

Acids and Bases—Preface

Vinegar, aspirin, Vitamin C, baking soda, ammonia—many familiar substances that we use every day are acids or bases. Acids and bases are also among the most common and useful reagents in the lab. Indeed, their uses span a wide range of applications, from dissolving metals to catalyzing reactions. The purpose of *Acids and Bases*, Volume 13 in the Flinn ChemTopic™ Labs series, is to bring together in one place a representative selection of acid–base lab activities for the high school chemistry classroom. Six experiments and five demonstrations allow teachers and students to fully explore the properties, principles, and applications of acid–base chemistry.

Identify and classify

Acids and bases are classified based on their physical and chemical properties. In “Properties of Acids and Bases,” students test substances on a microscale level using conductivity, indicators, and chemical reactions and use the results to identify and classify acids and bases. “Natural Indicators” is an inquiry-based experiment that allows students to explore the origin of acid–base indicators in nature. Students extract natural indicators from flowers and fruits of their choice and examine their color changes with known acids and bases. The pH scale literally comes to life in living color as students further classify a variety of unknown solutions. Two demonstrations, “Indicator Sponge” and “The Rainbow Tube,” round out the selection of lab activities that may be used to introduce the topic of acids and bases and illustrate their properties.

Strong versus weak acids

Acids vary greatly in their strength—their ability to produce ions when dissolved in water. Why do some acids have lower pH values than others, even though their concentrations are the same? Use the “Strong vs. Weak Acids” demonstration to compare the activity and distinguish between strong and weak acids. In “Measuring Acid Strength,” students use a simple but elegant procedure to tackle a difficult concept, the nature and magnitude of the equilibrium constant (K_a) for ionization of a weak acid.

Measure and analyze

One of the most common questions chemists have to answer is how much of something is present in a sample or product. If the product contains an acid or base, this question is usually answered by titration. In “Classic Titration,” students measure a titration curve for neutralization of a strong acid with a strong base and then analyze the concentration of an

unknown strong acid solution. Instructions have been provided for both technology-based and manual data collection and analysis. The principles and applications of titration reactions have been adapted to the microscale level in “Microscale Titration,” in which students analyze the percent acetic acid in vinegar.



Biological and consumer applications

Acid–base balance is a true vital sign—in living cells, lakes and streams, even consumer products. In “Buffers Keep the Balance,” students investigate the preparation and properties of model solutions that mimic natural biological buffers. Students learn what buffers are made of, how they work, and why different buffers are effective in different pH ranges. Two demonstrations also illustrate the principles and applications of acid–base chemistry in consumer products. “Upset Tummy? MOM to the Rescue!” reveals the role of neutralization reactions in antacid chemistry, while “Buffer Balancing Acts” highlights the physiological role of buffers within cells and in consumer products.

Safety, flexibility and choice

Depend on Flinn Scientific to give you the information and resources to help your students learn to love chemistry. The selection of experiments and demonstrations in *Acids and Bases*—combined with complete sample data and teacher notes—lets every teacher be a leader in the classroom. Your students will appreciate not only the range of activities but also the way in which they bring abstract principles to life. Beginning-level students will thrive as they learn to construct their own working definitions of important concepts in “Properties of Acids and Bases.” The intersection of technology- and microscale-based approaches in “Classic Titration” and “Microscale Titration” accommodates students with different interests and learning styles. All students will enjoy the surprise and satisfaction of working with natural products in “Natural Indicators.” Finally, because each experiment in *Acids and Bases* has been thoroughly tested and retested, your students are assured of success. Use the experiment summaries and concepts on the following pages to locate the concepts you want to teach and to choose experiments and demonstrations that will help you meet your goals.

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