NCEA Level 2 Chemistry Practice Exam (Sample)

Study Guide

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Questions

1. Can a catalyst alter the position of equilibrium or the value of Kc?

A. Yes, it can change both

B. No, it cannot change the equilibrium position

C. Yes, but only the value of Kc

D. No, it only increases reaction speed

2. Which of these is an indicator of a reaction at equilibrium?

A. Reactants are completely consumed.

B. Forward and reverse reactions happen at equal rates.

C. The reaction stops entirely.

D. All reactants are converted to products.

3. What happens to the number of effective collisions when temperature increases?

A. They decrease

B. They remain constant

C. They increase

D. They fluctuate randomly

4. What does it mean if a species is described as amphiplotic?

A. It can act as a catalyst

B. It can only accept protons

C. It can donate protons

D. It can accept or donate a proton

5. Increasing concentration in a reaction primarily affects what aspect?

A. The temperature of the reaction

B. The number of particles per unit volume

C. The activation energy required

D. The volume of the reaction mixture

6. What is necessary for electricity to be conducted in a material?

- **A. Presence of metallic bonds**
- **B. Presence of free moving charged particles**
- **C. High temperature**
- **D. Low ionization energy**

7. In which condition do weak bases operate primarily?

- **A. At High Concentrations Only**
- **B. In Non-Aqueous Solutions**
- **C. Partially Dissociated**
- **D. Completely Dissociated**

8. What does the term "mol" refer to in chemistry?

- **A. A unit of mass**
- **B. A quantity of substance containing Avogadro's number of particles**
- **C. A type of chemical bond**
- **D. A scale for measuring acidity**

9. What effect does an increase in temperature have on the conductivity of ionic solutions?

- **A. It decreases conductivity**
- **B. It has no effect**
- **C. It increases conductivity**
- **D. It makes conductivity sporadic**

10. According to the law of conservation of mass, what happens to mass in a chemical reaction?

- **A. Mass is created and destroyed**
- **B. Mass is transformed into energy**
- **C. Mass remains constant**
- **D. Mass is converted into heat**

Answers

1. B
2. B
3. C
4. D
5. B
6. B
7. C
8. B
9. C
10. C

Explanations

1. Can a catalyst alter the position of equilibrium or the value of Kc?

A. Yes, it can change both

B. No, it cannot change the equilibrium position

C. Yes, but only the value of Kc

D. No, it only increases reaction speed

A catalyst is a substance that increases the rate of a chemical reaction without being consumed in the process. It works by providing an alternative pathway for the reaction with a lower activation energy. While a catalyst speeds up the rate at which equilibrium is reached for both the forward and reverse reactions, it does not change the actual position of the equilibrium or the equilibrium constant (Kc). The position of equilibrium is determined by the relative energies of the reactants and products and the stoichiometry of the reaction. A catalyst affects the kinetics of the reaction but does not alter the thermodynamic parameters that define the equilibrium state. Therefore, although a catalyst makes it faster to reach equilibrium, it does not shift the equilibrium position toward products or reactants, nor does it change the value of Kc, which is a constant at a given temperature for a specific reaction. This is why the correct statement is that a catalyst does not change the equilibrium position.

2. Which of these is an indicator of a reaction at equilibrium?

A. Reactants are completely consumed.

B. Forward and reverse reactions happen at equal rates.

C. The reaction stops entirely.

D. All reactants are converted to products.

The indication of a reaction at equilibrium is when the forward and reverse reactions occur at equal rates. This means that the rate at which reactants are converted into products matches the rate at which products are converted back into reactants. As a result, the concentrations of both reactants and products remain constant over time, although they may not be equal in amount. This balance reflects a dynamic state where both reactions are still occurring, but there is no net change in concentration. In contrast, if reactants are completely consumed or if all reactants are converted to products, those scenarios would indicate that the reaction has gone to completion and is not at equilibrium. The reaction stopping entirely signifies that there is no further reaction occurring, which also indicates a lack of dynamic balance characteristic of an equilibrium state.

3. What happens to the number of effective collisions when temperature increases?

A. They decrease

B. They remain constant

C. They increase

D. They fluctuate randomly

When temperature increases, the kinetic energy of the molecules also increases. This leads to a greater velocity for the molecules, which means they are moving faster. As a result, there is a higher frequency of collisions between reacting particles. In addition to the increase in the number of collisions, a rise in temperature also has a significant impact on the energy of those collisions. More particles collide with enough energy to overcome the activation energy barrier required for a reaction to occur. This combination of increased collision frequency and increased energy leads to a rise in the number of effective collisions, which are collisions that result in a chemical reaction. Thus, the correct choice reflects that an increase in temperature enhances both the rate of collision and the effectiveness of those collisions, ultimately contributing to a greater number of successful interactions at the molecular level.

4. What does it mean if a species is described as amphiplotic?

A. It can act as a catalyst

B. It can only accept protons

C. It can donate protons

D. It can accept or donate a proton

A species is described as amphiplotic when it has the ability to both accept and donate protons. This characteristic is significant in the context of acid-base chemistry, where substances that can perform both roles play a crucial part in chemical reactions. Such species are often involved in maintaining pH levels in biological systems and can participate in various reactions depending on the surrounding chemical environment. This dual capability allows amphiplotic species to interact flexibly with other substances, making them important in buffering systems and other chemical equilibria. For example, water can serve as an amphiplotic species because it can donate a proton to become hydroxide (OH^-) or accept a proton to form hydronium (H_3O^+). Understanding this property is essential for grasping the dynamics of acid-base reactions and the behavior of molecules in different contexts.

