

EXAM PRACTICE QUESTIONS

Chapter 17

1. Write the equilibrium constant expression for the following reaction.



Answer: $K_c = \frac{[\text{NO}]^4[\text{H}_2\text{O}]^6}{[\text{NH}_3]^4[\text{O}_2]^5}$

2. Some nitrogen and hydrogen gases are pumped into an empty 5.00-L vessel at 500 °C. When equilibrium was established, 3.00 moles of N_2 , 2.10 moles of H_2 , and 0.298 moles of NH_3 were present. Evaluate K_c at 500 °C.



Answer: $K_c = 0.080$

3. The equilibrium constant, K_c , for the following reaction is 0.0154 at a high temperature. A mixture in a container at this temperature has the concentrations: $[\text{H}_2] = 1.11 \text{ M}$, $[\text{I}_2] = 1.30 \text{ M}$ and $[\text{HI}] = 0.181 \text{ M}$. Will more product or more reactant be formed, or is the reaction at equilibrium?



Answer: $Q = 0.227 > K_c$, shifts left, reactants are produced

4. $K_c = 0.040$ for the system below at 450 °C. If a reaction is initiated with 0.20 mole of Cl_2 , and 0.20 mole of PCl_3 in a 1.0-L container, what concentration of PCl_5 will be present at equilibrium?



Answer: 0.13 M

5. Consider the equilibrium system below.



Predict the affect on the equilibrium due to the application of each of the following stresses.

- A) adding Cl_2 _____
- B) lower the temperature _____
- C) decreasing volume at constant temperature _____
- D) decreasing O_2 _____

Answer: right, left, left, right

6. A system at equilibrium in a 1.0-L container was found to contain 0.20 mol of A, 0.20 mol B, 0.40 mol C, and 0.40 mol of D. If 0.15 mol of A and 0.15 mold of B are added to this system, what will be the new equilibrium concentration of A?



Answer: 0.25 M

7. Consider the equilibrium system below.



At 250. °C a sample of PCl_5 was placed in a 24-L evacuated reaction vessel and allowed to come to equilibrium. Analysis showed that at equilibrium 0.42 mole of PCl_5 , 0.64 mole of PCl_3 , and 0.64 mole of Cl_2 were present in the vessel. Calculate K_p for the reaction at 250. °C.

Answer: 1.8

8. A sample of only solid ammonium chloride was heated in a 1.00-L container at 500. °C.



At equilibrium, the pressure of $\text{NH}_3(\text{g})$ was found to be 1.75 atm. What is the equilibrium constant, K_c , for the decomposition at this temperature.

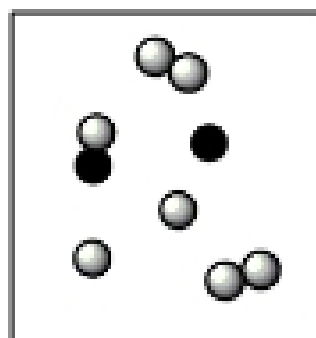
Answer: 7.62×10^4

9. Consider the following reaction at 25 °C for which ΔH° is -26.9 kJ and ΔS° is 11.4 J/K. Evaluate the equilibrium constant, K_p , for the reaction at 25 °C. $R = 8.314 \text{ J/mol}\cdot\text{K}$.



Answer: 2.05×10^5

10. The following picture represents a mixture that contains A atoms, B atoms, and AB and B_2 molecules for the hypothetical reaction given below. Calculate the equilibrium constant, K_c , for the reaction.



Answer: 1