

Equilibrium Practice # 1

Approaching Equilibrium MCQ Questions

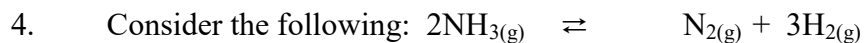
1. Consider the following equilibrium: $\text{H}_2\text{O}_{(g)} + \text{CO}_{(g)} \rightleftharpoons \text{H}_2_{(g)} + \text{CO}_{2(g)}$

A closed container is initially filled with H_2O and CO . As the reaction proceeds towards equilibrium the

- A. $[\text{CO}]$ and $[\text{CO}_2]$ both increase
 - B. $[\text{CO}]$ and $[\text{CO}_2]$ both decrease
 - C. $[\text{CO}]$ increases and $[\text{CO}_2]$ decreases
 - D. $[\text{CO}]$ decreases and $[\text{CO}_2]$ increases
2. Consider the following equilibrium: $2\text{SO}_{3(g)} \rightleftharpoons 2\text{SO}_{2(g)} + \text{O}_{2(g)}$

At equilibrium, the rate of decomposition of SO_3

- A. Equals the rate of formation of O_2
 - B. Equals the rate of formation of SO_3
 - C. Is less than the rate of formation of O_2
 - D. Is less than the rate of formation of SO_3
3. Which of the following is true for all equilibrium systems?
- A. The mass of reactants is equal to the mass of products
 - B. Addition of a catalyst changes the equilibrium concentrations
 - C. The concentration of reactants is equal to the concentration of products
 - D. The rate of the forward reaction is equal to the rate of the reverse reaction



A flask is initially filled with NH_3 . As the system approaches equilibrium, the rate of the forward reaction

- A. Increases as the rate of the reverse reaction decreases
 - B. Decreases as the rate of the reverse reaction increases
 - C. Increases as the rate of the reverse reaction increases
 - D. Decreases as the rate of the reverse reaction decreases
5. A system at equilibrium is said to be dynamic because at equilibrium the
- A. Temperature does not change
 - B. Macroscopic properties are constant
 - C. Forward and reverse reactions continue to occur
 - D. Concentrations of reactants and products are constant
6. In all systems at equilibrium, the
- A. Concentration of reactants is less than the concentration of products
 - B. Concentration of reactants and the concentration of products are equal
 - C. Concentration of reactants is greater than the concentration of products
 - D. Concentration of reactants and the concentration of products are constant

7. Consider the following equilibrium: $\text{H}_2\text{O}_{(g)} + \text{CO}_{(g)} \rightleftharpoons \text{H}_2_{(g)} + \text{CO}_{2(g)}$
- At high temperature, H_2O and CO are placed in a closed container. As the system approaches equilibrium, the
- A. Rate of the forward and reverse reaction both increase
 - B. Rate of the forward and reverse reaction both decrease
 - C. Rate of the forward reaction decreases and the rate of the reverse reaction increases
 - D. Rate of the forward reaction increases and the rate of the reverse reaction decreases
8. Which of the following statements are true for all equilibrium systems?
- I. Macroscopic Properties are constant
 - II. Mass of the reactants equals mass of the products
 - III. Equilibrium can be achieved from either products or reactants
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II, and III
9. Consider the following equilibrium: $\text{N}_2\text{O}_{4(g)} + \text{heat} \rightleftharpoons 2\text{NO}_{2(g)}$
- Initially, a 1.0 L container is filled with 2.0 mol of NO_2 . As the system approaches equilibrium, the rate of reaction of NO_2
- A. Increases and $[\text{N}_2\text{O}_4]$ increases
 - B. Increases and $[\text{N}_2\text{O}_4]$ decreases
 - C. Decreases and $[\text{N}_2\text{O}_4]$ increases
 - D. Decreases and $[\text{N}_2\text{O}_4]$ decreases



Nitrogen gas and oxygen react when placed in a closed container. As the reaction proceeds towards equilibrium,

the rate of the reverse reaction

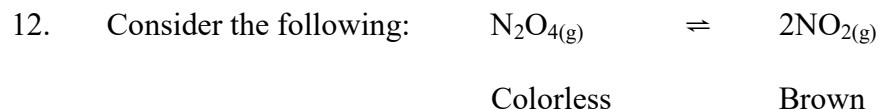
- A. Increases as the concentration of products decreases
- B. Decreases as the concentration of products decreases
- C. Increases as the concentration of products increases
- D. Decreases as the concentration of products increases

11. Consider the following

I	Constant Temperature
II	Equal concentrations of reactants and products
III	Equal rates of forward and reverse reactions

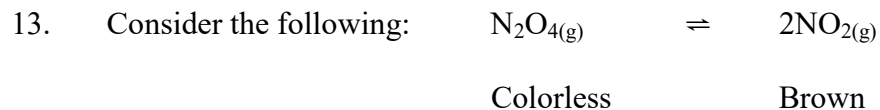
A system at equilibrium must have

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II , and III



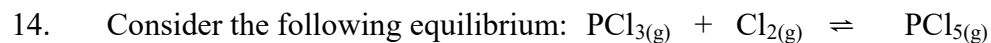
NO_2 is placed in a flask at a constant temperature. Which of the following is true as the system approaches equilibrium?

- A. The Color gets darker as $[\text{NO}_2]$ increases.
- B. The Color gets lighter as $[\text{NO}_2]$ decreases.
- C. The Color gets darker as $[\text{N}_2\text{O}_4]$ increases.
- D. The Color gets lighter as $[\text{N}_2\text{O}_4]$ decreases.



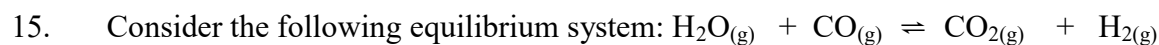
N_2O_4 is placed in a flask at a constant temperature. Which of the following is true as the system approaches equilibrium?

- A. The Color gets darker as $[\text{NO}_2]$ increases.
- B. The Color gets lighter as $[\text{NO}_2]$ decreases.
- C. The Color gets darker as $[\text{N}_2\text{O}_4]$ increases.
- D. The Color gets lighter as $[\text{N}_2\text{O}_4]$ decreases.



If PCl_5 is put in a container, how will the reaction rates change as the system approaches equilibrium?

- | | Forward Rate | Reverse Rate |
|----|--------------|--------------|
| A. | increases | increases |
| B. | increases | decreases |
| C. | decreases | decreases |
| D. | decreases | increases |

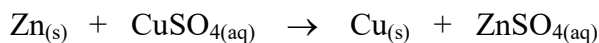


2.00 mole of CO_2 and 2.00 mole of H_2 are placed in a container and the system approached equilibrium.

The following changes occur:

- | | $[\text{CO}_2]$ | $[\text{H}_2]$ | $[\text{CO}]$ |
|----|-----------------|----------------|---------------|
| A. | increases | decreases | decreases |
| B. | increases | increases | decreases |
| C. | decreases | increases | increases |
| D. | decreases | decreases | increases |

16. For the equilibrium system below:



We would know the system is at equilibrium because:

- A. $[\text{Cu}^{2+}] = [\text{Zn}^{2+}]$
- B. $\text{Cu}_{(s)} = \text{Zn}_{(s)}$
- C. the mass of $\text{Cu}_{(s)}$ remains constant.
- D. the mass of the entire system remains constant.

17. Which of the factors below is not a condition necessary for equilibrium?
- A. a closed system
 - B. a constant temperature
 - C. equal forward and reverse reaction rates
 - D. equal concentrations of reactants and products
18. Products are placed in a beaker. How do the rates of the forward and reverse reactions changes
the system proceeds to equilibrium?
- | | Forward Rate | Reverse Rate |
|----|--------------|--------------|
| A. | increases | increases |
| B. | increases | decreases |
| C. | decreases | increases |
| D. | decreases | decreases |
19. Which of the factors below is not a condition necessary for equilibrium?
- A. constant macroscopic properties
 - B. constant concentrations of reactant and product
 - C. equal forward and reverse reaction rates
 - D. a high activation energy