

INTRODUCTION

Students delight in exploring the world they live in. They naturally observe the properties of the objects in order to make sense of them. This unit provides students with skills and concepts that will assist in this natural discovery. Students will learn that having an understanding of what constitutes a liquid, solid or a gas, is a valuable skill for organizing and classifying physical things.

SCIENCE STANDARDS AND INDICATORS

Conceptual Theme; Properties of Matter- How does the structure of matter affect the properties and uses of materials?

Content Standard 2.1- Materials can be classified as solid, liquid or gas based on their observable properties.

Core Science Inquiry Expected Performance

A INQ.1- Make observation and ask questions about objects, organisms and the environment.

A INQ.2 - Use senses and simple measuring tools to collect data

A INQ.6 - Present information in words and drawings

A INQ.9 - Count order and sort objects by their properties.

CMT Expected Performances

A.18- Describe the differences in the physical properties of solids and liquids.

Grade Level Concept: Solids tend to maintain their own shapes, while liquids tend to assume the shapes of their containers, and gases fill their containers fully.

GRADE-LEVEL EXPECTATIONS:

- All materials (matter) take up space. Matter can be classified by whether it is in solid, liquid or gas form. Each state of matter has unique properties.
- Solids are the only state of matter that keeps their own shape. A solid's shape can only be changed if a force is applied to it, such as hammering, slicing or twisting. Solids can be hard, soft, bouncy or stretchy.
- Solids take up a certain amount of space (volume); the volume does not change if the solid is placed in different containers.
- Liquids do not have their own shape; they go to the bottom of a container and take on the shape of the part of the container they occupy. Liquids pour and flow from a higher point to a lower point; some liquids flow faster than others.
- Liquids have a definite volume. When a liquid is poured into different containers, the shape of the liquid may change, but the volume does not.
- Gases do not have a definite shape; they take on the shape of whatever container they occupy. For example, the air in an inflated balloon can be squeezed and reshaped.
- Gases do not have a definite volume; they spread out in all directions to fill any size container, or they keep spreading in all directions if there is no container. For example, blowing even a small amount of air into a balloon immediately fills the entire balloon; the smell of baking bread eventually fills the entire house and even outside.

KEY SCIENCE VOCABULARY: property, classify, matter, state of matter, solid, liquid, gas, volume

SCIENCE INQUIRY: Scientific inquiry is a thoughtful and coordinated attempt to search out describe, explain and predict natural phenomena.

SCIENCE LITERACY: Science literacy includes speaking listening, presenting, interpreting, reading and writing about science.

SCIENCE NUMERACY: Mathematics provides useful tool for the description, analysis and presentation of scientific data and ideas.

BIG IDEA

Solids tend to maintain their own shapes, while liquids tend to assume the shapes of their containers, and gases fill their containers fully.

ALIGNMENT TO OTHER STANDARDS

Science is an opportunity for students to use literary and math skills. They will explore, discover the world around them and use math skills to sort and quantify what they see. They will then develop their thinking by communicating what they notice, by writing, talking and describing what they understand. Science would not be possible without language arts and math skills. Providing students with the chance to develop inquiry skills is perfect for developing and applying skills in other content areas.

MATH

1.1a1 - Describe and classify data and objects based on more than one attribute.

1.1a2 - Use patterns and the rules that describe them, to identify a missing object, objects with common or different attributes and the complement of a set of objects.

1.1a3 - Explore a variety of ways to describe and write rules for patterns.

ESSENTIAL KNOWLEDGE:

- Solids have a definite shape. The shape of a solid can be changed by applying a force (for example, hammering, cutting, squeezing).
- Solids take up a certain amount of space (volume); the volume does not depend on the size or shape of the container.
- Some solids bend easily (for example, paper or latex), while others do not (for example, steel or wood.)
- Some solids are made up of small particles that can be poured (for example, powders, salt or breakfast cereals).
- Liquids have no definite shape. They take on the shape of the part of the container they occupy. Liquids pour and flow.
- Liquids have a definite volume the amount of liquid does not vary when it is poured into a different container.
- Liquids flow from a higher point to a lower point; some liquids flow faster than others. The rate at which liquids flow depends on the thickness of the liquid (viscosity) or the steepness of the slope.
- Gases have no definite shape. They take on the shape of the whole container they occupy.
- Gases have no definite volume. They spread out in all directions to fill any size container.

CONCEPTS

- Solids and liquids can be described by their properties
- Some properties of solids are colors, shape, ability to roll or stack, hardness, magnetic attraction, and whether they float or sink.
- Some properties of liquids are color, tendency to flow, degree of viscosity or fluidity, whether they are miscible with water, whether they float or sink in water
- Test can be performed to investigate properties of solids and liquids that cannot otherwise be observed.

SKILLS: Students will be able to do:

- Observing and describing the properties of solid and liquids.
- Conducting tests to investigate the properties of solids and liquids.
- Sorting solid into groups on the basis of their properties.
- Comparing similarities and differences among solids.
- Comparing similarities and difference among liquids.
- Applying tests to investigate new solids and liquids
- Compare the properties of solids with the properties of liquids
- Communicating ideas, observations and experiences through writing drawing, and discussion

ESSENTIAL QUESTIONS TO GUIDE INSTRUCTION AND ASSESSMENT:

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- What are the properties of liquid?
- What are the properties of a solid?
- What are the properties of liquids, solids, and gas?
- How do the properties help determine the usage?

