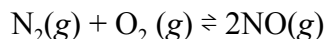


Name:
College ID:
Thomas Edison State University
General Chemistry II with Labs (CHE-122)
Section no.:
Semester and year:

Written Assignment 4: Chemical Equilibrium

Answer all assigned questions and problems, and show all work.

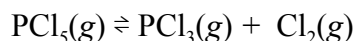
1. Consider the following reaction:



If the equilibrium partial pressures of N_2 , O_2 , and NO are 0.15 atm, 0.33 atm, and 0.050 atm, respectively, at 2200°C , what is K_p ? (5 points)

(Reference: Chang 14.19)

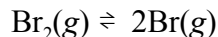
2. The equilibrium constant K_p for the reaction



is 1.05 atm at 250°C . The reaction starts with a mixture of PCl_5 , PCl_3 , and Cl_2 at pressures 0.177 atm, 0.223 atm, and 0.111 atm, respectively, at 250°C . When the mixture comes to equilibrium at that temperature, which pressures will have decreased and which will have increased? Explain why. (5 points)

(Reference: Chang 14.23)

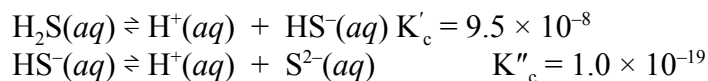
3. Consider the following reaction at 1600°C :



When 1.05 moles of Br_2 are put in a 0.980-L flask, 1.20 percent of the Br_2 undergoes dissociation. Calculate the equilibrium constant K_c for the reaction. (8 points)

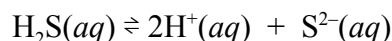
(Reference: Chang 14.25)

4. The following equilibrium constants have been determined for hydrosulfuric acid at 25°C:



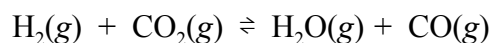
Calculate the equilibrium constant for the following reaction at the same temperature:

(5 points)



(Reference: Chang 14.29)

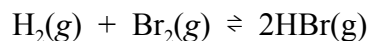
5. For the reaction



at 700°C, $K_c = 0.534$. Calculate the number of moles of H_2 that are present at equilibrium if a mixture of 0.300 mole of CO and 0.300 mole of H_2O is heated to 700°C in a 10.0-L container. (10 points)

(Reference: Chang 14.41)

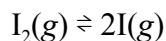
6. The equilibrium constant K_c for the reaction



is 2.18×10^6 at 730°C. Starting with 3.20 moles of HBr in a 12.0-L reaction vessel, calculate the concentrations of H_2 , Br_2 , and HBr at equilibrium. (10 points)

(Reference: Chang 14.43)

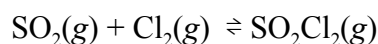
7. The dissociation of molecular iodine into iodine atoms is represented as



At 1000 K, the equilibrium constant K_c for the reaction is 3.80×10^{-5} . Suppose you start with 0.0456 mol of I_2 in a 2.30-L flask at 1000 K. What are the concentrations of the gases at equilibrium? (10 points)

(Reference: Chang 14.44)

8. Consider the following equilibrium system involving SO_2 , Cl_2 , and SO_2Cl_2 (sulfuryl dichloride):

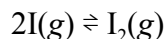


Predict how the equilibrium position would change if the temperature remains constant:

- Cl_2 gas were added to the system. (2 points)
- SO_2Cl_2 were removed from the system. (2 points)
- SO_2 were removed from the system. (2 points)

(Reference: Chang 14.53)

9. Consider the exothermic equilibrium



What would be the effect on the position of equilibrium of

- increasing the total pressure on the system by decreasing its volume. (2 points)
- adding gaseous I_2 to the reaction mixture. (2 points)
- decreasing the temperature. (2 points)

(Reference: Chang 14.57)

10. Consider the reaction



Comment on the changes in the concentrations of SO_2 , O_2 , and SO_3 at equilibrium if

we were to

- a. increase the temperature. (2 points)
- b. increase the pressure. (2 points)
- c. increase SO_2 . (2 points)
- d. add a catalyst. (2 points)
- e. add helium at constant volume. (2 points)

(Reference: Chang 14.59)

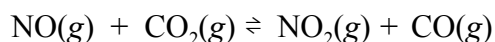
11. At 1130°C the equilibrium constant (K_c) for the reaction



is 2.25×10^{-4} . If $[\text{H}_2\text{S}] = 4.84 \times 10^{-3} \text{ M}$ and $[\text{H}_2] = 1.50 \times 10^{-3} \text{ M}$, calculate $[\text{S}_2]$.
(5 points)

(Reference: Chang 14.79)

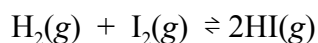
12. A mixture containing 3.9 moles of NO and 0.88 moles of CO_2 was allowed to react in a flask at a certain temperature according to the equation



At equilibrium, 0.11 mole of CO_2 was present. Calculate the equilibrium constant K_c of this reaction. (10 points)

(Reference: Chang 14.89)

13. The equilibrium constant K_c is 54.3 at 430°C for the following reaction:



Initially, 0.90 M H_2 , I_2 , and HI are introduced into a 5.0-L flask and allowed to come to equilibrium. What are the equilibrium concentrations of H_2 , I_2 , and HI in the flask?
(10 points)

