CA NGSS TIME Prescreen Review Guide

Structure and Properties of Matter, Grade 5

Building Blocks OF SCIENCE™ | 3D

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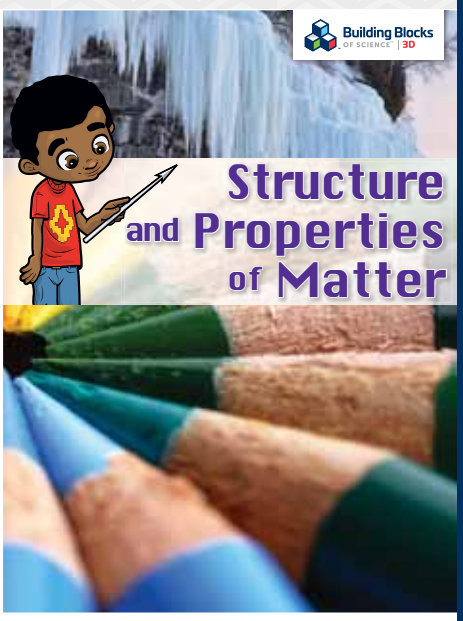
Structure and Properties of Matter



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Building Blocks OF SCIENCE™ 3D

This prescreen tool uses one Building Blocks of Science™ 3D unit to provide a roadmap of how the program meets the criteria of the CA NGSS* Toolkit of Instructional Materials Evaluation. Each page of this document highlights features of the Teacher's Guide, with page references from the printed version. All the information found in the printed Teacher's Guide is also accessible in the digital version of the Teacher's Guide, which you can view at www.carolina.com/bbs3dreview. Both versions of the Teacher's Guide will be provided to all teachers who implement Building Blocks of Science 3D. In addition to the digital support, the equipment for the investigations is also part of the all-inclusive package that teachers receive.

To help with your review, here's an overview of the program's organization:

- Building Blocks of Science 3D consists of 18 units that cover the grade-level CA NGSS Performance Expectations and the three dimensions
- There are three units per grade level
- Each unit is divided into lessons, each lesson is divided into investigations

The cornerstone of each lesson is a phenomena-based, hands-on, three-dimensional learning experience **for all students.** Each all-inclusive unit includes:

- Investigative phenomena that provides real-world context for each lesson
- Notebook prompts that help students use data and ideas to develop evidence-based claims
- Informational texts that support the science content—in English and in Spanish
- Thought-provoking questions in every investigation for the teacher to ask to support students' sensemaking
- A comprehensive assessment system that provides formative, summative, pre- and post-assessments
- A complete digital version for every classroom—instantly access instruction, simulations, literacy, assessments and more at www.carolina.com/bbs3dreview

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CA NGSS TIME Prescreen Review Guide

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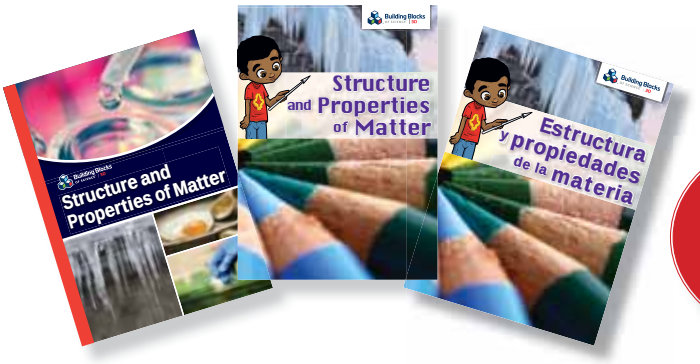


Leveled literacy

All-inclusive, phenomena-based science

Building Blocks of Science™ 3D has already been reviewed by the Instructional Materials Advisory Panel (IMAP) and the Content Review Panel (CRP). They determined that Building Blocks of Science 3D meets the requirements of Chapter 13 of the CA Science Framework. This takes the verification of program requirements as outlined by the Framework out of adoption committee's responsibility, allowing the committee time to focus on developing a district lens for review.

Structure and Properties of Matter, Grade 5

The examples in this prescreen tool are reflective of formatting and features that consistently appear throughout each unit in the program.

You can review the scope and sequence of instruction for the entire unit in the Evidence of Instructional Scaffolding chart on the last pages of this Reviewer's Guide and in the unit's Teacher's Guide (pages xxii-xxiii).

To access resources online, visit **www.carolina.com/bbs3dreview** and click on ***Structure and Properties of Matter.***

Criteria	Evidence from Structure and Properties of Matter
Use Phenomena/Problems Materials provide relevant and authentic learning contexts through which students: • engage as directly as possible with phenomena or problems to ask and answer their questions as well as questions from other sources; and • have the potential to use the three dimensions to make sense of phenomena or design solutions to problems.	The **Anchoring Phenomenon** for the unit is the physical and chemical changes that occur during baking. **1.** The unit begins instruction in Lesson 1 with an **Anchoring Phenomenon** (pg. 34) narrative, which is shared with the class. The Phenomena Video (pg. 34) accompanies this narrative. It is also available online at www.carolina.com/bbs3dreview • **Click on:** Unit Title > Unit Overview > Digital Resources **2.** A lesson-specific **Investigative Phenomenon** (pg. 34) opens each lesson. Students ask questions that they want to answer and that will be revisited at the end of each lesson in the Phenomenon discussion (pg. 47). **3. Investigation** titles are posed as a question to set a problem for students to solve (pg. 44). **4. Investigations** always put phenomena in students' hands. They are asked to gather and analyze information, share their learning with others, and provide claims based on evidence (Lesson 1, Investigation C, pgs. 44-47). **5. Tell Me More** prompts at the end of each investigation provide opportunities for formative assessment as students complete a task in which they apply their learning to additional phenomena, which helps students to develop more complex and complete understandings over time (pg. 71). **6. Using three dimensions:** The 3Ds are listed at the start of each investigation and are integrated into instruction at point of use (pg. 70).

