

Chemical Tests

Narrative Summary

This unit introduces third-graders to the science of chemistry by challenging them to explore and determine the identity of five common household chemicals: sugar, alum, talc, baking soda, and cornstarch. Students begin by focusing on the physical properties of color, form, and texture. Next, they explore chemical properties by observing how the five powders interact with water, vinegar, iodine, and red cabbage juice. These tests enable them to explore phenomena such as crystallization and to observe the processes of evaporation and filtration. Finally, students apply their skills and their knowledge of the five chemicals to identify a variety of “mystery” mixtures. As a result of conducting these investigations, students develop scientific skills such as observing and recording results, forming conclusions on the basis of experience, communicating results, and applying their knowledge to solve problems.

Science Content

This unit focuses on the properties of materials that can be observed and investigated with simple physical and chemical tests. Students learn about chemicals through direct experience with everyday substances and observe changes in properties as they mix one substance with another. Through



investigation, students are introduced to solubility, filtration, evaporation, and acids, bases, and neutrals. Students develop basic laboratory skills; strengthen their ability to collect, record, and organize data; and learn about laboratory safety.

Assessment

Chemical Tests begins with a pre-unit assessment lesson in which students share what they know and would like to know about chemicals.

Students also observe and describe an unknown material. In a matched post-unit assessment, the class revisits the pre-unit assessment questions and activity. In Lesson 11, as students review evidence gathered in the unit, teachers can assess students' ability to interpret the importance of specific test results in identifying unknowns. A set of criteria helps guide this assessment. An embedded assessment in Lesson 16 challenges students to synthesize and apply what they have learned to identify unlabeled test liquids. Additional assessments at the close of the unit include a student self-assessment and a performance-based assessment in which students analyze the composition of unknown mixtures they created in Lesson 14.

Goals for *Chemical Tests*

In this unit, students investigate the properties of a variety of common household chemicals. From their experiences, they are introduced to the following concepts, skills, and attitudes.

Concepts

- Common household chemicals have different physical and chemical properties.
- Chemicals undergo changes in form, color, or texture when they are mixed together, separated, or heated.
- Some chemicals can be identified by their interaction with water, vinegar, iodine, red cabbage juice, and heat.
- Different types of mixtures, such as solutions or suspensions, are created when solids are combined with water.
- Evaporation and filtration are methods for separating mixtures of solids and liquids.
- Some chemicals can be classified as acids, bases, or neutral substances on the basis of their reactions with red cabbage juice.

Skills

- Observing and describing properties of materials.
- Learning to perform different physical and chemical tests.
- Predicting, observing, describing, and recording results of tests.
- Analyzing and drawing conclusions from the results of tests.
- Comparing and contrasting test results to define the properties of household chemicals so they can be identified.
- Supporting conclusions with reasons based on experiences.
- Communicating results and reflecting on experiences through writing and discussion.
- Applying previously learned knowledge and skills to solve a problem.
- Reading to enhance understanding of chemistry concepts.
- Developing proper laboratory techniques to ensure safety and avoid contamination.

Attitudes

- Developing an interest in exploring and investigating properties of chemicals.
- Recognizing the importance of guidelines for experimentation.
- Developing an awareness of the importance of chemicals in our lives.
- Developing an appreciation for the safe handling of chemicals.



Chemical Tests

Fundamental Concepts and Principles Addressed (K–4)

Science as Inquiry

Abilities necessary to do scientific inquiry

- Ask a question about objects, organisms, and events in the environment.
- Plan and conduct a simple investigation.
- Employ simple equipment and tools to gather data and extend the senses.
- Use data to construct a reasonable explanation.
- Communicate investigations and explanations.

Understandings about scientific inquiry

- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
- Scientists use different kinds of investigations, depending on the questions they are trying to answer.
- Simple instruments, such as magnifiers, provide more information than scientists obtain using only their senses.
- Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge).

Physical Science

Properties of objects and materials

- Objects have many observable properties, including size, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools.
- Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.
- Materials can exist in different states—solid, liquid, and gas.

Light, heat, electricity, and magnetism

- Heat can be produced in many ways such as burning or mixing one substance with another.

Earth and Space Science

Properties of earth materials

- Earth materials are varied and have different physical and chemical properties that make them useful in different ways. Earth materials provide many of the resources needed by humans.

Science and Technology

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- People have always had problems and invented tools and techniques to solve them.
- Scientists and engineers often work in teams with different individuals doing different things that contribute to the results.
- Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.

Abilities to distinguish between natural objects and objects made by humans

- Some objects occur in nature; others have been designed and made by people to solve human problems and enhance the quality of life.

Science in Personal and Social Perspectives

Personal health

- Safety and security are basic needs of humans. Safety involves freedom from danger, risk, or injury.

Types of resources

- Resources are things we get from the living and nonliving environment to meet the needs and wants of a population.
- Some resources are basic materials and some are produced from basic resources.

History and Nature of Science

Science as a human endeavor

- Although men and women using scientific inquiry have learned much about the objects, events, and phenomena in nature, much more remains to be understood.
- Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science.

Unifying Concepts and Processes

Systems, order, and organization

Evidence, models, and explanation

Constancy, change, and measurement