

## Acid Base Worksheet

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### Part 1: Foundational Knowledge

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#### Which of the following is a characteristic of a base?

*Hint: Think about how bases interact with protons.*

- A) Donates protons
- B) Accepts protons
- C) Has a pH less than 7
- D) Completely dissociates in water

#### Which of the following is a characteristic of a base?

*Hint: Consider the definitions of acids and bases.*

- A) Donates protons
- B) Accepts protons
- C) Has a pH less than 7
- D) Completely dissociates in water

#### Which of the following are strong acids? (Select all that apply)

*Hint: Consider the common strong acids you know.*

- A) Hydrochloric acid (HCl)
- B) Acetic acid (CH<sub>3</sub>COOH)
- C) Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>)
- D) Ammonia (NH<sub>3</sub>)

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- C) Sulfuric acid ( $\text{H}_2\text{SO}_4$ )
- D) Ammonia ( $\text{NH}_3$ )

**Explain the difference between a strong acid and a weak acid in terms of dissociation in water.**

*Hint: Consider how completely each type of acid dissociates.*

**Explain the difference between a strong acid and a weak acid in terms of dissociation in water.**

*Hint: Consider how each type of acid behaves in solution.*

**List two examples of a weak base and a weak acid.**

*Hint: Think of common substances that fit these categories.*

1. Weak Base Example 1

2. Weak Base Example 2

3. Weak Acid Example 1

4. Weak Acid Example 2

**What is the pH of a neutral solution?**

*Hint: Recall the pH scale.*

- A) 0
- B) 7
- C) 14
- D) 10

**What is the pH of a neutral solution?**

*Hint: Consider the scale of pH values.*

- A) 0
- B) 7
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- D) 10

## Part 2: Understanding Concepts

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**Which of the following statements about buffers is true? (Select all that apply)**

*Hint: Think about the function and composition of buffers.*

- A) Buffers resist changes in pH.
- B) Buffers are composed of a strong acid and its conjugate base.
- C) Buffers are used to maintain a stable pH in biological systems.
- D) Buffers can only be made from weak acids and their conjugate bases.

**Which of the following statements about buffers is true? (Select all that apply)**

*Hint: Consider the role of buffers in maintaining pH.*

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**Describe how the Henderson-Hasselbalch equation is used to calculate the pH of a buffer solution.**

*Hint: Consider the components of the equation.*

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### Part 3: Applying Knowledge

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**If you add a small amount of hydrochloric acid to a buffer solution, what is most likely to happen?**

*Hint: Consider the role of buffers in maintaining pH.*

- A) The pH will increase significantly.
- B) The pH will decrease significantly.
- C) The pH will remain relatively stable.
- D) The buffer will become neutralized.

**If you add a small amount of hydrochloric acid to a buffer solution, what is most likely to happen?**

*Hint: Consider the buffer's ability to resist pH changes.*

- A) The pH will increase significantly.
- B) The pH will decrease significantly.
- C) The pH will remain relatively stable.
- D) The buffer will become neutralized.

**During a titration, which of the following indicators could be used to determine the endpoint? (Select all that apply)**

*Hint: Think about common indicators used in titrations.*

- A) Phenolphthalein
- B) Litmus
- C) Bromothymol blue
- D) Methyl orange

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**A solution has a pH of 3. Is it acidic, basic, or neutral? Explain your reasoning.**

*Hint: Consider the pH scale and its implications.*

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## Part 4: Analyzing Relationships

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Analyze the following reactions and identify which are neutralization reactions. (Select all that apply)

*Hint: Consider the definition of neutralization.*

- A)  $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- B)  $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
- C)  $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$
- D)  $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

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Explain the role of water in acid-base reactions and how it affects the dissociation of acids and bases.

*Hint: Consider the properties of water as a solvent.*

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## Part 5: Synthesis and Reflection

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**Which of the following scenarios would require the use of a buffer solution?**

*Hint: Think about situations where pH stability is crucial.*

- A) Preparing a solution for a chemical reaction that requires a specific pH.
- B) Cleaning a surface with a strong acid.
- C) Neutralizing a base spill in a laboratory.
- D) Diluting an acid with water.

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**Evaluate the following statements and identify which are true about the pH scale. (Select all that apply)**

*Hint: Consider the properties of the pH scale.*

- A) A pH of 0 indicates a very strong acid.
- B) A pH of 14 indicates a very strong base.
- C) A pH of 7 is always neutral, regardless of the solution.
- D) The pH scale is logarithmic, meaning each whole number change represents a tenfold change in acidity or basicity.

**Evaluate the following statements and identify which are true about the pH scale. (Select all that apply)**

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**Design an experiment to test the buffering capacity of a solution. Describe the steps you would take and the observations you would expect.**

*Hint: Consider the methods used to test buffer capacity.*

**Design an experiment to test the buffering capacity of a solution. Describe the steps you would take and the observations you would expect.**

*Hint: Consider the materials and methods you would use.*