Examples

ANCHORING PHENOMENON

Understanding matter is vital to successful baking. Bakers rely on specific ratios of ingredients to create the desired consistency, size, and flavor of baked goods. Although we don't typically think about the interaction of particles while making cookies or whipping cream, we can observe the changes in the volume and mass before and after energy is added. The anchoring phenomenon for *Structure and Properties of Matter* is the physical and chemical changes that occur during baking.

Read the investigative phenomena aloud to the class. Encourage students to generate questions about what they hear. Keep track of students' questions on a class chart, or have students record the questions in their science notebooks. Refer to these questions at the end of the lesson and throughout the unit to support the unit's anchoring phenomenon.

Investigative Phenomenon for Lesson 1: There are many different types of bread. Most are made using different combinations of flour, water, salt, and yeast. When you mix the ingredients, they form a soft, sticky dough. An important step in making bread is allowing the dough to rise for a long period of time. After about an hour of rising, you should notice that the dough takes up more space in its bowl. When you press on the dough, it seems to release a lot of air. What does this make you wonder?

Anticipated Questions:

- Why is the dough sticky?
- What causes the dough to rise?
- Why does the dough release air?

Phenomena Video: Watch the phenomena video for *Structure and Properties of Matter* as a class. As you watch, encourage students to record questions in their science notebooks about what they see in the video. At the end of the video, create a class chart of students' questions. Save this chart to refer to at the end of the unit.

1. Phenomena (pg. 34)

Phenomenon

Review students' questions about the investigative phenomenon from the beginning of this lesson. Guide students in applying the concepts explored in this lesson and connecting them to the anchoring phenomenon: the physical and chemical changes that occur during baking. By the end of the lesson, students should be able to explain that:

- Each ingredient in bread has different physical properties.
- Ingredients can be measured by mass. Changing the mass of each ingredient in a recipe will yield a bread with different properties.
- The volume of bread dough changes when it rises.
- The dough releases air, signifying the presence of gas inside of the dough. This also explains why bread often has many small holes in it.

2. Phenomena (pg. 47)

B. Measure and Record

Find the mass and volume of each material listed below using the tools at your station. As you work, complete the chart.

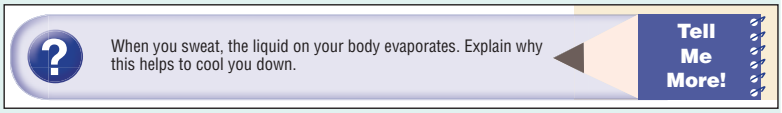
Material	Mass	Volume
Wax block	_____ grams	Length: _____ centimeters Width: _____ centimeters Height: _____ centimeters Multiply the three numbers to find the volume. _____ × _____ × _____ = _____ cubic centimeters
Water	_____ grams	_____ milliliters (Use this answer to help you below!)
10 Marbles	_____ grams	Measure 100 mL of water in the graduated cylinder. _____ mL (water and marbles) Subtract the volume of the water from the volume of the water and the marbles to find the volume of the marbles only. _____ – _____ = _____ mL Because the volume of solids is measured in cube units, convert your answer to cubic centimeters. 1 milliliter = 1 cubic centimeter _____ mL = _____ cubic centimeters
Modeling clay	_____ grams	Measure 100 mL of water in the graduated cylinder. Show your work to determine the volume of the clay.

C. Analyze the Data

1. Is a material's mass always the same as its volume? How do mass and volume differ?

2. Displacement could also be used to determine the volume of the wax block. Predict the volume of water that the wax block would displace. _____

4. Phenomena in students' hands (pgs. 50-51)



5. Formative Assessment (pg. 71)

Investigation C

CAN YOU PROVE GASES HAVE MASS AND VOLUME?

MATERIALS

■ **Student**
1 Science notebook*
1 Student Investigation Sheet 1C: *Do Gases Have Mass and Volume?*
1 Take-Home Science Letter
1 Take-Home Science Activity: *Make More Comparisons*
1 Pair of safety goggles*

■ **Class**
4 Pan balances with weights
Masking tape*

■ **Teacher**
1 Student Investigation Sheet 1C: *Do Gases Have Mass and Volume?* (Teacher's Version)
2 Balloons
1 Clear plastic jar with lid, 32 oz
1 Pair of safety goggles*
1 Pair of scissors*
1 Pan balance with weights
1 Roll of string

*These materials are needed but not supplied.

3. Investigations as questions (pg. 44)

Disciplinary Core Idea
■ **PS1.A:** Structure and Properties of Matter

Science and Engineering Practice
■ Engaging in Argument from Evidence

Crosscutting Concept
■ Cause and Effect

5Es
■ Explore
■ Explain
■ Elaborate

Literacy Components
■ *Structure and Properties of Matter* Literacy Reader, pg. 7
■ **Literacy Article 2B:** The Life of a Snowman

Digital Component
■ **Simulation:** States of Water

Investigation B

ARE EVAPORATION AND CONDENSATION OBSERVABLE?

MATERIALS

■ **Student**
1 Science notebook*
1 Student Investigation Sheet 2B: *Can You Observe Evaporation and Condensation?*

■ **Team of four students**
1 Coffee mug (heavy enough not to float)*
4 Ice cubes
1 Marble
1 Piece of plastic wrap, 46 cm*
1 Piece of masking tape, 114 cm*
1 Plastic cup (10 oz) of colored water
1 Plastic tank
1 L Water*
1 White paper towel*

■ **Class**
Newspapers* (optional)
Paper towels*
Sunny location in the classroom*

■ **Teacher**
1 Student Investigation Sheet 2B: *Can You Observe Evaporation and Condensation?* (Teacher's Version)
1 Color of food coloring*
1 Graduated cylinder, 1,000 mL
8 Plastic cups, 10 oz
1 Roll of masking tape
1 Roll of plastic wrap*
Ice*
Water*

*These materials are needed but not supplied.

