For each of the reactions in question #1-4, determine the following. Look up any constants you need!

a. The equilibrium constant expression for Kc.

b. The equilibrium constant expression for Kp if it exists.

c. The direction the equilibrium would shift if the concentration ofO2 is increased.

d. The direction the equilibrium would shift if the concentration ofO2 is decreased.

e. The direction the equilibrium would shift if the pressure is increased.

f. The direction the equilibrium would shift if a catalyst is added.

g. The direction the equilibrium would shift if the temperature is increased.

1. O3 (g) + NO (g) ⇄ O2 (g) + NO2 (g)

2. 2 CO (g) + O2 (g) ⇄ CO2 (g)

3. 2 NaClO3 (s) ⇄ 2 NaCl (s) + 3 O2 (s)

4. 2 H2O (g) ⇄ 2 H2 (g) + O2 (g)

Questions not related to #1-4 above!

5. Given the following equilibrium equations and their corresponding equilibrium constants:

2 CO2 (g) + H2O (g) ⇄ 2 O2 (g) + CH2CO (g) Kc = 6.1 x 108

CH4 (g) + 2 O2 (g) ⇄ CO2 (g) + 2 H2O (g) Kc = 1.2 x 1014

Find Kc for the reaction: CH4 (g) + CO2 (g) ↔ CH2CO (g) + H2O (g)

6. CO (g) + H2O (g) ⇄ CO2 (g) + H2 (g)       Keq= 10.0 at 690oC.      If at a certain time [CO] = 0.80M, [H2O] = 0.050M, [CO2] = 0.50M and [H2] = 0.40M, is the reaction at equilibrium? If not, how will it shift in order to get to equilibrium?

7. At a certain temperature, Kc is 4.13 x 10-2 for the equilibrium:

2 IBr (g) ⇄ I2 (g) + Br2 (g)

Assume that equilibrium is established at the above temperature by adding only IBr (g) to the reaction flask. What are the concentrations of I2 (g) and Br2 (g) in equilibrium with 0.0124 moles/liter of IBr(g) ?

8. 2 CrO4-2 (aq) + 2H+ (aq) ⇄ Cr2O7-2 (aq) + H2O (l)

Calculate the Kc if the following amounts were found at equilibrium in a 2.0L volume.

CrO4-2 = .030 mol, H+ = .020 mol, Cr2O7-2= 0.32 mol, H2O = 110 mol

9. Initially, a mixture of 0.100 M NO, 0.050 M H2 and 0.100 M H2O was allowed to reach equilibrium. There was no N2 present initially. Calculate the equilibrium concentrations of all species.

2 NO (g) + 2 H2 (g) ⇄ N2 (g) + 2 H2O (g) Kc = 650