q_c

$$2\ NO(g) + 2\ H_2(g) \rightleftharpoons N_2(g) + 2\ H_2O(g)$$

$$2\ KCl(s) \rightleftharpoons K(g) + Cl_2(g)$$

b) (5 points) At 100 °C, K_p = 60.6 for the reaction

$$2\ NOBr(g) \rightleftharpoons NO(g) + Br_2(g)$$

In a particular experiment, 0.35 atm (atmospheres) of NOBr, 4.0 atm of NO, and 2.0 atm of Br_2 are placed in a vessel. Is the reaction at equilibrium? Explain.

If not, in which direction will it proceed? Explain.

2. a) (4 points) Gaseous ammonia (NH_3) was introduced into a sealed container and heated to a certain temperature

$$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$$

At equilibrium, $[NH_3]$ = 0.0250M, $[N_2]$ = 0.124M, and $[H_2]$ = 0.322M. Calculate K_c for this reaction at this temperature.

b) (1 point) What will happen to the $[NH_3]$ if more N_2 is now added to the container?

c) (4 points) For the following reaction, $K_p = 8.5 \times 10^4$ at a particular temperature.

$$2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$$

At equilibrium, p_{NO} = 0.35 atm and p_{Cl2} = 0.10 atm. What is the partial pressure of NOCl(g) (p_{NOCl}) at equilibrium?

d) (1 point) What will happen to the pNO if N_2 is now added to the container?

3. (3 points each)
The reaction below has K_c = 4.4 at 300 K. Use this to answer a) and b).

$$CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$$

a) What is K_c for the reaction below. Explain your answer.

$$\tfrac{1}{2}CO(g) + \tfrac{1}{2}H_2O(g) \rightleftharpoons \tfrac{1}{2}CO_2(g) + \tfrac{1}{2}H_2(g)$$

b) What is K_c for the reaction below? Explain your answer.

$$CO_2(g) + H_2(g) \rightleftharpoons CO(g) + H_2O(g)$$

c) K_c = 122 for the reaction below at 300 K? What is K_p?

$$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$$

4. (10 points) Consider the following reaction at a particular temperature:

$$2HI(g) \rightleftharpoons H_2(g) + I_2(g)$$

A 2.00 L flask is filled with 0.320 mol of HI and allowed to reach equilibrium. At equilibrium, [HI] = 0.098 M. Calculate K_c.

5. (10 points) At a particular temperature, the reaction below has K_c = 0.680

$$CO(g) + H_2O(g) \rightleftharpoons CO_2(g) + H_2(g)$$

In a 20.0 L vessel, 1.00 mol of CO and 1.00 mol of H_2O are allowed to reach equilibrium. Calculate the concentrations of all four species at equilibrium.