

Unit 7 – Chapter 13 Conclusion questions: Experiment 20

Name _____

Period _____

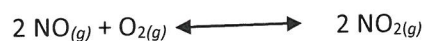
1. Calculate K_c at 303 K for:



$K_p = 34.5$ at this temperature

$$K_c = 858$$

2. The equilibrium constant for the reaction



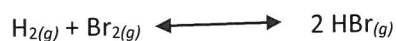
$K_p = 1.48 \times 10^4$ at 184°C

a) Calculate K_p for the reverse reaction $K_p = 6.76 \times 10^{-5}$

b) Does the equilibrium favor the production of NO and O_2 or does it favor NO_2 at this temperature?

→ Production of NO_2

3. A mixture of 1.374 g of H_2 and 70.31 g of Br_2 is heated in a 2.00-liter vessel at 700 K. The substances react as follows:



At equilibrium the vessel is found to contain 0.566 g of H_2 .

a) Calculate the equilibrium concentrations of all the reactants and products

b) Calculate the value of K_c .

$$\begin{aligned} \text{a) } & \text{H}_2 = .141 \text{ M} \\ & \text{Br}_2 = .020 \text{ M} \\ & \text{HBr} = .400 \text{ M} \end{aligned}$$

$$\text{b) } 57$$

4. At 100°C, K_c for the following reaction is 2.0×10^{-4}



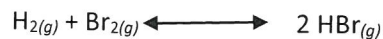
Calculate the concentrations of all the species at equilibrium for each of the following original mixtures:
2.0 moles of CO, 2.0 mol of O₂ in a 5-liter container.

$$\begin{aligned} [\text{CO}] &= .396 \text{ M} \\ [\text{O}_2] &= .396 \text{ M} \\ [\text{CO}_2] &= .003 \text{ M} \end{aligned}$$

5. Using the equilibrium equation in #4, calculate the direction the reaction will go at the following concentrations: $[\text{CO}] = 1.94 \text{ M}$, $[\text{O}_2] = 0.78 \text{ M}$, $[\text{CO}_2] = 0.007 \text{ M}$

$$Q = 1.67 \times 10^{-5} < K \quad \therefore \rightarrow$$

6. A mixture of 0.36 M H₂ and 0.30 M Br₂ is heated at 600 K. The equilibrium reaction is:



$$K_c = 4.2 \times 10^{-5}$$

Calculate the equilibrium concentrations of all reactants and products.

$$\begin{aligned} [\text{H}_2] &= .359 \text{ M} \\ [\text{Br}_2] &= .299 \text{ M} \\ [\text{HBr}] &= .00212 \text{ M} \end{aligned}$$

7. A mixture of 0.200 moles of CO₂, 0.100 moles of H₂, and 0.160 moles of H₂O is placed in a 2.00-liter vessel. The following equilibrium is established at 500 K.



a) Calculate the initial pressures of CO₂, H₂, and H₂O (Hint: Use $pV = nRT$)

b) At equilibrium $P_{\text{H}_2\text{O}} = 3.51 \text{ atm}$, calculate the equilibrium partial pressures of CO₂, H₂, and CO.

c) Calculate K_p for the reaction.

$$\begin{aligned} \text{a) } P_{\text{CO}_2} &= 4.10 \text{ ATM} \\ P_{\text{H}_2} &= 2.05 \text{ ATM} \\ P_{\text{H}_2\text{O}} &= 3.28 \text{ ATM} \end{aligned}$$

$$\begin{aligned} \text{b) } P_{\text{CO}_2} &= .387 \text{ ATM} \\ P_{\text{H}_2} &= 1.82 \text{ ATM} \\ P_{\text{CO}} &= .23 \text{ ATM} \\ P_{\text{H}_2\text{O}} (\text{GIVEN}) &= 3.51 \text{ ATM} \end{aligned}$$

$$\text{c) } K_p = .11$$