6. Integrated three dimensions (pg. 70)

Structure and Properties of Matter, Grade 5

To access resources online, visit **www.carolina.com/bbs3dreview** and click on ***Structure and Properties of Matter.***

Criteria	Evidence from Structure and Properties of Matter
Presence of Logical Sequence Student learning across the three dimensions is: • arranged in a logical sequence; and • sufficient and appropriate for students to figure out the phenomena or problems.	***Structure and Properties of Matter*** *is a grade 5 physical science unit. This unit supports NGSS Performance Expectations and provides connections to physical science and engineering:* • **5-PS1-1; 5-PS1-2; 5-PS1-3; 5-PS1-4; 3-5-ETS1-2** **1. NGSS** for the unit (pg. vi) **2. Evidence of Instructional Scaffolding** (pgs. xxii–xxiii) **3. Investigations** refer to previous learnings and provide multiple opportunities to use the 3Ds to make sense of phenomena and problems (Lesson 2, Investigation A, pg. 66, Step 2) to build a conceptual progression upon prior learning. **4. Tell Me More** prompts at the end of each investigation provide opportunities for formative assessment as students complete a task in which they apply their learning to additional phenomena, developing more complex and complete understandings over time (pg. 69). **5. Notebooking** tasks for each investigation provide authentic opportunities for students to share evidence-based arguments and reasoning (Lesson 3, Investigation A, pgs. 95-97 and Student Investigation Sheet 3A, Part C: Evaluate).

Examples

Next Generation Science Standards

The Building Blocks of Science unit *Structure and Properties of Matter* integrates process skills as defined by the Next Generation Science Standards (NGSS).

Performance Expectations
- **5-PS1-1:** Develop a model to describe that matter is made of particles too small to be seen.
- **5-PS1-2:** Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- **5-PS1-3:** Make observations and measurements to identify materials based on their properties.
- **5-PS1-4:** Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- **3-5-ETS1-2:** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Disciplinary Core Ideas
- **PS1.A:** Structure and Properties of Matter
- **PS1.B:** Chemical Reactions
- **ETS1.B:** Developing Possible Solutions
- **ETS1.C:** Optimizing the Design Solution

Science and Engineering Practices
- Asking Questions and Defining Problems
- Developing and Using Models
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Using Mathematics and Computational Thinking
- Engaging in Argument from Evidence

Crosscutting Concepts
- Cause and Effect
- Scale, Proportion, and Quantity

1. NGSS for unit (pg. vi)

Evidence of Instructional Scaffolding

Scaffolding is a crucial yet natural element in all classrooms. Building Blocks of Science strives to simplify this instructional strategy by integrating this guided process into each unit, systematically building upon student knowledge, using hands-on learning to reinforce concepts, and employing student-driven inquiry. These strategies introduce new concepts and, with practice and review, lead students toward mastery. It is important to integrate scaffolding not only throughout the unit but also throughout each lesson. As students demonstrate understanding of a concept, they should be encouraged to take a leadership role in class or to attempt assignments independently. Additionally, scaffolding reveals opportunities for differentiation. Below-level learners require more reinforcement as they learn new skills, so the process toward mastery will need to be adjusted. Above-level learners do not need as much support and achieve mastery more quickly; therefore, these students can be assigned more independent study.

	Lesson 1 ▸	Lesson 2 ▸	Lesson 3 ▸
OBJECTIVES	■ Develop a working definition of the term "matter." ■ Make observations to differentiate between solids, liquids, and gases. ■ Construct an argument about the properties of each state of matter. ■ Determine the best method for determining the mass and volume of objects. ■ Analyze data to prove that matter takes up space and has mass.	■ Make observations to gather evidence that the movement of and attraction between particles change as energy is added to matter. ■ Develop a model to explain the movement of particles in each state of matter. ■ Identify phase changes as physical properties of matter, specifically using evaporation and condensation. ■ Use data to graph quantities and provide support for concepts related to matter conservation. ■ Develop a scenario to describe matter conservation.	■ Identify additional physical properties of matter, including buoyancy, hardness, magnetism, and viscosity. ■ Plan an investigation for testing buoyancy, hardness, and magnetism, and use collected data to make connections between a material and its uses. ■ Determine the density of a liquid by testing the rate at which it flows. ■ Define "density" by making connections to the behavior of matter particles.
SCAFFOLDING	Students should know: ■ Matter is anything that takes up space and has mass. ■ Mass and volume are properties of matter. ■ Volume can be measured using displacement of water. ■ There are three states of matter that each have unique properties. ■ Matter can change states.	Students should know: ■ Each state of matter is unique based on the behavior of its particles. ■ Particles change in motion and attraction as energy is added or removed from matter. ■ Physical properties of matter include the temperatures at which it can change state. ■ Matter is conserved as it changes state.	Students should know: ■ Matter can be identified using physical properties like magnetism, buoyancy, hardness, and viscosity. ■ The properties of matter can be used to determine a function for a specific material or substance. ■ The density of a substance affects its ability to float or flow. ■ Density relates to the attraction of particles.

2. Evidence of Instructional Scaffolding (pgs. xxii–xxiii)

Investigation A

HOW DO PARTICLES OF MATTER BEHAVE?

MATERIALS
- **Student**

1 Science notebook*
1 Student Investigation Sheet 2A: *What Are the States of Matter?*
1 Pair of safety goggles*
- **Team of four students**

1 Clear plastic jar with lid, 32-oz
20 Marbles
- **Teacher**

1 Student Investigation Sheet 2A: *What Are the States of Matter?* (Teacher's Version)
1 Balloon
1 Glass beaker (100 mL) filled with ice
1 Glass beaker (100 mL) filled two-thirds with water
3 Clear containers of different shapes, filled with equal volumes of water*
3 Clear plastic jars with lids, 32 oz
3 Colors of food coloring*
1 Graduated cylinder, 1,000 mL
1 Hot plate*
1 Modeling-clay lump (shape and size to resemble the small, rigid, solid object below)
1 Oven mitt*
1 Pair of safety goggles*
1 Resealable plastic bag, 1 gal*
1 Small, rigid, solid object* (e.g., a plastic toy car)
1 Thermometer
Chart paper or whiteboard*
Marbles
Markers*

*These materials are needed but not supplied.

1. Distribute a copy of Student Investigation Sheet 2A: *What Are the States of Matter?* to each student. As a brief review, instruct students to complete the first two rows of the chart individually. Ask students to share their responses.

