

Review Questions

18. Which factors must be equal when a reversible chemical process reaches equilibrium?

- (1) mass of the reactants and mass of the products
- (2) rate of the forward reaction and rate of the reverse reaction
- (3) concentration of the reactants and concentration of the products
- (4) activation energy of the forward reaction and activation energy of the reverse reaction

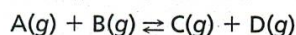
20. Which description applies to a system in a sealed flask that is half full of water?

- (1) Only evaporation occurs, but it eventually stops.
- (2) Only condensation occurs, but it eventually stops.
- (3) Neither evaporation nor condensation occurs.
- (4) Both evaporation and condensation occur.

21. Solution equilibrium always exists in a solution that is

- (1) unsaturated
- (2) saturated
- (3) dilute
- (4) concentrated

22. Given the reaction at equilibrium:



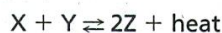
The addition of a catalyst will

- (1) shift the equilibrium to the right
- (2) shift the equilibrium to the left
- (3) increase the rate of forward and reverse reactions equally
- (4) have no effect on the forward or reverse reactions

23. If a catalyst is added to a system at equilibrium and the temperature and pressure remain constant, there will be no effect on the

- (1) rate of the forward reaction
- (2) rate of the reverse reaction
- (3) activation energy of the reaction
- (4) heat of reaction

24. Consider the equation for the following reaction at equilibrium.



The concentration of the product could be increased by

- (1) adding a catalyst
- (2) adding more heat to the system
- (3) increasing the concentration of Y
- (4) decreasing the concentration of X

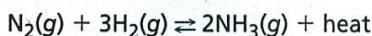
25. In a reversible reaction, chemical equilibrium is attained when the

- (1) rate of the forward reaction is greater than the rate of the reverse reaction
- (2) rate of the reverse reaction is greater than the rate of the forward reaction
- (3) concentration of the reactants reaches zero
- (4) concentration of the products remains constant

19. A solute is added to water and a portion of the solute remains undissolved. When equilibrium between the dissolved and undissolved solute is reached, the solution must be

- (1) dilute
- (2) saturated
- (3) unsaturated
- (4) supersaturated

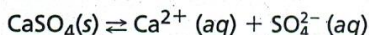
26. Consider the following equation.



What stress would cause the equilibrium to shift to the left?

- (1) increasing the temperature
- (2) increasing the pressure
- (3) adding $N_2(g)$ to the system
- (4) adding $H_2(g)$ to the system

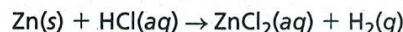
27. Consider the equation for the following reaction at equilibrium.



When Na_2SO_4 is added to the system, how will the equilibrium shift?

- (1) The amount of $CaSO_4$ will decrease, and the concentration of $Ca^{2+}(aq)$ will decrease.
- (2) The amount of $CaSO_4$ will decrease, and the concentration of $Ca^{2+}(aq)$ will increase.
- (3) The amount of $CaSO_4$ will increase, and the concentration of $Ca^{2+}(aq)$ will decrease.
- (4) The amount of $CaSO_4$ will increase, and the concentration of $Ca^{2+}(aq)$ will increase.

28. Consider the following equation.



As the concentration of the $HCl(aq)$ decreases at constant temperature, the rate of the forward reaction

- (1) decreases
- (2) increases
- (3) remains the same

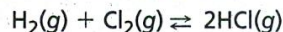
29. Consider the following equation.



Which change will not shift the point of equilibrium?

- (1) changing the pressure
- (2) changing the temperature
- (3) changing the concentration of $H_2(g)$
- (4) changing the concentration of $HF(g)$

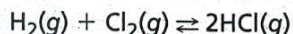
30. Consider the following equation.



As the pressure increases at constant temperature, the mass of $H_2(g)$

- (1) decreases
- (2) increases
- (3) remains the same

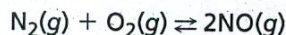
31. Consider a reaction at STP and at equilibrium.



Which change will result in an increase in the concentration of $\text{Cl}_2(\text{g})$?

- (1) decreasing the pressure on the system
- (2) decreasing the concentration of HCl
- (3) increasing the concentration of $\text{H}_2(\text{g})$
- (4) increasing the concentration of HCl

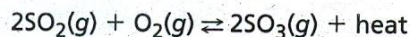
32. Consider the following equation.



As the concentration of $\text{N}_2(\text{g})$ increases, the concentration of $\text{O}_2(\text{g})$ will

- (1) decrease
- (2) increase
- (3) remain the same

33. Consider the following equation.



Which change will shift the equilibrium to the right?

- (1) decreasing the concentration of SO_2
- (2) decreasing the pressure
- (3) increasing the concentration of O_2
- (4) increasing the temperature

34. The addition of a catalyst to a system at equilibrium will increase the rate of

- (1) the forward reaction only
- (2) the reverse reaction only
- (3) both the forward and reverse reactions
- (4) neither the forward nor the reverse reaction

35. A system is said to be in a state of dynamic equilibrium when the

- (1) concentration of products is greater than the concentration of reactants
- (2) concentration of products is less than the concentration of reactants
- (3) rate at which products are formed is greater than the rate at which reactants are formed
- (4) rate at which products are formed is the same as the rate at which reactants are formed