

ARISE Curriculum Guide

Chemistry: Topic 20—Acid/Bases/pH

ChemMatters

[Order a CD with 25 years of ChemMatters](#), \$30

Articles for Student Use

Biosphere II: Feb. 1995, pp. 8-11.
Carnivorous Plants: Dec. 1993, pp.4-5.
Caves: Chemistry Goes Underground: April 2002, pp. 7-9.
Detergents: April 1985, pp. 4-6.
Leavening: How Great Cooks Loaf: April 1996, pp. 4-5.
The New Gold Rush: Oct. 1989, pp. 4-4-8.
Permanent Waves: April 1993, pp. 8-11.
Real Leather: April 1990, pp. 4-6.
Swimming Pools: April 1994, pp. 10-12.
Treasure: April 1987, pp. 4-9.
Wastewater: April 1992, pp. 12-15.

Articles for Teacher Use

Number and Topic:	2. Measurement 8. Chemical Reactions 20. Acids/Bases/pH
Source:	<i>ChemMatters</i> , Feb. 1995, pp. 8-11, “Biosphere II”
Type of Material:	Student Journal Article
Building on:	Measurement, chemical reactions
Leading to:	Acids/bases/pH
Links to Physics:	
Links to Biology:	Ecosystems, respiration, bacterial action
Good Stories:	Entire article is a story
Activity Description:	Article relates the attempt to build a completely enclosed ecosystem in which humans could live for years and the problems that arose, especially those of falling oxygen and rising carbon dioxide levels. A lot of fundamental acid-base chemistry is presented in the article.

- Number and Topic:** 2. Measurement
3. Problem Solving
17. Water, Aqueous Solutions
20. Acids/Bases/pH
21. Organic Chemistry
- Source: *ChemMatters*, April 1994, pp. 10-12, "Swimming Pools"
Type of Material: Student Journal Article
Building on: Quantitative calculations, ppm
Leading to: Acids, bases, pH, organic chemistry
Links to Physics:
Links to Biology:
Good Stories:
Activity Description: Article discusses the chemistry involved in keeping a swimming pool clean and safe. It does a good job of illustrating the complexity of the trying to balance different requirements that are often in conflict.
- Number and Topic:** 8. Chemical Reactions
15. Ionic and Metallic Bonds
16. Covalent Bonds, Molecular Shapes and Intermolecular Forces
20. Acids/Bases/pH
21. Organic Chemistry
22. Redox/Electrochemistry
- Source: *ChemMatters*, April 1993, pp. 8-11, "Permanent Waves"
Type of Material: Student Journal Article
Building on: Molecular structures, acids and bases
Leading to: Hydrogen bonds, amino acids, proteins,
Links to Physics:
Links to Biology: Structure of human hair, proteins
Good Stories:
Activity Description: Article details the complex structure of human hair and how permanent waves act on hair to produce their effect.
- Number and Topic:** 6. Chemical Names and Formulas/Compounds and Elements
8. Chemical Reactions
20. Acid/Bases/pH
21. Organic Chemistry
- Source: *ChemMatters*, April 1990, pp. 4-6, "Real Leather"
Type of Material: Student Journal Article
Building on: Names and formulas, chemical reactions, acids, bases, pH
Leading to: Organic chemistry
Links to Physics:
Links to Biology: Structure of collagen, amino acids
Good Stories: Relates the history of leather tanning from ancient times to the present.
Activity Description: Article describes various techniques that can be used to tan leather, going into the chemical reactions involved in different processes.

Number and Topic: 6. Chemical Names and Formulas/Compounds and Elements
8. Chemical Reactions
20. Acid/Bases/pH
22. Redox/Electrochemistry

Source: *ChemMatters*, Oct. 1989, pp. 4-4-8, "The New Gold Rush"
Type of Material: Student Journal Article
Building on: Chemical reactions
Leading to: Acids, bases, redox
Links to Physics:
Links to Biology: How bacteria can actually be used in some gold recovery processes
Good Stories:
Activity Description: Article discusses the history of gold mining, from crude early methods to modern sophisticated processes, going into detail about the chemical reactions and various processes that are employed.

Number and Topic: 6. Chemical Names and Formulas/Compounds and Elements
17. Water, Aqueous Solutions
20. Acids/Bases/pH
21. Organic Chemistry

Source: *ChemMatters*, April 1985, pp. 4-6, "Detergents"
Type of Material: Student Journal Article
Building on: Basic knowledge of molecular structures and ions
Leading to: Discussion of anionics, cationics, nonionics, emulsions, micelles, hard water
Links to Physics:
Links to Biology: Eutrophication caused by the presence of phosphates in detergents, bacterial action on surfactants
Good Stories:
Activity Description: Article discusses detergents, what they contain, the function of each ingredient and how they are different from soaps.

Number and Topic: 8. Chemical Reactions
17. Water, Aqueous Solutions
19. Equilibrium
20. Acid/ Bases/pH

Source: *ChemMatters*, April 2002, pp. 7-9, "Caves: Chemistry Goes Underground"
Type of Material: Student Journal Article
Building on: Chemical Reactions, Water, Aqueous solutions
Leading to: Equilibrium, acids, bases, pH
Links to Physics: Thermodynamics, entropy
Links to Biology: Ecosystems, energy flow
Good Stories: Good stories and photographs about sinkholes swallowing up entire homes
Activity Description: Article deals with how caves are formed. It contains some good examples of the kinds of equilibrium reactions involved and the extent to which these reactions are related to pH.