2. Conduct Demonstration #1 where all students can observe. During the demonstration, allow students to ask questions to refine their understanding of these three states of matter.

a. Solids: Display the toy car and the lump of modeling clay. Squeeze the lump of modeling clay to change its shape. Ask:
- What did you observe when I squeezed each solid object? *(The clay changed shape, but the car did not.)*
- Did the masses of these solid objects change? Did the volumes change? *(No, the mass and volume did not change. If students do not recognize this, you may wish to form the clay back into a ball, and measure the mass and volume of both the clay and the car in front of the class. Squeeze the clay again and remeasure to demonstrate there is no change in mass or volume.)*
- Recall from the previous lesson that all matter is made of tiny building blocks called particles. If the volume or mass did not change, do you think the number of particles making up each object changed when the objects were squeezed? Explain your answer. *(No, because adding or removing particles would cause the object's volume or mass to change.)*

3. Build on prior learning (pg. 66)

Some lakes freeze during the winter; however, people can swim in the same lake in the summer. Use terms from the investigation to explain how this is possible.

Tell Me More!

4. Apply new learning (pg. 69)

C. Evaluate

1. How many of the objects sink? How many float? _____

2. Organize the objects you tested into categories of "hard" and "soft." _____

3. Which objects are attracted to the magnet? _____

4. How can we use an object's or substance's physical properties to identify it? Make a claim to answer the question. Support your claim with evidence and reasoning from your investigation.

Claim (a statement or conclusion that answers the question you are testing)	
Evidence (data that supports your claim)	**Reasoning** (a justification explaining why your evidence supports your claim using scientific principles)

5. Notebooking (pgs. 103-105)

Structure and Properties of Matter, Grade 5

To access resources online, visit **www.carolina.com/bbs3dreview** and click on ***Structure and Properties of Matter.***

Criteria	Evidence from Structure and Properties of Matter
Students Are Figuring Out Materials position students to make sense of phenomena and design solutions to problems by: • asking and answering questions that link learning over time; and • using the three dimensions to link prior knowledge and negotiate new understandings and abilities.	**1.** Each investigation provides an opportunity for students to **make sense of phenomena** (Lesson 3, Investigation B, pgs. 98-100). Students review past learning and organize data in their notebooks (Step 1), conduct multiple trials and gather data (Step 7), and learn new science vocabulary in context as they use materials (Steps 4 and 9). **2.** Opportunities to engineer **design solutions** are integrated into the instruction (pgs. 173-178) as students work in groups to design, build, and test a water filtration model to separate contaminants from water.

Examples

Disciplinary Core Idea
- **PS1.A:** Structure and Properties of Matter

Science and Engineering Practice
- Analyzing and Interpreting Data

Crosscutting Concept
- Cause and Effect

5Es
- Explore
- Explain
- Elaborate

Literacy Component
- *Structure and Properties of Matter* Literacy Reader, pgs. 11–13

Digital Components
- **Simulation:** Layering by Density
- **Simulation:** Viscosity Racetrack

Investigation B

DO PROPERTIES OF LIQUIDS VARY?

MATERIALS

- **Student**
  - 1 Science notebook*
  - 1 Student Investigation Sheet 3B.1: *Which Liquid Will Win the Race?*
- **Team of four students**
  - 1 Student Investigation Sheet 3B.2: *Liquid Racetrack*
  - 1 Cafeteria tray
  - 1 Clear sheet protector*
  - 4 Pipets
  - 1 Set of four liquid samples*
  - 1 Sheet of heavy card stock, 8.5 × 11 in*
- **Class**
  - Newspapers* (optional)
  - Paper towels*
- **Teacher**
  - 1 Student Investigation Sheet 3B.1: *Which Liquid Will Win the Race?* (Teacher's Version)
  - 1 Graduated cylinder, 1,000 mL
  - 1 Marker*
  - 32 Plastic cups with lids, 1.25 oz
  - Access to water*
  - Dark corn syrup*
  - Dish soap (green or blue)*
  - Honey*
  - Milk*
  - Vegetable oil*

*These materials are needed but not supplied.

1. Ask students to name different liquids they have used today, and create a list on the board. Direct students to examine the list and categorize the liquids using their physical properties. Allow time for students to record their groupings in their science notebooks.

2. Encourage students to volunteer their ideas. Draw attention to categories that consider opacity and transparency or the thickness of the liquid.

3. Display samples of water, milk, and honey. Swirl each around for students to observe. Ask students to describe the movements of each liquid and how they differ in appearance. It is important that students note that honey moves more slowly than milk or water. If students don't point this out, prompt them to do so with questions or point it out to them.

Differentiation Strategy

If students struggle with the term "viscosity," begin by describing liquids as thick, thin, or runny.

4. Introduce the term "viscosity" by citing honey as the most viscous of the three liquids on display. Explain that students will investigate the viscosity of liquids in this investigation by having them "race" down a track.

1. Making sense of phenomena (pg. 98)

Investigation A

HOW IS CONTAMINATED WATER CLEANED?

MATERIALS

- **Student**
  - 1 Science notebook*
  - 1 Student Investigation Sheet 6A: *Can You Engineer a Filtration System?*
  - 1 Hand lens
- **Team of four students**
  - 1 Jar of prepared mixture*
- **Class**
  - 4 Pan balances and weights
  - Additional quantities of any other materials, including coffee filters, plastic spoons, and plastic wrap*
  - All remaining materials from the kit, including cups, mesh, and funnels
- **Teacher**
  - 8 Clear plastic jars with lids, 32 oz
  - Food coloring*
  - Sand
  - Pebbles
  - Science in the News article or video about local water quality/treatment facilities*
  - Soil
  - Water*

*These materials are needed but not supplied.

