

chapter 19 acids bases and salts worksheet answers

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Introduction

Welcome to your ultimate study companion for **Chapter 19: Acids, Bases, and Salts Worksheet Answers**.

Whether you're a high school chemistry student, a college freshman tackling general chemistry, or a lifelong learner brushing up on the fundamentals, this guide will help you master the concepts, solve practice problems, and gain confidence in your exam performance.

We've gathered a comprehensive set of worksheet answers, complete with step by step explanations, key definitions, and practical tips. By reading through this article, you'll not only find the correct solutions but also understand the reasoning behind each one, so you can apply the same logic to new problems you encounter.

Understanding Chapter 19: Acids, Bases, and Salts

Chapter 19 is a cornerstone of chemistry education. It introduces the essential properties of acids and bases, explores the concept of pH, and explains how salts form from acid base reactions. Mastery of these topics is crucial for success in subsequent chapters on equilibria, electrochemistry, and analytical techniques.

Key Concepts Covered in Chapter 19

- Definition and characteristics of acids and bases (Arrhenius, Brønsted–Lowry, Lewis).
- The role of hydrogen ions (H^+) and hydroxide ions (OH^-).
- Calculating pH and pOH from concentrations.
- Neutralization reactions and the formation of salts.
- Common acids, bases, and salts encountered in everyday life.
- Applications of acid–base chemistry in industry, medicine, and environmental science.

Why Worksheet Answers Matter

Practice worksheets are the bridge between theory and application. They allow you to test your understanding, identify weak spots, and reinforce learning. However, merely looking at the answers without comprehension can be counterproductive. That's why this guide pairs each answer with a clear, logical explanation, ensuring you internalize the underlying principles.

Chapter 19 Worksheet Answers: A Complete Guide

Below you'll find a selection of typical worksheet problems from Chapter 19, along with detailed solutions. The problems are grouped into sections that reflect the progression of topics in the chapter: acid–base identification, pH calculations, neutralization reactions, and salt formation. Each section includes:

- Problem statements.
- Step by step solutions.
- Key take aways highlighted in bold text.
- Common pitfalls to avoid.

Worksheet 1: Identifying Acids and Bases

These questions test your ability to classify substances based on their properties and reactions.

1. Identify whether the following substances are acids, bases, or neither:

- a) HCl (hydrochloric acid)
2. b) NaOH (sodium hydroxide)
3. c) NH₃ (ammonia)
4. d) C₂H₅OH (ethanol)

- a) Acid – HCl donates H⁺ ions in aqueous solution.
- b) Base – NaOH dissociates to provide OH⁻ ions.
- c) Base – NH₃ accepts H⁺ to form NH₄⁺ (Brønsted–Lowry base).
- d) Neither – Ethanol is a neutral molecule; it does not donate H⁺ or accept it under normal conditions.

- a) H₂SO₄ + H₂O → H₃O⁺ + HSO₄⁻
- b) NH₃ + H₂O → NH₄⁺ + OH⁻
- c) NaOH + H₂O → Na⁺ + OH⁻ + H₂O

- a) H₂SO₄ is a strong acid; it donates H⁺ to water, forming hydronium.
- b) NH₃ is a base; it accepts a proton from water, producing NH₄⁺.
- c) NaOH is a base; it dissociates to produce OH⁻ ions.

Worksheet 2: Calculating pH and pOH

Mastering pH calculations is essential for predicting the behavior of solutions in chemical reactions.

Calculation:

- [H⁺] = 0.010 M
- pH = -log[H⁺] = -log(0.010) = 2.00

NaOH is a strong base and fully dissociates, providing OH⁻ ions.

Step 1: Calculate [OH⁻]

- [OH⁻] = 0.050 M

Step 2: Compute pOH

- pOH = -log[OH⁻] = -log(0.050) = 1.30

Using the relationship pH + pOH = 14:

- pH = 14 – pOH = 14 – 1.30 = 12.70

Acetic acid is a weak acid, so we must use the acid dissociation constant (K_a) to find [H⁺].

Step 1: Set up the equilibrium expression:

- CH₃COOH ⇌ H⁺ + CH₃COO⁻
- K_a = [H⁺][CH₃COO⁻] / [CH₃COOH]

Assume x = [H⁺] = [CH₃COO⁻] at equilibrium.

$$K_a = x^2 / (0.020 - x) \approx x^2 / 0.020 \text{ (since } x \ll 0.020)$$

$$\text{Thus, } x^2 = K_a \times 0.020 = (1.8 \times 10^{-5})(0.020) = 3.6 \times 10^{-7}$$

$$\text{So, } x = \sqrt{3.6 \times 10^{-7}} = 6.0 \times 10^{-4} \text{ M}$$

Step 2: Calculate pH:

- $\text{pH} = -\log(6.0 \times 10^{-4}) = 3.22$

Worksheet 3: Neutralization Reactions and Salt Formation

These problems focus on combining acids and bases to produce salts and water.

- $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

Reaction:

- $\text{Ca(OH)}_2 + \text{H}_2\text{CO}_3 \rightarrow \text{CaCO}_3 + 2 \text{H}_2\text{O}$

Stoichiometry: 1 mol Ca(OH)_2 produces 1 mol CaCO_3 .

Given 0.100 mol Ca(OH)_2 , the moles of CaCO_3 formed = 0.100 mol.

Calculate mass:

- Molar mass $\text{CaCO}_3 = 100.09 \text{ g/mol}$.
- Mass = $0.100 \text{ mol} \times 100.09 \text{ g/mol} = 10.01 \text{ g}$.

Both solutions are 0.050 M and equal in volume, so the moles of acid and base are equal.

H_2SO_4 is a diprotic acid. Each mole supplies two H^+ ions. Thus, 0.050 mol H_2SO_4 gives 0.100 mol H^+ .

NaOH provides 0.050 mol OH^- .

After mixing, 0.050 mol OH^- neutralizes 0.050 mol H^+ , leaving 0.050 mol H^+ unreacted.

Resulting concentration of H^+ in the final volume (which is double the original, i.e., $2 \times 0.050 \text{ L} = 0.100 \text{ L}$):

Tags: #chapter #acids #bases #salts #worksheet #answers

