

Revised August 2011



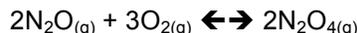
## HONORS WORKSHEET 11b: Kc and Le Chatelier's Principle



1. The equilibrium constant for the reaction below, at a given temperature is 45.6. If the equilibrium concentrations of  $F_2$  and  $BrF_3$  are  $1.24 \times 10^{-1} M$  and  $1.99 \times 10^{-1} M$  respectively, calculate the equilibrium concentration of  $Br_2$ . (4)

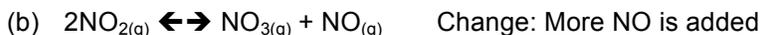


2. An equilibrium is established in the reaction below and the concentrations of each component are determined. Calculate the value of Kc at this temperature. (2)



Equilibrium concentrations,  $N_2O = 1.55 \times 10^{-2} M$ ,  $O_2 = 1.69 \times 10^{-2} M$ ,  $N_2O_4 = 1.71 \times 10^{-2} M$

3. Assume that each of the reactions below are at equilibrium. Using your knowledge of Le Chatelier's principle, explain carefully how the system will respond to the change. (2)



4. Calculate the equilibrium amounts of each substance in the reaction below if an initial amount of 0.1 moles of  $H_2$  are brought together with an initial amount of 0.2 moles of  $I_2$  and then equilibrium is established at 300 K. Kc at this temperature = 70. (4)



5. Calculate the equilibrium amounts of each substance in the reaction below if an initial amount of 0.4 moles of CO are brought together with an initial amount of 2.2 moles of  $Cl_2$  and then equilibrium is established at 900 K in a 1.0 L container. Kc at this temperature = 0.80. (4)



6. The Haber process is used to produce ammonia commercially.

- (a) 1.00 mol of  $N_2$  and 3.00 mols of  $H_2$  are mixed together to produce ammonia according to the equation below. At equilibrium, only 50.0% of the  $N_2$  that was present originally, remains. Calculate Kc for this reaction at this temperature if the reaction is carried out in a 1.0 L container. (6)



- (b) Predict how each of the following changes would affect the percentage of ammonia in the equilibrium mixture. (3)
- (i) Adding a catalyst
  - (ii) Increasing the total pressure
  - (iii) Using a high temperature