Disciplinary Core Ideas
- **PS1.A:** Structure and Properties of Matter
- **PS1.B:** Chemical Reactions

Science and Engineering Practice
- Asking Questions and Defining Problems

Crosscutting Concepts
- Cause and Effect
- Scale, Proportion, and Quantity

5Es
- Explore
- Explain
- Elaborate

Literacy Component
- *Structure and Properties of Matter* Literacy Reader, pg. 21

1. To begin a conversation about water treatment, discuss the Science in the News Article you assigned, and invite students to share their article reports. Alternatively, show a video about water treatment to help students visualize this process. Allow students to develop questions and pose them for the class. Record students' questions so they can be answered at the end of the lesson.

2. Set the stage for the lesson by asking students to think about a story, a show, or a movie about a person who is somehow stranded away from civilization. Cultivate a discussion about what that person has to do to survive. If they don't bring it up themselves, direct students' attention to the need for water. As a class, compare the water found in nature to the water they drink every day.

3. Discuss the practice of water treatment with students. Explain that it is unlikely the water they drink came from pure, freshwater or running streams. Rather, the water was treated using technology to make it safe to drink. As a class, define "water filtration" as a science and engineering process that provides clean water by filtering wastewater. Challenge students to think about where wastewater comes from. Ask:

- How is water used by living things? *(Answers will vary. Examples include drinking, bathing, boating, cleaning, or washing.)*
- Water is a common solvent. How might this be a factor in water contamination? *(Many substances will dissolve in water, causing it to become contaminated easily.)*
- How does water become contaminated, or dirty? *(Answers will vary. Examples include waste being thrown into water, animals swimming in water, and boats polluting water with oil.)*
- In what ways are humans responsible for contaminated water? *(Humans dump garbage into waterways, use it to bathe or wash clothes, swim in it.)*

Identify Phenomena

Research the location of the water treatment plants in your area and communicate this information to students. Describe the steps of water purification by drawing a diagram or sharing an image or video.

Differentiation Strategy

Students should employ the engineering cycle throughout this lesson. It might be helpful to guide students by explaining each step of the cycle. Refer to "The Engineering Cycle" in the front of this Teacher's Guide for a graphic and a detailed description. You might provide a printout of the engineering cycle to assist students as they complete this lesson.

4. Organize students into groups of four, and provide each group with four hand lenses and a prepared mixture in a jar. Instruct groups to examine the mixture with their hand lenses, discuss what they think it contains, and record their ideas in their science notebooks. Ask:

- Could this mixture be separated?
- What materials would be needed to separate this mixture?

5. Explain that students will design their own water filtration systems to separate their mixtures into as many individual substances as possible. Direct students to the materials they may use, and encourage them to consider materials they have used in previous investigations. Allow time for groups to brainstorm ideas for a design and to create an initial materials list in their science notebooks.

Teaching Tip

Evaporation is likely to be a part of the systems that groups design. Explain that they are not expected to separate and retain each individual substance, particularly the water. It is more important that groups demonstrate how the substances are separated rather than retaining the total mass.

6. Distribute a copy of Student Investigation Sheet 6A: *Can You Engineer a Filtration System?* to each student. Clarify that their challenge is to build a filtration system that successfully separates the materials in the mixture.

7. Allow time for students to work with their group members to complete Parts A and B of the investigation sheet, employing the engineering cycle by defining the problem and developing a solution to address that problem.

Tell Me More!

There are many factors that contribute to water contamination, such as rain, erosion, and animal waste. Describe two ways humans contaminate water.

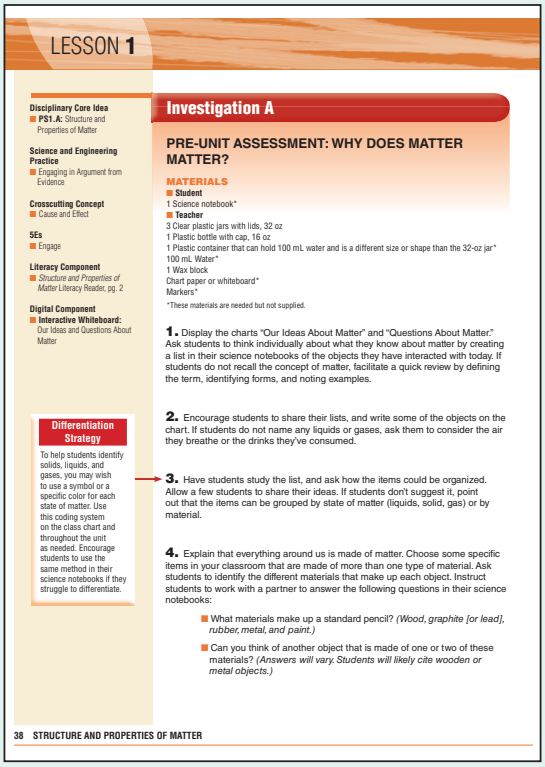
2. Three dimensions applied to engineering challenge (pgs. 173-174)

Structure and Properties of Matter, Grade 5

To access resources online, visit **www.carolina.com/bbs3dreview** and click on ***Structure and Properties of Matter.***

Criteria	Evidence from Structure and Properties of Matter
Three-dimensional Performances Materials include assessments designed to: • match the targeted learning goals; and • elicit evidence of students' use of the three dimensions to make sense of phenomena and/or to design solutions to problems.	Three-dimensional assessment system provides 3D assessment throughout the unit to monitor new growth over time. **1. Pre-Assessment:** Lesson 1, Investigation A (pgs. 38-41): Students draw upon prior knowledge to develop a chart to share their ideas about the states of matter, develop a working definition of matter, and categorize materials with evidence. **2. Formative Assessment** opportunities are part of every lesson. The Tell Me More prompt on page 74 focuses on the 3Ds listed on page 72. **3. Assessment Strategies** at the end of every lesson (pg. 76) provide strategies for using Student Investigation Sheets and Tell Me More to assess the 3Ds. Also available digitally at www.carolina.com/bbs3dreview • **Click on:** Unit Title > Unit Overview > Digital Resources **4. Summative Assessments** in every unit's final lesson provide a performance task for group assessment of 3Ds (pgs. 173-178, Teacher Sheet 6: Filtration Design Rubric) and a written assessment (after Student Investigation Sheet 6A). A scenario-based assessment is available online at www.carolina.com/bbs3dreview • **Click on:** Unit Title > Unit Overview > Digital Resources **5. Summative Assessment Remediation Strategies** list lessons to revisit for Performance Expectations-specific remediation based on individual assessment items (chart follows Summative Assessment Answer Key).

