

chapter 19 acids bases and salts workbook answers

Published: September 27, 2026 | Index ID: #-

Understanding Chapter 19: Acids, Bases, and Salts – A Complete Workbook Guide

Chapter 19 of many high school chemistry textbooks, such as the NCERT series, focuses on the fundamentals of acids, bases, and salts. These concepts are the backbone of chemical education, linking everyday phenomena to laboratory experiments and industrial processes. Students often encounter a variety of problems in the accompanying workbook that test their grasp of definitions, reactions, and real world applications. This article offers a comprehensive, step by step walkthrough of the chapter, along with detailed workbook answers that clarify common misconceptions and strengthen problem solving skills.

1. What Does Chapter 19 Cover?

At its core, Chapter 19 introduces three major classes of compounds:

- Acids – substances that release hydrogen ions (H^+) in aqueous solution.
- Bases – substances that release hydroxide ions (OH^-) or accept hydrogen ions.
- Salts – ionic compounds formed when an acid reacts with a base.

Beyond the definitions, the chapter explores:

1. Classification of acids and bases (strong vs. weak).
2. Acid–base indicators and pH measurement.
3. Neutralization reactions and the formation of salts.
4. Real world applications such as the use of acids in cleaning agents, bases in soaps, and salts in food preservation.

Understanding these topics provides a solid foundation for subsequent chapters on electrolytes, ionic bonding, and chemical equilibrium.

2. Key Terminology and Definitions

Before diving into problems, it's essential to master the vocabulary. Below is a quick reference guide.

Acid

An acid is a substance that donates a proton (H^+) to another species. In aqueous solution, acids dissociate to release H^+ ions, which gives the solution a sour taste and a pH less than 7.

Base

A base is a substance that accepts a proton or releases hydroxide ions (OH^-). Bases feel slippery, taste bitter, and have a pH greater than 7.

Salt

Salts are ionic compounds formed when an acid and a base react in a neutralization reaction. The general reaction is:

Acid + Base → Salt + Water

pH Scale

The pH scale measures acidity or alkalinity. A pH of 7 is neutral; values below 7 indicate acidity, while values above 7 indicate alkalinity.

Indicator

Indicators are substances that change color depending on the pH of the solution. Common indicators include phenolphthalein, litmus paper, and universal indicator.

Strong vs. Weak Acids/Bases

Strong acids/bases fully dissociate in water, whereas weak acids/bases only partially dissociate, resulting in fewer free ions.

3. Classification of Acids, Bases, and Salts

3.1 Acids

- Strong Acids: Hydrochloric acid (HCl), sulfuric acid (H₂SO₄), nitric acid (HNO₃).
- Weak Acids: Acetic acid (CH₃COOH), citric acid (C₆H₈O₇).

3.2 Bases

- Strong Bases: Sodium hydroxide (NaOH), potassium hydroxide (KOH).
- Weak Bases: Ammonium hydroxide (NH₄OH), sodium carbonate (Na₂CO₃).

3.3 Salts

- Common salts include sodium chloride (NaCl), potassium nitrate (KNO₃), and calcium sulfate (CaSO₄).
- Salts can be neutral, acidic, or basic depending on the parent acid and base.

4. Properties and Characteristics

4.1 Physical Properties

- Acids – often corrosive, can dissolve metals, and may have a sour taste.
- Bases – slippery feel, can turn red litmus blue.
- Salts – crystalline solids with high melting points, good electrical conductors when molten or dissolved.

4.2 Chemical Properties

- Acids react with metals to produce hydrogen gas.
- Bases react with acids to produce water and a salt.
- Salts can undergo hydrolysis, affecting the pH of their solution.

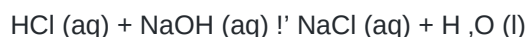
5. Acid–Base Reactions

5.1 Neutralization

The classic neutralization reaction follows the pattern:

Acid + Base → Salt + Water

Example:



5.2 pH and Indicators

Using indicators, students can determine whether a solution is acidic, neutral, or basic. For instance:

- Phenolphthalein turns pink in basic solutions ($\text{pH} > 8.2$).
- Litmus paper turns red in acidic solutions.

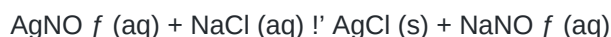
5.3 Buffer Solutions

Buffers resist changes in pH when small amounts of acid or base are added. They are essential in biological systems, such as blood.

6. Formation of Salts

6.1 Double Displacement Reaction

When two ionic compounds dissolve in water and exchange ions, a new salt forms. Example:



6.2 Hydrolysis of Salts

Some salts can react with water to produce acidic or basic solutions. For instance, sodium acetate (CH_3COONa) hydrolyzes to produce a slightly basic solution.

7. Workbook Problems and Detailed Answers

Below are common types of questions found in Chapter 19 workbooks, along with step by step solutions. These examples illustrate the application of concepts and help reinforce learning.

7.1 Identify the Type of Acid or Base

Question: Classify H_2SO_4 and NaOH as strong or weak acids/bases.

Answer: H_2SO_4 is a strong acid; it fully dissociates in water. NaOH is a strong base; it also fully dissociates, releasing OH^- ions.

7.2 Neutralization Reaction with a Balanced Equation

Question: Write and balance the equation for the reaction between hydrochloric acid and magnesium hydroxide.

Answer:

1. Write the unbalanced equation: $\text{HCl} + \text{Mg}(\text{OH})_2 \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$.
2. Check the atom count: 1 H on left, 2 H on right (in H_2O). Balance by placing a coefficient of 2 in front of HCl .
3. Balanced equation: $2 \text{HCl}(\text{aq}) + \text{Mg}(\text{OH})_2(\text{s}) \rightarrow \text{MgCl}_2(\text{aq}) + 2 \text{H}_2\text{O}(\text{l})$.

7.3 pH Calculation of a Weak Acid

Question: Calculate the pH of a 0.01 M solution of acetic acid (CH_3COOH) with $K_a = 1.8 \times 10^{-5}$.

Answer:

1. Set up the equilibrium expression: $K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]}$.
2. Assume $x = [\text{H}^+] = [\text{CH}_3\text{COO}^-]$. Then $1.8 \times 10^{-5} = \frac{x^2}{(0.01 - x)}$.
 $x^2 = 1.8 \times 10^{-5} (0.01 - x)$
3. Solve for x: $x^2 = 1.8 \times 10^{-5} (0.01 - x)$ $x = 4.24 \times 10^{-4}$ M.
4. Calculate pH: $\text{pH} = -\log(4.24 \times 10^{-4}) = 3.37$.

7.4 Determining the Salt Formed

Question: Identify the salt produced when sodium hydroxide reacts with nitric acid.

Answer: The reaction: $\text{NaOH} + \text{HNO}_3 \rightarrow \text{NaNO}_3 + \text{H}_2\text{O}$. The salt formed is sodium nitrate (NaNO_3).

7.5 Indicator Color Prediction

Question: Predict the color change of phenolphthalein when added to a solution of potassium hydroxide.

Answer: Potassium hydroxide is a strong base, so the solution has a $\text{pH} > 8.2$. Phenolphthalein turns pink in this environment.

7.6 Hydrolysis of a Salt

Question: Explain the pH of a 0.1 M solution of ammonium chloride (NH_4Cl).

Answer: NH_4Cl dissociates into NH_4^+ and Cl^- . NH_4^+ is the conjugate acid of the weak base NH_3 and undergoes hydrolysis:



This reaction produces H_3O^+ , making the solution acidic. The pH is typically around 5.5.

7.7 Buffer Preparation

Question: How would you prepare a buffer solution with a pH of 5.5 using

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