MATERIALS AND SUPPLIES

- STC Solids and liquids Kit
- See Resources

OBJECTIVES AND GOALS

LESSON ONE

Observing and Describing Two Solids

- Students observe compare and describe two solid objects
- Students discuss the similarities and differences between the two objects
- Students write about what they know about solids

LESSON TWO

Observing Properties

- Students sort solids on the basis of the properties of color and shape.
- Students describe and discuss the similarities and difference in the ways they have grouped the solids.
- Students discuss the idea that a solid can be described by either its color or shape.

LESSON THREE

Comparing Solids That Roll with Solids That Stack

- Students test a set of solids to determine whether they roll or stack.
- Students apply the results of their test to sort the solids into groups.
- Students describe the similarities among the solids in each group.
- Students describe the differences among the solids in each group.
- Students discuss the characteristics of the solids that both roll and stack.

LESSON FOUR

Rolling Solids

- Students predict which solids will roll down a ramp and which will roll the farthest.
- Students test their predictions.
- Students discuss the similarities among the solids that roll the farthest and among those that do not roll at all down the ramp.
- Students determine how far they can make a solid move by blowing on it through a straw.
- Students discuss their observations and record their discoveries.

LESSON FIVE

Testing the Hardness of Solids

- Students arrange a set of solids in serial order on the basis of how hard they are.
- Students discuss and compare the ways they have arranged the solids.
- Students recognize that different words can be used to describe how hard something is.

LESSON SIX

Investigation Solids in Water

- Students investigate what happens when they place solid in water.
- Students describe their observation of the solids in water.
- Students perform a test to determine which solids float and which sink.
- Students describe and compare the similarities among the solids that float and those that sink.

LESSONS SEVEN
Testing Solids with a Magnet

- Students test a set of solids with a magnet
- Students sort the solids into two groups those that are attracted to a magnet and those that are not attracted to a magnet.
- Students describe and compare similarities among the solids that are attracted to a magnet.
- Students describe and compare similarities among the solids that are not attracted to a magnet.

LESSON EIGHT
Guess My Reason

- Students sort a set of solids into groups on the basis of a property of their choice.
- Students guess the reason that served as the basis for how a partner grouped the solids
- Students describe new ways to sort solids

LESSON NINE
Investigation Two Solids

- Student observe two new solids
- Students conduct tests to learn more about the two new solids
- Students record their observations
- Students discuss and compare their observation and test results
- Students read a story tow girls building a snow friend

LESSON TEN
Observing and Describing Two Liquids

- Students observe, describe and compare two liquids
- Students discuss the similarities and differences between the two liquids
- Students write about what they know about liquids

LESSON ELEVEN
Investigating Liquids

- Students observe and compare the appearance and feel of four liquids.
- Students observe a drop of each liquid under a hand lens.
- Students discuss and record their observations.

LESSON TWELVE
Flowing Liquids

- Students manipulate liquids in re-sealable plastic bags
- Students record their observations.
- Students discuss the idea that liquids have no definite shape and that they flow at different rates.

LESSON THIRTEEN
Drop Races

- Students predict which of two liquids will travel sown a slick surface faster.
- Students conduct a drop race to test their predictions
- Students record discuss and compare their results

LESSON FOURTEEN
Mixing Liquids

- Students predict what will happen when they pour a liquid into a cup of water.
- Students test their predictions.
- Students record and discuss their results.

LESSON FIFTEEN
Investigating Two New Liquids

- Students observe two new liquids
- Students conduct tests to learn more about the two liquids

- Students record, discuss, and compare their observations and test results.

LESSON SIXTEEN

Comparing Solids and Liquids

- Students record what they have learned about solids and liquids.
- Students create a class Venn diagram to compare the similarities and differences between the properties of solids and liquids
- Students use their science journals entries to make presentations on what they have learned about solids liquids or both.

RESOURCES

Web sites

<http://www.grc.nasa.gov/WWW/K-12/airplane/state.html>

<http://www.nyu.edu/pages/mathmol/textbook/statesofmatter.html>

<http://www.usoe.k12.ut.us/curr/science/sciber00/7th/matter/sciber/intro.htm>

Literacy Books

Solids, Liquids and Gases; Ray Boudreau

What Is the World Made Of? (Let's-Read-and-Find-Out Science, Stage 2) (Paperback)

Solids, Liquids, and Gases by Ballard, Carol

From Cow to Ice Cream; Bertram T. Knight, Bertram T. Knight

Why Are the Ice Caps Melting?; F. Rockwell, Paul Meisel

Soap making: 50 Fun & Fabulous Soaps to Melt & Pour (Kid's Crafts Series) Joe Rhatigan

Where Do Snowmen Go when They Melt?; Hank Bruce,

States of Matter; Carol Baldwin

Oil Spill; Melvin Berger

The Snowman; Raymond Briggs

What Am I?; N. N. Charles

The Magic School Bus at the Waterworks; Joanna Coles

Bouncing and Rolling; Terry Jennings

The Snowy Day; Ezra Keats

Hammers and Mops; True Kelley

The Great Blueness and Other Predicaments; Arnold Lobel

Prince William; Gloria Rand

Sylvester and the Magic Pebble; William Steig

I Don't Want to Melt!; Alma Florida,

Extension Activities

Make soap

Make Ice cream

Field trips

Maple Syrup in the making

Ice house

Links to United Streaming

For this unit, go to <http://www.unitedstreaming.com>

Search strand: Solids and liquids