

Properties of Acids and Bases

Identification and Classification

Introduction

Acids and bases are useful reagents in the chemistry laboratory, and they play an important role in biology and nature. What are acids and bases? What properties can be used to distinguish between them? Let's explore the properties of acids and bases and identify the characteristic features that will allow us to classify substances as acids and bases.

Concepts

- Acids and bases
- Indicators
- pH scale
- Neutralization
- Active metals
- Conductivity

Background

The word *acid* is derived from the Latin verb *acere*, which means “to (be) sour.” The origin of the word itself reveals a characteristic physical property of acids—they taste sour. Lemons, oranges and grapefruits are called *citrus* fruits because they contain citric acid, an acidic compound that gives them their sour taste. Although taste is an interesting property of the food we eat, it is not a property that we will use in the chemistry laboratory to classify compounds as acids or bases. The following properties are typically used to classify compounds as acids or bases.

- **Conductivity.** Some acids and bases ionize completely when dissolved in water. Solutions that contain large numbers of dissolved ions conduct an electric current and are called *electrolytes*. Other weaker acids and bases may ionize only partially when dissolved in water and may conduct electricity only weakly—they are called *weak electrolytes*. Substances that do not produce dissolved ions will not conduct electricity and are called *nonelectrolytes*.
- **Reactions with Metals.** Acids react with so-called *active metals*—reactive metals, such as magnesium and zinc—to produce hydrogen gas and solutions of metal ions. The reactions of different metals with acids is a well-known test used to rank metals from most active to least active. Reaction of a single active metal with a variety of different solutions is one of the best methods to identify acids and compare their relative acidity.

- **Effect on Indicators.** Indicators are organic dyes that change color in acidic or basic solutions. One of the oldest known acid–base indicators is litmus, a natural dye obtained from lichens. Its use was described as early as the 16th century. Litmus paper, prepared by soaking paper in a solution of the dye, is often used as a general test for acids and bases. Phenolphthalein is another indicator that shows a color change as solutions change from acidic to basic. Although these indicators are useful for broadly classifying substances as acids or bases, they are not able to distinguish among different levels of acidity or basicity. By using combinations of different indicators, however, it is possible to obtain a spectrum of color changes over a wide range of acidity levels. Universal indicator and pH paper are two products that use combinations of indicators to rank substances from most acidic to least acidic or most basic to least basic.

- **The pH Scale.** The pH scale is a numerical scale used to describe the relative acidity or basicity of a solution related to the concentration of H_3O^+ ions. The abbreviation pH stands for “power of hydrogen”—a difference of one unit on the pH scale corresponds to a power of ten difference in the concentration of H_3O^+ ions. Pure water contains extremely small but equal concentrations of H_3O^+ and OH^- ions due to self-ionization (Equation 1). Acids and bases are substances that alter the concentrations of H_3O^+ and OH^- ions in solution.



- **Neutralization Reactions.** Acids and bases react with each other to give *neutral* products—solutions that are neither acidic nor basic. The products of the neutralization of an acid and a base are an ionic compound (generally referred to as a salt) and water. The amount of acid that will react with a specific amount of base is governed by stoichiometry. Neutralization reactions are frequently used in the laboratory to determine how much of an acidic or basic compound is present in a substance.

Experiment Overview

The purpose of this experiment is to explore the properties of aqueous solutions and to classify them as acidic, basic or neutral. The results will be used to develop working definitions and to study the pH scale for identifying acids and bases.

Flinn Chemtopic Labs Properties Of Acids And Bases Answers

Kōzō Tanabe



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Physical Chemistry and Acid-Base Properties of Surfaces Jean-Charles Joud,Marie-Geneviève Barthés-Labrousse,2015-11-04 The first part of this book looks at the consequence of chemical and topological defects existing on real surfaces which explain the wettability of super hydrophilic and super hydrophobic surfaces There follows an in depth analysis of the acido basicity of surfaces with as an illustration different wettability experiments on real materials The next chapter deals with various techniques enabling the measurement of acido basicity of the surfaces including IR and XPS technics The last part of the book presents an electrochemical point of view which explains the surface charges of the oxide at contact with water or other electrolyte solutions in the frame of Bronsted acido basicity concept Various consequences are deduced from such analyses illustrated by original measurement of the point of zero charge or by understanding the basic principles of the electrowetting experiments 1997, 000000 0000

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and the pretreatment conditions of solid acids and bases on the acidic and basic properties the nature of acidic and basic sites and the mechanism regarding the generation of acidity and basicity have been elucidated experimentally and theoretically On the basis of the accumulated knowledge of solid acids and bases it is now possible to design and develop highly active and selective solid acid and base catalysts for particular reactions The chemistry of solid acids and bases is now being related to and utilized in numerous areas including adsorbents sensors cosmetics fuel cells sensitized pressed papers and others The information presented in this book will therefore be of interest to a wide ranging readership

Solid Acids and Bases Kozo Tanabe, 2012-12-02 Solid Acids and Bases Their Catalytic Properties reviews developments in the studies of acidic and basic properties of solids including the efficacy and special characteristics of solid acid and base catalysts This book discusses the determination of basic and acidic properties on solid surfaces and relationship between acid strength and acid amount The structure and acid base properties of mixed metal oxides and correlation between acid base properties and catalytic activity and selectivity are also deliberated This publication is useful to professional chemists and graduate students in the fields of organic inorganic and physical chemistry petroleum chemistry and catalysis including readers interested in the acidic and basic properties on solid surfaces

A New View of Current Acid-base Theories H. L. Finston, Allen C. Rychtman, 1982

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New Solid Acids and Bases, 1989

Strong Acids and Bases-General Properties, 2016 You return to the topic of pH and learn about how pH relates to two kinds of compounds acids and bases Through an introductory problem you explore the relationship of various ions within these compounds

New Solid Acids and Bases Kōzō Tanabe, 1989

Acid-base Equilibria Edward Jasper King, 1965

Acids & Bases Chris Oxlade, 2002 This book discusses what gives acids and bases their properties how acids and bases react with each other and how we use them in our everyday lives

Acids, Bases and Salts Brian Knapp, 1998-01-01 Provides photographic and textual demonstrations of a range of chemistry tests which explore the properties of acids bases and salts Suggested level secondary

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