

## Buffers Quiz Answer Key PDF

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**Which buffer system is primarily responsible for maintaining blood pH?**

- a. Phosphate buffer system
- b. Ammonia buffer system
- c. bicarbonate buffer system ✓**
- d. Acetate buffer system

**Buffers are essential in biochemical research because they:**

- a. Enhances the color of solutions
- b. Maintain a stable pH for reactions ✓**
- c. Increase the speed of reactions
- d. Reduce the cost of experiments

**Natural buffers in the human body include: (Select all that apply)**

- a. bicarbonate buffer system ✓**
- b. Phosphate buffer system ✓**
- c. Ammonia buffer system
- d. Sulfate buffer system

**The Henderson-Hasselbalch equation requires which of the following inputs? (Select all that apply)**

- a. pKa of the acid ✓**
- b. Concentration of the conjugate base ✓**
- c. Temperature of the solution
- d. Concentration of the weak acid ✓**

**What is the primary function of a buffer solution?**

- a. To change the pH of a solution
- b. To resist changes in pH ✓**
- c. To increase the acidity of a solution
- d. To neutralize all acids and bases

**Which of the following is an example of an acidic buffer?**

- a. Ammonia and ammonium chloride
- b. Acetic acid and sodium acetate ✓**
- c. Hydrochloric acid and sodium hydroxide
- d. Sodium bicarbonate and carbonic acid

**A buffer solution typically consists of:**

- a. A strong acid and a strong base
- b. A weak acid and its conjugate base ✓**
- c. A strong base and its conjugate acid
- d. Water and salt

**Buffers are used in which of the following industries? (Select all that apply)**

- a. Pharmaceuticals ✓**
- b. Agriculture
- c. Food processing ✓**
- d. Textile manufacturing

**Explain how a buffer solution works to maintain pH stability when an acid is added.**

**A buffer solution maintains pH stability by using its weak acid to neutralize added base or its conjugate base to neutralize added acid, thus preventing significant changes in pH.**

**Describe the role of a conjugate base in an acidic buffer system.**

**In an acidic buffer system, the conjugate base neutralizes added acids by reacting with hydrogen ions, thus helping to maintain the pH.**

**How does the concentration of buffer components affect the buffer capacity?**

Higher concentrations of buffer components increase the buffer capacity, allowing the buffer to neutralize more added acid or base without a significant change in pH.

**Why is a buffer most effective within  $\pm 1$  pH unit of the pKa of the buffering agent?**

A buffer is most effective within  $\pm 1$  pH unit of the pKa because this is where the concentrations of the weak acid and its conjugate base are similar, allowing optimal neutralization of added acids or bases.

**Calculate the pH of a buffer solution containing 0.1 M acetic acid and 0.1 M sodium acetate. (Assume pKa of acetic acid is 4.76)**

Using the Henderson-Hasselbalch equation:  $\text{pH} = \text{pKa} + \log\left(\frac{[\text{A}^-]}{[\text{HA}]}\right) = 4.76 + \log(0.1/0.1) = 4.76$ .

**Buffer capacity is defined as:**

- a. The pH range over which a buffer is effective
- b. The amount of acid or base a buffer can neutralize ✓**
- c. The concentration of the buffer components
- d. The temperature at which a buffer operates

**Factors that affect buffer capacity include: (Select all that apply)**

- a. Concentration of buffer components ✓**
- b. Temperature ✓**
- c. Volume of the solution
- d. pH of the solution

**A buffer is most effective when the pH is:**

- a. Equal to the pKa of the buffering agent ✓**
- b. 2 units above the pKa
- c. 2 units below the pKa
- d. Equal to the pH of pure water

**The Henderson-Hasselbalch equation is used to calculate:**

- a. The concentration of a buffer
- b. The pH of a buffer solution ✓**
- c. The temperature of a buffer solution
- d. The volume of a buffer solution

**A buffer is effective within which of the following pH ranges relative to the pKa? (Select all that apply)**

- a.  $\pm 1$  pH unit ✓**
- b.  $\pm 2$  pH units
- c.  $\pm 0.5$  pH units ✓**
- d.  $\pm 3$  pH units

**Which of the following are components of a basic buffer? (Select all that apply)**

- a. Weak base ✓**
- b. Strong acid
- c. Conjugate acid ✓**
- d. Strong base

**Discuss the importance of the bicarbonate buffer system in maintaining blood pH.**

**The bicarbonate buffer system is crucial for maintaining blood pH by neutralizing excess acids or bases, thus ensuring proper physiological function and preventing harmful pH fluctuations.**