Examples



LESSON 1

Disciplinary Core Idea
■ PS1.A: Structure and Properties of Matter

Science and Engineering Practice
■ Engaging in Argument from Evidence

Crosscutting Concept
■ Cause and Effect

5Es
■ Engage

Literacy Component
■ *Structure and Properties of Matter* Literacy Reader, pg. 2

Digital Component
■ Interactive Whiteboard: Our Ideas and Questions About Matter

Investigation A

PRE-UNIT ASSESSMENT: WHY DOES MATTER MATTER?

MATERIALS
■ Student
1 Science notebook*
■ Teacher
3 Clear plastic jars with lids, 32 oz
1 Plastic bottle with cap, 16 oz
1 Plastic container that can hold 100 mL water and is a different size or shape than the 32-oz jar*
100 mL Water*
1 Wax block
Chart paper or whiteboard*
Markers*
*These materials are needed but not supplied.

1. Display the charts "Our Ideas About Matter" and "Questions About Matter." Ask students to think individually about what they know about matter by creating a list in their science notebooks of the objects they have interacted with today. If students do not recall the concept of matter, facilitate a quick review by defining the term, identifying forms, and noting examples.

2. Encourage students to share their lists, and write some of the objects on the chart. If students do not name any liquids or gases, ask them to consider the air they breathe or the drinks they've consumed.

Differentiation Strategy
To help students identify solids, liquids, and gases, you may wish to use a symbol or a specific color for each state of matter. Use this coding system on the class chart and throughout the unit as needed. Encourage students to use the same method in their science notebooks if they struggle to differentiate.

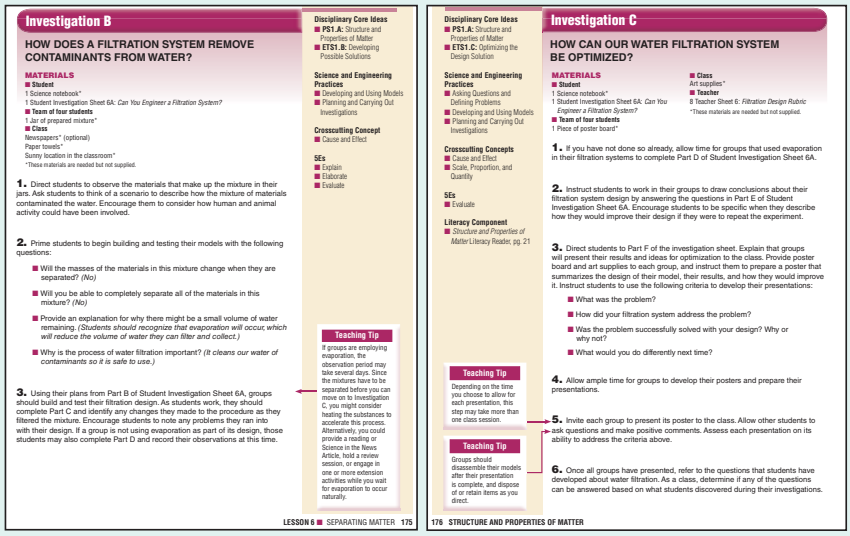
3. Have students study the list, and ask how the items could be organized. Allow a few students to share their ideas. If students don't suggest it, point out that the items can be grouped by state of matter (liquids, solid, gas) or by material.

4. Explain that everything around us is made of matter. Choose some specific items in your classroom that are made of more than one type of material. Ask students to identify the different materials that make up each object. Instruct students to work with a partner to answer the following questions in their science notebooks:

- What materials make up a standard pencil? *(Wood, graphite [or lead], rubber, metal, and paint.)*
- Can you think of another object that is made of one or two of these materials? *(Answers will vary. Students will likely cite wooden or metal objects.)*

38 STRUCTURE AND PROPERTIES OF MATTER

1. Pre-Unit Assessment (pgs. 38)



Investigation B

HOW DOES A FILTRATION SYSTEM REMOVE CONTAMINANTS FROM WATER?

MATERIALS
■ Student
1 Science notebook*
1 Student Investigation Sheet 6A: *Can You Engineer a Filtration System?*
■ Team of four students
1 Jar of prepared mixture*
■ Class
Newspapers* (optional)
Paper towels*
Sunny location in the classroom*
*These materials are needed but not supplied.

Disciplinary Core Ideas
■ PS1.A: Structure and Properties of Matter
■ ETS1.B: Developing Possible Solutions

Science and Engineering Practices
■ Developing and Using Models
■ Planning and Carrying Out Investigations

Crosscutting Concept
■ Cause and Effect

5Es
■ Explain
■ Elaborate
■ Evaluate

1. Direct students to observe the materials that make up the mixture in their jars. Ask students to think of a scenario to describe how the mixture of materials contaminated the water. Encourage them to consider how human and animal activity could have been involved.

2. Prime students to begin building and testing their models with the following questions:

- Will the masses of the materials in this mixture change when they are separated? *(No)*
- Will you be able to completely separate all of the materials in this mixture? *(No)*
- Provide an explanation for why there might be a small volume of water remaining. *(Students should recognize that evaporation will occur, which will reduce the volume of water they can filter and collect.)*
- Why is the process of water filtration important? *(It cleans our water of contaminants so it is safe to use.)*

3. Using their plans from Part B of Student Investigation Sheet 6A, groups should build and test their filtration design. As students work, they should complete Part C and identify any changes they made to the procedure as they filtered the mixture. Encourage students to note any problems they ran into with their design. If a group is not using evaporation as part of its design, those students may also complete Part D and record their observations at this time.

Teaching Tip
If groups are employing evaporation, the observation period may take several days. Since the mixtures have to be separated before you can move on to Investigation C, you might consider heating the substances to accelerate this process. Alternatively, you could provide a reading or Science in the News Article, hold a review session, or engage in one or more extension activities while you wait for evaporation to occur naturally.

