

What will be the equilibrium concentration of ethene if the concentration of H_2 is 0.0619 M and the concentration of C_2H_6 is 1.055 M?

Mixed Review

- 503.** Using the reaction $\text{A} + 2\text{B} \rightleftharpoons \text{C} + 2\text{D}$, determine the equilibrium constant if the following equilibrium concentrations are found. All components are gases.

$$[\text{A}] = 0.0567 \text{ M}$$

$$[\text{B}] = 0.1171 \text{ M}$$

$$[\text{C}] = 0.0003378 \text{ M}$$

$$[\text{D}] = 0.0006756 \text{ M}$$

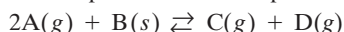
- 504.** In the reaction $2\text{A} \rightleftharpoons 2\text{C} + 2\text{D}$, determine the equilibrium constant when the following equilibrium concentrations are found. All components are gases.

$$[\text{A}] = 0.1077 \text{ M}$$

$$[\text{C}] = 0.0004104 \text{ M}$$

$$[\text{D}] = 0.0004104 \text{ M}$$

- 505.** Calculate the equilibrium constant for the following reaction. Note the phases of the components.



The equilibrium concentrations of the components are

$$[\text{A}] = 0.0922 \text{ M}$$

$$[\text{C}] = 4.11 \times 10^{-4} \text{ M}$$

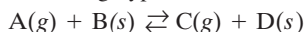
$$[\text{D}] = 8.22 \times 10^{-4} \text{ M}$$

- 506.** The equilibrium constant of the following reaction for the decomposition of phosgene at 25°C is 4.282×10^{-2} .



- What is the concentration of COCl_2 when the concentrations of both CO and Cl_2 are $5.90 \times 10^{-3} \text{ M}$?
- When the equilibrium concentration of COCl_2 is 0.00370 M, what are the concentrations of CO and Cl_2 ? Assume the concentrations are equal.

- 507.** Consider the following hypothetical reaction.



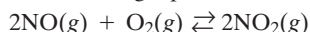
- If $K = 1$ for this reaction at 500 K, what can you say about the concentrations of A and C at equilibrium?
- If raising the temperature of the reaction results in an equilibrium with a higher concentration of C than A, how will the value of K change?

- 508.** The following reaction occurs when steam is passed over hot carbon. The mixture of gases it generates is called *water gas* and is useful as an industrial fuel and as a source of hydrogen for the production of ammonia.



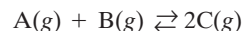
The equilibrium constant for this reaction is 4.251×10^{-2} at 800 K. If the equilibrium concentration of $\text{H}_2\text{O}(\text{g})$ is 0.1990 M, what concentrations of CO and H_2 would you expect to find?

- 509.** When nitrogen monoxide gas comes in contact with air, it oxidizes to the brown gas nitrogen dioxide according to the following equation:

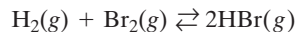


- The equilibrium constant for this reaction at 500 K is 1.671×10^4 . What concentration of NO_2 is present at equilibrium if $[\text{NO}] = 6.200 \times 10^{-2} \text{ M}$ and $[\text{O}_2] = 8.305 \times 10^{-3} \text{ M}$?
- At 1000 K, the equilibrium constant, K , for the same reaction is 1.315×10^{-2} . What will be the concentration of NO_2 at 1000 K given the same concentrations of NO and O_2 as were in (a)?

- 510.** Consider the following hypothetical reaction, for which $K = 1$ at 300 K:

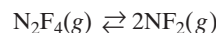


- If the reaction begins with equal concentrations of A and B and a zero concentration of C, what can you say about the relative concentrations of the components at equilibrium?
 - Additional C is introduced at equilibrium, and the temperature remains constant. When equilibrium is restored, how will the concentrations of all components have changed? How will K have changed?
- 511.** The equilibrium constant for the following reaction of hydrogen gas and bromine gas at 25°C is 5.628×10^{18} :



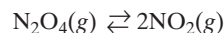
- Write the equilibrium expression for this reaction.
- Assume that equimolar amounts of H_2 and Br_2 were present at the beginning. Calculate the equilibrium concentration of H_2 if the concentration of HBr is 0.500 M.
- If equal amounts of H_2 and Br_2 react, which reaction component will be present in the greatest concentration at equilibrium? Explain your reasoning.

- 512.** The following reaction reaches an equilibrium state:



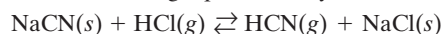
At equilibrium at 25°C the concentration of N_2F_4 is found to be 0.9989 M and the concentration of NF_2 is $1.131 \times 10^{-3} \text{ M}$. Calculate the equilibrium constant of the reaction.

- 513.** The equilibrium between dinitrogen tetroxide and nitrogen dioxide is represented by the following equation:



A student places a mixture of the two gases into a closed gas tube and allows the reaction to reach equilibrium at 25°C . At equilibrium, the concentration of N_2O_4 is found to be $5.95 \times 10^{-1} \text{ M}$ and the concentration of NO_2 is found to be $5.24 \times 10^{-2} \text{ M}$. What is the equilibrium constant of the reaction?

- 514.** Consider the following equilibrium system:



- Write a complete expression for the equilibrium constant of this system.
 - The equilibrium constant for this reaction is 2.405×10^6 . What is the concentration of HCl remaining when the concentration of HCN is 0.8959 M?
- 515.** The following reaction is used in the industrial production of hydrogen gas:

