Equilibrium Quiz # 1 Approaching Equilibrium

1. Consider the following equilibrium: H2O(g) + CO(g) ⇄ H2(g) + CO2(g)

A closed container is initially filled with H2O and CO. As the reaction proceeds towards equilibrium the

 A. [CO] and [CO2] both increase

 B. [ CO] and [CO2] both decrease

 C. [CO] increases and [CO2] decreases

 D. [CO] decreases and [CO2] increases

2. Consider the following equilibrium: 2SO3(g) ⇄ 2SO2(g) + O2(g)

At equilibrium, the rate of decomposition of SO3

 A. Equals the rate of formation of O2

 B. Equals the rate of formation of SO3

 C. Is less than the rate of formation of O2

 D. Is less than the rate of formation of SO3

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

4. Consider the following: 2NH3(g)  ⇄ N2(g) + 3H2(g)

A flask is initially filled with NH3. 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: H2O(g) + CO(g) ⇄ H2(g) + CO2(g)

At high temperature, H2O 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: N2O4(g) + heat ⇄ 2NO2(g)

Initially, a 1.0 L container is filled with 2.0 mol of NO2. As the system approaches equilibrium, the rate of reaction of NO2

 A. Increases and [ N2O4 ] increases

 B. Increases and [ N2O4 ] decreases

 C. Decreases and [ N2O4 ] increases

 D. Decreases and [ N2O4 ] decreases

10. Consider the following equilibrium: N2(g) + O2(g)  ⇄ 2NO(g)

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

12. Consider the following: N2O4(g)  ⇌ 2NO2(g)

 Colourless Brown

NO2 is placed in a flask at a constant temperature. Which of the following is true as the system approaches equilibrium?

A. The colour gets darker as [NO2] increases.

B. The colour gets lighter as [NO2] decreases.

C. The colour gets darker as [N2O4] increases.

D. The colour gets lighter as [N2O4] decreases.

13. Consider the following: N2O4(g)  ⇌ 2NO2(g)

 Colourless Brown

N2O4 is placed in a flask at a constant temperature. Which of the following is true as the system approaches equilibrium?

A. The colour gets darker as [NO2] increases.

B. The colour gets lighter as [NO2] decreases.

C. The colour gets darker as [N2O4] increases.

D. The colour gets lighter as [N2O4] decreases.

14. Consider the following equilibrium: PCl3(g) + Cl2(g) ⇌ PCl5(g)

If PCl5 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

15. Consider the following equilibrium system: H2O(g) + CO(g) ⇌ CO2(g) + H2(g)

2.00 mole of CO2 and 2.00 mole of H2 are placed in a container and the system approached equilibrium.

The following changes occur:

 [CO2] [H2] [CO]

A. increases decreases decreases

B. increases increases decreases

C. decreases increases increases

D. decreases decreases increases

16. For the equilibrium system below:

Zn(s)  + CuSO4(aq) → Cu(s) + ZnSO4(aq)

We would know the system is at equilibrium because:

A. [Cu2+] = [Zn2+]

B. Cu(s) = Zn(s)

C. the mass of 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