Number and Topic: 8. Chemical Reactions
20. Acids/Bases/pH
Source: *ChemMatters*, April 1996, pp. 4-5, "Leavening: How Great Cooks Loaf"
Type of Material: Student Journal Article
Building on: Chemical Reactions
Leading to: Acid-base chemistry
Links to Physics:
Links to Biology: Fermentation
Good Stories:
Activity Description: Article discusses the chemistry involved in the leavening of dough. It discusses both biological and chemical leavening and goes into the different types of chemical reactions that might be involved.

Number and Topic: 8. Chemical Reactions
17. Water, Aqueous Solutions
20. Acids/Bases/pH
21. Organic Chemistry
Source: *ChemMatters*, April 1992, pp. 12-15, "Wastewater"
Type of Material: Student Journal Article
Building on: Chemical reactions
Leading to: Acids/Bases, pH
Links to Physics:
Links to Biology: Aerobic bacterial action
Good Stories:
Activity Description: Article describes how wastewater is treated and turned into potable water. Article goes into much specific chemistry and is well written by an expert in water treatment.

Number and Topic: 8. Chemical Reactions
19. Equilibrium
20. Acid/Bases/pH
22. Redox/Electrochemistry
Source: *ChemMatters*, April 1987, pp. 4-9, "Treasure"
Type of Material: Student Journal Article
Building on: Basic chemical knowledge
Leading to: Discussion of acid-base and redox reactions, including equilibrium considerations and then continuing to a discussion of electrolysis, and how all of these chemical concepts can be applied to restoring articles that are recovered from a sunken ship.
Links to Physics: Electricity
Links to Biology:
Good Stories: Stories of the sinking of the ship Atocha and its recovery
Activity Description: Article deals with all the chemistry involved in restoring objects lifted from sunken ships that have been lying at the bottom of the sea for hundreds of years.

Number and Topic:	20. Acid/Bases/pH 21. Organic Chemistry
Source:	<i>ChemMatters</i> , Dec. 1993, pp.4-5, "Carnivorous Plants"
Type of Material:	Student Journal Article
Building on:	Chemical names and formulas
Leading to:	Organic structures, enzymes, proteins, acids, pH
Links to Physics:	
Links to Biology:	Plants, enzymes, DNA, evolution, diversity, adaptations, food
Good Stories:	Relates the myriad different ways by which about 500 species of plants consume insects and animals for food.
Activity Description:	Although this is a biology topic, the article contains a fairly significant amount of chemistry relating to enzymes, proteins, pH and other topics.

Flinn ChemTopic Labs

[Order Flinn ChemTopic Labs](#)

Demo: Acid in the Eye – Safety

Demo: A Burning Candle - Observations

Demo: Classifying Matter

Demo: Flaming Vapor Ramp—Safety Demo

Lab: Observation and Experiment - Introduction to the Scientific Method

Lab: Separation of a Mixture - Percent Composition

Lab: What is a Chemical Reaction - Evidence of Change

Lab: Common Gases—Physical and Chemical Properties

Lab: Preparing and Testing Hydrogen Gas—A Microscale Approach

Lab: Carbon Dioxide - What a Gas—Microscale Gas Chemistry

ICE LABS

Online Descriptions and Experiments

Number and Topic: 20. Acids, Bases and pH
Source: ICE Laboratory Leadership
Type of Material: Lab 11. pH of Familiar Products.
Building on: 8. Chemical reactions
Leading to: 21. Organic chemistry
Links to Physics: Energy (?)
Links to Biology: Many biological systems are pH dependent
Good Stories: Don't breathe too hard! Hyperventilation changes the pH of the blood and can lead to fainting!
Activity Description: To determine the pH of common household products and classify each based on its acidic or basic properties using the pH scale The numerical scale called pH indicates how acidic or basic an aqueous (water) solution is, or whether that solution is neutral. Many products we use daily for personal hygiene, home and auto care, or eating and drinking are suitable for pH testing. For this laboratory activity, you may bring to class as many products, in their original, closed containers, as you wish to test.

Number and Topic: 20. Acids/Bases/pH
Source: ICE Laboratory Leadership
Type of Material: Lab 17. How Bonding Affects Acidity
Building on: 8. Chemical reactions
Leading to: 19. Equilibrium
Links to Physics: Energy
Links to Biology: The ambient pH affects many biochemical reactions.
Good Stories:
Activity Description: To determine experimentally the number of ionizable H⁺ ions in an unknown solid acid and to form hypotheses regarding relations between bonding and acidity. In many common acids you have used in laboratory work, all hydrogens are acidic. This is true for acids such as sulfuric acid (H₂SO₄), nitric acid (HNO₃), and hydrochloric acid (HCl). In this laboratory activity, you will learn that only some hydrogen atoms within selected acid molecules may be capable of forming H⁺.

Technology-Adapted Labs

No activities for this topic.