

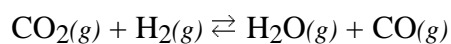
ALL work must be shown to receive full credit. **Due in lecture at 8:30 a.m. on Wednesday, March 27, 2002.**

PS8.1. A 0.522 gram quantity of COBr_2 is sealed in a glass bulb of 0.100 L volume and heated to a temperature of 73°C . At 73°C the COBr_2 partially decomposes according to the equation



for which $K_c = 0.190$. Calculate the concentration of each species at 73°C .

PS8.2. The equilibrium constant, K_p , for the reaction



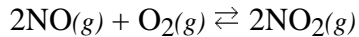
is 0.137. Calculate the partial pressure of all species at equilibrium for each of the following original mixtures:

- a) 1.0 atm of CO_2 and 1.0 atm of H_2 .

b) 1.0 atm of CO_2 , 1.00 atm of H_2 and 1.0 atm of H_2O .

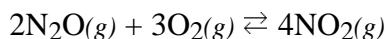
c) 1.0 atm of H_2O and 1.0 atm of CO .

PS8.3. At 1000 K the equilibrium constant, K_c , for the reaction



is 0.833. Calculate the concentrations of all species at equilibrium when 0.600 moles of NO_2 are placed in a 2.00 L container at 1000 K.

PS8.4. At 25 °C, 0.560 mol of O_2 and 0.20 mol of N_2O were placed in a 1.00 liter vessel and allowed to react according to the equation



When the system reached equilibrium, the concentration of NO_2 was found to be 0.020 M.

a) What were the equilibrium concentrations of N_2O and O_2 ?

PS8.4. (Continued)

- b) What is the value of K_c for this reaction at 25 °C?

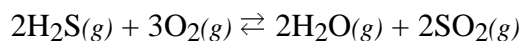
PS8.5. The reaction



has been carefully studied at 350 °C and the K_c is 0.079. Which direction (left-to-right or right-to-left) will the reaction proceed to establish equilibrium under each of the following initial conditions?

- a) $[\text{NOBr}]_o = 0.100 \text{ M} : [\text{NO}]_o = 0 : [\text{Br}_2]_o = 0$
- b) $[\text{NOBr}]_o = 0 : [\text{NO}]_o = 0.100 \text{ M} : [\text{Br}_2]_o = 0.100 \text{ M}$
- c) $[\text{NOBr}]_o = 0.100 \text{ M} : [\text{NO}]_o = 0 : [\text{Br}_2]_o = 0.100 \text{ M}$
- d) $[\text{NOBr}]_o = 0.100 \text{ M} : [\text{NO}]_o = 0.100 \text{ M} : [\text{Br}_2]_o = 0.100 \text{ M}$
- e) $[\text{NOBr}]_o = 0.200 \text{ M} : [\text{NO}]_o = 0.0500 \text{ M} : [\text{Br}_2]_o = 0.100 \text{ M}$

PS8.6. Consider the reaction



for which $\Delta H_{\text{rxn}} = -1036 \text{ kJ}$. Predict how the $[\text{SO}_2]$ will change when the equilibrium is disturbed by;

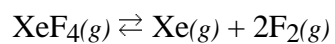
- a) Addition of O_2
- b) Addition of H_2O
- c) Addition of a catalyst
- d) Increase in temperature
- e) Decrease in the volume of the reaction container

PS8.7. The equilibrium constant, K_p , for the reaction



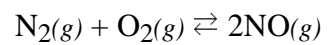
is 6.25 at 25 °C and $\Delta H^\circ = 34.4$ kJ. Calculate the magnitude of the equilibrium constant at 75 °C.

PS8.8. Given the reaction



A 10.0 liter vessel at 298 K initially contains a sample of XeF_4 at 1.25 atm. After the reaction achieves equilibrium, the total pressure in the vessel is 2.95 atm. Calculate K_p from this data.

PS8.9. The equilibrium constant, K_c , for the reaction



is 2.50×10^{-6} at a particular temperature. If the $[\text{N}_2]_0 = 2.00 \text{ M}$, the $[\text{O}_2]_0 = 1.00 \text{ M}$ and the $[\text{NO}]_0 = 0 \text{ M}$, calculate the equilibrium concentration of all species.