MULTIPLE CHOICE

1. Which of the following statements is true?

a. When two opposing processes are proceeding at identical rates, the system is at equilibrium.

b. Catalysts are an effective means of changing the position of an equilibrium.

c. The concentration of the products equals that of reactants and is constant at equilibrium.

d. An endothermic reaction shifts toward reactants when heat is added to the reaction.

e. None of these statements is true.

2. If, at a given temperature, the equilibrium constant for the reaction

\[ \text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{HCl}(\text{g}) \]

is \( K_p \), then the equilibrium constant for the reaction

\[ \text{HCl}(\text{g}) \rightleftharpoons \frac{1}{2}\text{H}_2(\text{g}) + \frac{1}{2}\text{Cl}_2(\text{g}) \]

can be represented as:

a. \( \frac{1}{K_p} \)

b. \( K_p \)

c. \( \frac{1}{\sqrt{K_p}} \)

d. \( \sqrt{K_p} \)

Use the following information to answer the question(s) below.

Consider the chemical system \( \text{CO} + \text{Cl}_2 \rightleftharpoons \text{COCl}_2 \); \( K = 4.6 \times 10^9 \text{ L/mol} \).

3. How do the equilibrium concentrations of the reactants compare to the equilibrium concentration of the product?

a. They are much smaller.

b. They are much bigger.

c. They are about the same.

d. They have to be exactly equal.

e. You can't tell from the information given.

Use the following information to answer the question(s) below.

Consider the following equilibrium:

\[ 2\text{NOCl}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \]

with \( K = 1.6 \times 10^{-5} \text{ mol/L} \). 1.00 mole of pure NOCl and 1.00 mole of pure Cl\(_2\) are replaced in a 1.00-L container.
4. If $x$ moles of NOCl react, what is the equilibrium concentration of NO?
   a. $+x$
   b. $+2x$
   c. $-x$
   d. $-2x$
   e. $x$

5. If $x$ moles of NOCl react, what is the equilibrium concentration of Cl$^-$?
   a. $+x$
   b. $+\frac{x}{2}$
   c. $1 + x$
   d. $1 + \frac{x}{2}$
   e. $1 + 2x$

6. Calculate the equilibrium concentration of NO(g).
   a. 1.0 M
   b. $1.6 \times 10^{-5}$ M
   c. 0.50 M
   d. $6.2 \times 10^{-4}$ M
   e. $4.0 \times 10^{-8}$ M