5. Increasing concentration in a reaction primarily affects what aspect?

A. The temperature of the reaction

B. The number of particles per unit volume

C. The activation energy required

D. The volume of the reaction mixture

Increasing the concentration in a chemical reaction primarily affects the number of particles per unit volume. When the concentration of reactants increases, there are more particles present in a given volume, which results in a higher likelihood of collisions between these particles. According to collision theory, the rate of a chemical reaction depends on the frequency of effective collisions between reactant particles. Therefore, a higher concentration increases the chances of these collisions occurring, leading to an increased rate of reaction. While other factors such as temperature, activation energy, and volume can influence a reaction, they are not directly affected by an increase in concentration. Temperature can affect the energy of the particles and the rate of reaction, but increasing concentration alone does not inherently change temperature. Similarly, activation energy is a characteristic of the reaction mechanism and is not altered simply by changing concentration. Lastly, the volume of the reaction mixture may change in some contexts, but this is not a direct effect of increasing concentration; rather, it's a consequence of how the reactants are mixed or contained. Therefore, the primary and direct impact of increasing concentration is on the number of reactant particles per unit volume.

6. What is necessary for electricity to be conducted in a material?

A. Presence of metallic bonds

B. Presence of free moving charged particles

C. High temperature

D. Low ionization energy

For electricity to be conducted in a material, the presence of free-moving charged particles is essential. These charged particles can be electrons in metals or ions in electrolytes. When an electric field is applied, these charged particles move, allowing electrical current to flow through the material. In metals, the structure allows for delocalized electrons, which can easily move throughout the material, thus facilitating electrical conduction. In ionic compounds, when dissolved in water or melted, the lattice structure breaks down, allowing ions (which carry charge) to move freely, resulting in conductivity. While metallic bonds are strong and contribute to the presence of these free electrons, they alone do not guarantee the ability to conduct electricity since the mobility of the electrons is what primarily affects conductivity. High temperature can increase the energy and movement of particles, but it is not a requirement for conduction and can sometimes actually impede it in insulators. Low ionization energy indicates that an element can lose electrons easily, but it is the actual presence of those free-moving charged particles that is fundamentally necessary for electrical conduction.

7. In which condition do weak bases operate primarily?

A. At High Concentrations Only

B. In Non-Aqueous Solutions

C. Partially Dissociated

D. Completely Dissociated

Weak bases primarily operate in a condition where they are partially dissociated in solution. This characteristic is fundamental to understanding weak acids and bases. Unlike strong bases, which dissociate completely in solution to release hydroxide ions (OH^-), weak bases only partially ionize. As a result, they exist in a state of equilibrium between the un-dissociated base and the ions produced. For instance, when a weak base like ammonia (NH_3) is dissolved in water, it exists mainly in its molecular form, with only a small fraction converting to ammonium ions (NH_4^+) and hydroxide ions (OH^-). This equilibrium dynamic is crucial in determining the pH of the solution and reflects the fundamental behavior of weak bases. Understanding this concept is essential, as it helps predict how these substances will behave in various chemical contexts, such as in buffering solutions or during reactions with acids.

8. What does the term "mol" refer to in chemistry?

A. A unit of mass

B. A quantity of substance containing Avogadro's number of particles

C. A type of chemical bond

D. A scale for measuring acidity

The term "mol" in chemistry specifically refers to a quantity of substance that contains Avogadro's number of particles, which is approximately 6.022×10^{23} entities (such as atoms, molecules, ions, etc.). This definition is foundational in chemistry as it provides a bridge between the atomic scale and macroscopic quantities of substances that we can measure in the laboratory. By using the mole as a unit, chemists can relate masses of substances to the number of particles they contain, allowing for stoichiometric calculations in chemical reactions. The mole is crucial for determining how reactants combine to form products in precise amounts based on their chemical formulas. The other options do not accurately describe the concept of a mole. For instance, while mass is a relevant concept in chemistry, it is not the definition of a mole. Similarly, a type of chemical bond pertains to interactions between atoms, which is distinct from the mole's function. Lastly, a scale for measuring acidity, such as pH, is unrelated to the definition of a mole, highlighting that the mole specifically deals with counting particles rather than chemical properties.

9. What effect does an increase in temperature have on the conductivity of ionic solutions?

A. It decreases conductivity

B. It has no effect

C. It increases conductivity

D. It makes conductivity sporadic

An increase in temperature generally leads to an increase in the conductivity of ionic solutions. This phenomenon can be understood through a couple of key concepts in chemistry. When the temperature of an ionic solution rises, the ions that are present in the solution acquire more energy. This increased energy leads to greater molecular motion among the ions, allowing them to move more freely and rapidly through the solution. As a result, the movement of these charged particles is enhanced, leading to an increase in electrical conductivity. Additionally, with higher temperatures, the viscosity of the solvent (usually water) decreases, making it easier for the ions to navigate through the solution. The combination of increased ion mobility and reduced viscosity means that the solution becomes a better conductor of electricity at elevated temperatures. Thus, the impact of temperature on ionic solution conductivity is a direct relationship where rising temperatures enhance the ability of the solution to conduct electricity.

10. According to the law of conservation of mass, what happens to mass in a chemical reaction?

A. Mass is created and destroyed

B. Mass is transformed into energy

C. Mass remains constant

D. Mass is converted into heat

In a chemical reaction, according to the law of conservation of mass, the total mass of the reactants must equal the total mass of the products. This principle asserts that matter cannot be created or destroyed in a closed system during a chemical reaction. Therefore, when substances undergo a transformation during a reaction, the mass stays consistent throughout the process. This means that even though the substances may change form and structure, the total quantity of matter before and after the reaction remains the same, exemplifying that mass is conserved. Hence, the statement that mass remains constant during a chemical reaction accurately reflects this fundamental principle of chemistry.