

Weak Bases Quiz Questions and Answers PDF

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In the reaction of a weak base with water, what is formed?

- Only OH⁻ ions
- Only H⁺ ions
- BH⁺ and OH⁻ ions ✓**
- Only BH⁺ ions

When a weak base reacts with water, it typically forms hydroxide ions (OH⁻) and the corresponding conjugate acid of the weak base. This process is known as hydrolysis.

In which scenarios would you find weak bases being used? (Select all that apply)

- Buffer solutions ✓**
- Strong acid neutralization
- Cleaning agents
- Biological systems ✓**

Weak bases are commonly used in scenarios such as buffer solutions, biological systems, and certain chemical reactions where a controlled pH is necessary. They are also utilized in applications like titrations and in the production of pharmaceuticals.

Which of the following are true about the pH calculation of weak bases? (Select all that apply)

- pH = 14 - pOH ✓**
- Requires K_b value ✓**
- Directly measured by pH meter
- Involves calculating pOH first ✓**

The pH calculation of weak bases involves understanding their dissociation in water and the equilibrium constant (K_b) associated with that dissociation. Additionally, the pH can be derived from the concentration of hydroxide ions produced, which is related to the base's strength and concentration.

Which of the following are weak bases? (Select all that apply)

- Ammonia (NH_3) ✓
- Sodium hydroxide (NaOH)
- Aniline ($\text{C}_6\text{H}_5\text{NH}_2$) ✓
- Potassium hydroxide (KOH)

Weak bases are substances that do not completely ionize in solution, resulting in a lower concentration of hydroxide ions. Common examples include ammonia (NH_3) and certain amines.

Which of the following statements about weak bases are true? (Select all that apply)

- They have a high K_b value.
- They establish an equilibrium in solution. ✓
- They are fully ionized in water.
- They can act as buffers. ✓

Weak bases are substances that partially ionize in solution, resulting in a lower concentration of hydroxide ions compared to strong bases. They typically have a lower pH and a weaker ability to accept protons than strong bases.

What are the characteristics of weak bases? (Select all that apply)

- High pH
- Partial ionization ✓
- Strong electrolyte
- Forms a buffer with its salt ✓

Weak bases are characterized by their incomplete ionization in solution, lower pH levels compared to strong bases, and a tendency to establish an equilibrium between the base and its ions. They typically have a lower concentration of hydroxide ions compared to strong bases.

What is the relationship between K_b and K_a for a conjugate acid-base pair?

- $K_b = K_a$
- $K_b \times K_a = K_w$ ✓
- $K_b + K_a = 1$
- $K_b - K_a = 0$

The relationship between K_b and K_a for a conjugate acid-base pair is given by the equation $K_a \times K_b = K_w$, where K_w is the ion product of water at a given temperature. This means that as the strength of

the acid (K_a) increases, the strength of its conjugate base (K_b) decreases, and vice versa.

Which of the following best describes the pH of a solution containing a weak base?

- Exactly 7
- Less than 7
- Greater than 7 ✓
- Exactly 14

A solution containing a weak base typically has a pH greater than 7 but less than 14, indicating that it is basic but not strongly so.

Which of the following weak bases is commonly used in pharmaceuticals?

- Sodium bicarbonate
- Methylamine ✓
- Potassium hydroxide
- Calcium carbonate

Weak bases such as diphenhydramine and ranitidine are commonly used in pharmaceuticals for their antihistamine and acid-reducing properties, respectively.

What is a characteristic of a weak base?

- Completely dissociates in water
- Partially dissociates in water ✓
- Does not dissociate in water
- Forms a strong acid

A weak base is characterized by its incomplete ionization in solution, resulting in a lower concentration of hydroxide ions compared to strong bases.

Which factor does NOT affect the strength of a weak base?

- Temperature
- Concentration
- Pressure ✓
- Common ion effect

The strength of a weak base is primarily influenced by factors such as its concentration, the presence of other ions in solution, and the temperature. However, the molecular weight of the base does not directly affect its strength as a weak base.

Which of the following is an example of a weak base?

- Sodium hydroxide (NaOH)
- Ammonia (NH₃) ✓
- Hydrochloric acid (HCl)
- Sulfuric acid (H₂SO₄)

A weak base is a substance that partially ionizes in solution, resulting in a lower concentration of hydroxide ions compared to strong bases. An example of a weak base is ammonia (NH₃).

What does the equilibrium constant (K_b) represent for a weak base?

- The rate of reaction
- The extent of dissociation ✓
- The color change in a reaction
- The temperature of the solution

The equilibrium constant (K_b) for a weak base quantifies the extent to which the base dissociates in water to form hydroxide ions and its conjugate acid. A higher K value indicates a stronger base, as it reflects a greater tendency to accept protons and produce hydroxide ions.

Outline the steps involved in calculating the pH of a solution containing a weak base.

To calculate the pH of a weak base solution, first determine the concentration of OH⁻ ions using the K_b value, calculate the pOH, and then use the formula $\text{pH} = 14 - \text{pOH}$.

How does the common ion effect influence the equilibrium of a weak base in solution?

The common ion effect shifts the equilibrium position of a weak base towards the undissociated form, decreasing ionization and affecting the pH of the solution.

Discuss the significance of the equilibrium constant (K_b) in determining the strength of a weak base.

The equilibrium constant (K_b) indicates the extent of ionization of a weak base; a higher K_b value means a stronger base as it dissociates more in solution.

Provide an example of a weak base used in a biological system and explain its function.

Ammonia is a weak base used in biological systems to excrete nitrogen waste in the form of urea, helping to maintain pH balance in the body.

Explain why weak bases do not completely dissociate in water.

Weak bases do not completely dissociate in water because they have a lower tendency to donate hydroxide ions, resulting in an equilibrium between the undissociated base and its ions.

Describe the role of weak bases in buffer solutions and how they help maintain pH stability.

Weak bases in buffer solutions react with added acids to neutralize them, maintaining pH stability by resisting changes in pH when small amounts of acid or base are added.

What are the effects of the common ion on weak bases? (Select all that apply)

- Shifts equilibrium position ✓
- Increases ionization
- Decreases ionization ✓
- Affects pH ✓

The presence of a common ion decreases the solubility of weak bases and shifts the equilibrium towards the formation of the base's conjugate acid, resulting in a decrease in pH.