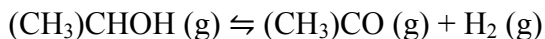


Worksheet 3

1. Isopropyl alcohol can dissociate into acetone and hydrogen:

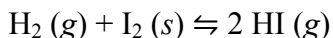


At 179 °C, the equilibrium constant for this dehydrogenation reaction is 0.444.

(a) If 10.00 g of isopropyl alcohol is placed in a 10.00 L vessel and heated to 179°C, what is the partial pressure of acetone when equilibrium is attained?

(b) What fraction of isopropyl alcohol is dissociated at equilibrium?

2. The equilibrium constant for the reaction:

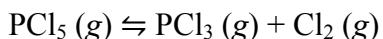


at 25°C is $K = 0.345$.

(a) If the partial pressure of hydrogen is $P_{\text{H}_2} = 1.00$ atm and solid iodine is present, what is the equilibrium partial pressure of hydrogen iodide, P_{HI} , at 25°C?

(b) An excess of solid I_2 is added to a container filled with hydrogen at 25°C and a pressure of 4.00 atm. Calculate the pressures of $\text{H}_2 (\text{g})$ and $\text{HI} (\text{g})$ reached at equilibrium.

3. At 300°C the equilibrium constant for the reaction



is $K = 11.5$.

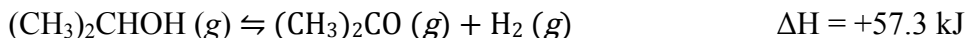
(a) Calculate the reaction quotient Q if initially $P_{\text{PCl}_3} = 2.0$ atm, $P_{\text{Cl}_2} = 6.0$ atm, and $P_{\text{PCl}_5} = 0.10$ atm. State whether the reaction proceeds to the right or to the left as equilibrium is approached.

(b) Calculate P_{PCl_3} , P_{Cl_2} , and P_{PCl_5} , at equilibrium.

(c) If the volume of the system is then increased, will the amount of PCl_5 present increase or decrease?

4. At 1000 K, $K_p = 19.9$ for the reaction $\text{Fe}_2\text{O}_3 (\text{s}) + 3 \text{CO} (\text{g}) \rightleftharpoons 2 \text{Fe} (\text{s}) + 3 \text{CO}_2 (\text{g})$. What are the equilibrium partial pressures of CO and CO_2 if CO is the only gas present initially, at a partial pressure of 0.978 atm?

5. In the gas phase at 400°C, isopropyl alcohol decomposes to acetone, an important industrial solvent:



Worksheet 3

Does the amount of acetone increase, decrease, or remain the same when an equilibrium mixture of reactants and products is subjected to the following changes?

- (a) The temperature is increased
- (b) The volume is increased
- (c) The addition of Argon
- (d) H_2 is added
- (e) A catalyst is added