LESSON 6 ■ SEPARATING MATTER 175

Investigation C

HOW CAN OUR WATER FILTRATION SYSTEM BE OPTIMIZED?

MATERIALS
■ Student
1 Science notebook*
1 Student Investigation Sheet 6A: *Can You Engineer a Filtration System?*
■ Team of four students
1 Piece of poster board*
■ Class
Art supplies*
■ Teacher
8 Teacher Sheet 6: *Filtration Design Rubric*
*These materials are needed but not supplied.

Disciplinary Core Ideas
■ PS1.A: Structure and Properties of Matter
■ ETS1.C: Optimizing the Design Solution

Science and Engineering Practices
■ Asking Questions and Defining Problems
■ Developing and Using Models
■ Planning and Carrying Out Investigations

Crosscutting Concepts
■ Cause and Effect
■ Scale, Proportion, and Quantity

5Es
■ Evaluate

Literacy Component
■ *Structure and Properties of Matter* Literacy Reader, pg. 21

1. If you have not done so already, allow time for groups that used evaporation in their filtration systems to complete Part D of Student Investigation Sheet 6A.

2. Instruct students to work in their groups to draw conclusions about their filtration system design by answering the questions in Part E of Student Investigation Sheet 6A. Encourage students to be specific when they describe how they would improve their design if they were to repeat the experiment.

3. Direct students to Part F of the investigation sheet. Explain that groups will present their results and ideas for optimization to the class. Provide poster board and art supplies to each group, and instruct them to prepare a poster that summarizes the design of their model, their results, and how they would improve it. Instruct students to use the following criteria to develop their presentations:

- What was the problem?
- How did your filtration system address the problem?
- Was the problem successfully solved with your design? Why or why not?
- What would you do differently next time?

4. Allow ample time for groups to develop their posters and prepare their presentations.

Teaching Tip
Depending on the time you choose to allow for each presentation, this step may take more than one class session.

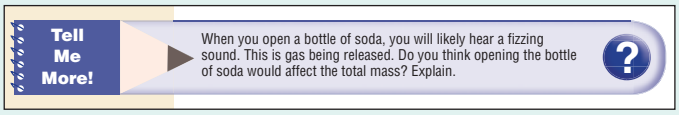
5. Invite each group to present its poster to the class. Allow other students to ask questions and make positive comments. Assess each presentation on its ability to address the criteria above.

Teaching Tip
Groups should disassemble their models after their presentation is complete, and dispose of or retain items as you direct.

6. Once all groups have presented, refer to the questions that students have developed about water filtration. As a class, determine if any of the questions can be answered based on what students discovered during their investigations.

176 STRUCTURE AND PROPERTIES OF MATTER

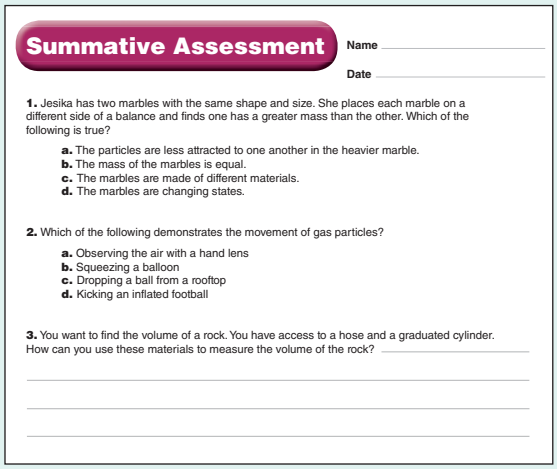
4. Performance-Task Assessment (pgs. 175-176)



Tell Me More!

When you open a bottle of soda, you will likely hear a fizzing sound. This is gas being released. Do you think opening the bottle of soda would affect the total mass? Explain.

2. Formative Assessment (pg. 74)



Summative Assessment

Name _____

Date _____

1. Jesika has two marbles with the same shape and size. She places each marble on a different side of a balance and finds one has a greater mass than the other. Which of the following is true?

a. The particles are less attracted to one another in the heavier marble.
b. The mass of the marbles is equal.
c. The marbles are made of different materials.
d. The marbles are changing states.

2. Which of the following demonstrates the movement of gas particles?

a. Observing the air with a hand lens
b. Squeezing a balloon
c. Dropping a ball from a rooftop
d. Kicking an inflated football

3. You want to find the volume of a rock. You have access to a hose and a graduated cylinder. How can you use these materials to measure the volume of the rock? _____

4. Summative Written Assessment (pgs. 185-188)

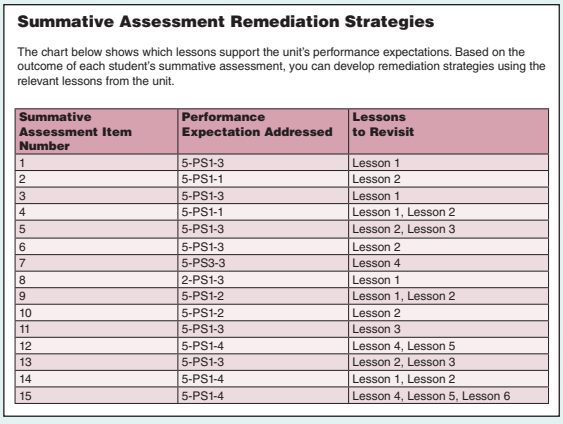
ASSESSMENT STRATEGIES

1. Investigation A

■ Use Student Investigation Sheet 2A: *What Are the States of Matter?* to determine how well students can describe the three states of matter and the particle movement in each. If students appear to struggle with these concepts, you may need to provide additional review.

■ Use students' responses to the Tell Me More question to determine if they can properly use the vocabulary to describe a scenario. Students should recognize that the lake freezes but does not boil.

3. Lesson Assessment Strategies (pg. 76)



Summative Assessment Remediation Strategies

The chart below shows which lessons support the unit's performance expectations. Based on the outcome of each student's summative assessment, you can develop remediation strategies using the relevant lessons from the unit.

