

Quiz 8 – Nov. 13, 2019

1. (5 pts) Which of the following is/are true **at equilibrium**? (Circle all that apply.)

- a. The rates of the forward and reverse reactions are equal.
 b. $\Delta G < 0$
 c. The amounts of reactants and products are equal
 d. None of the above

2. (20 pts) The reaction shown below has an equilibrium constant $K_P = 0.090$ at 25 °C.



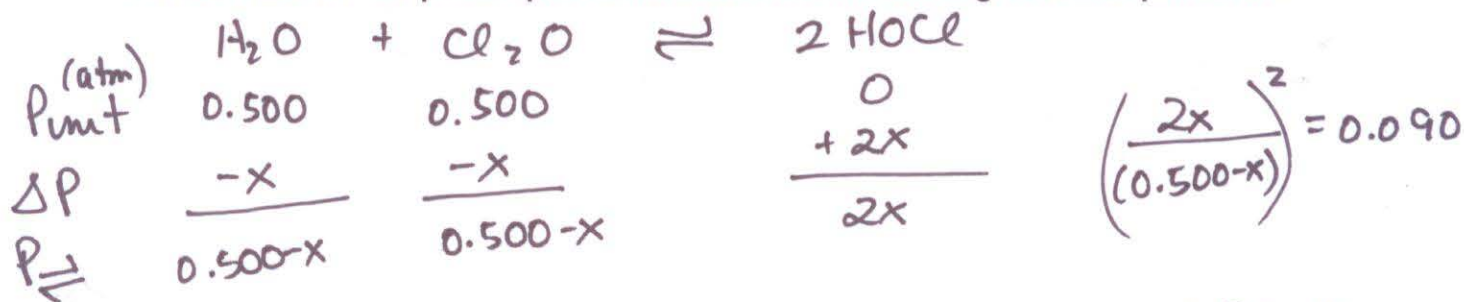
a. Write an expression for K_P .

$$K_P = \frac{(P_{\text{HOCl}})^2}{(P_{\text{H}_2\text{O}})(P_{\text{Cl}_2\text{O}})} = 0.090$$

b. Based on the K_P value given, do you expect reactants or products to dominate at equilibrium? **Explain** in a few words.

Reactants. $K_P < 1$, so denominator is larger than numerator.

c. Suppose that you combine 0.500 atm of H_2O with 0.500 atm of Cl_2O in an empty container. Please calculate the **partial pressure of each of the three gases at equilibrium**.



$$P_{\text{H}_2\text{O}} = P_{\text{Cl}_2\text{O}} = 0.500 - x = \underline{0.435 \text{ atm}}$$

$$P_{\text{HOCl}} = 2x = \underline{0.130 \text{ atm}}$$

$$\frac{2x}{0.500-x} = \sqrt{0.090} = 0.3$$

$$2x = 0.3(0.500-x)$$

$$2x = 0.15 - 0.3x$$

$$2.3x = 0.15$$

$$x = \underline{0.0652 \text{ atm}}$$