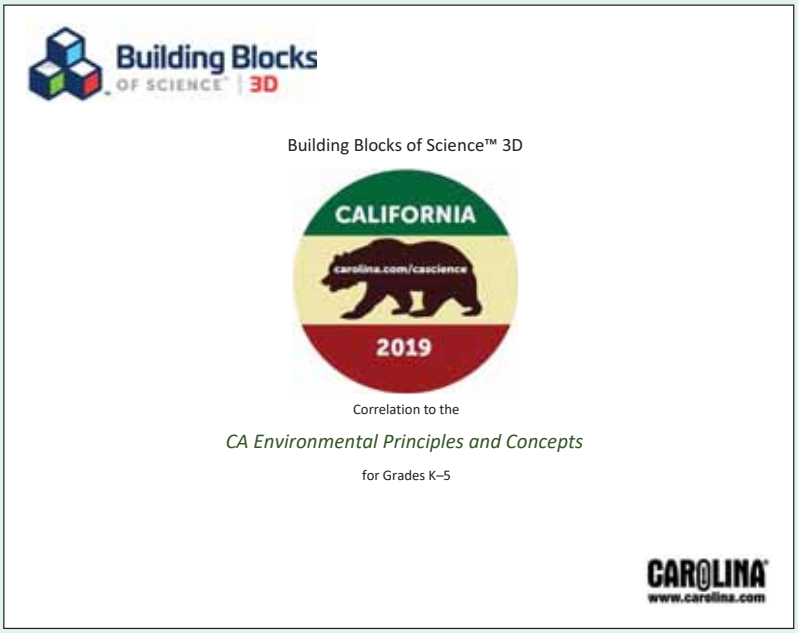
Summative Assessment Item Number	Performance Expectation Addressed	Lessons to Revisit
1	5-PS1-3	Lesson 1
2	5-PS1-1	Lesson 2
3	5-PS1-3	Lesson 1
4	5-PS1-1	Lesson 1, Lesson 2
5	5-PS1-3	Lesson 2, Lesson 3
6	5-PS1-3	Lesson 2
7	5-PS3-3	Lesson 4
8	2-PS1-3	Lesson 1
9	5-PS1-2	Lesson 1, Lesson 2
10	5-PS1-2	Lesson 2
11	5-PS1-3	Lesson 3
12	5-PS1-4	Lesson 4, Lesson 5
13	5-PS1-3	Lesson 2, Lesson 3
14	5-PS1-4	Lesson 1, Lesson 2
15	5-PS1-4	Lesson 4, Lesson 5, Lesson 6

5. Summative Assessment Remediation Strategies (pg. 193)

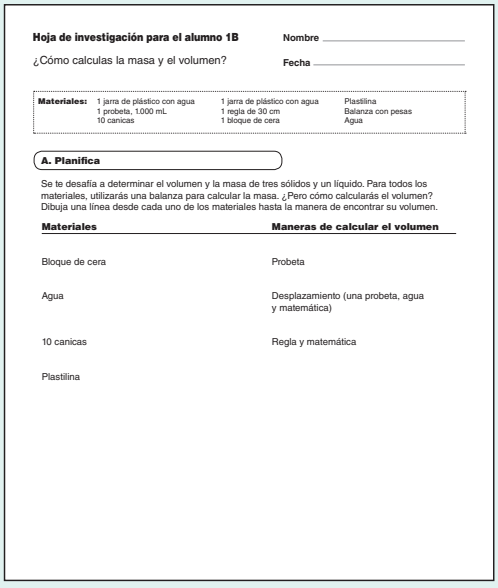
Structure and Properties of Matter, Grade 5

To access resources online, visit **www.carolina.com/bbs3dreview** and click on ***Structure and Properties of Matter.***

District Lens and Helpful Supports	Examples from Structure and Properties of Matter
1. Environmental Principles and Concepts (EP&Cs)	Units include EP&Cs at the end of relevant lessons (pg. 179). A complete of Building Blocks of Science 3D to the EP&C is available online at www.carolina.com/cascience • **Click on:** Building Blocks of Science 3D > Correlations
2. Spanish Teacher and Student Materials	All student-facing materials are available in Spanish in both print and digital formats. Teacher instruction is also available in Spanish.



Coming soon: Digital Spanish Teacher's Guide



Hoja de investigación para el alumno 1B Nombre _____

¿Cómo calculas la masa y el volumen? Fecha _____

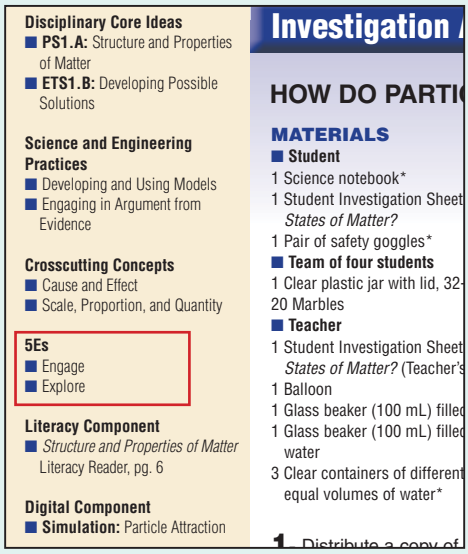
Materiales: 1 jarra de plástico con agua, 1 probeta, 1,000 mL, 10 canicas; 1 jarra de plástico con agua, 1 regla de 30 cm, 1 bloque de cera; Plastilina, Balanza con pesas, Agua

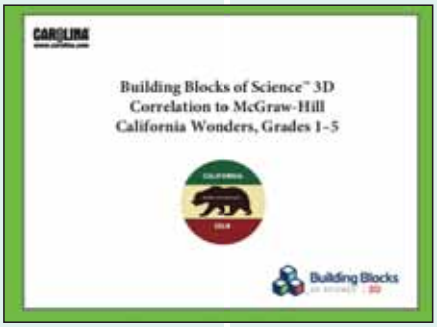
A. Planifica

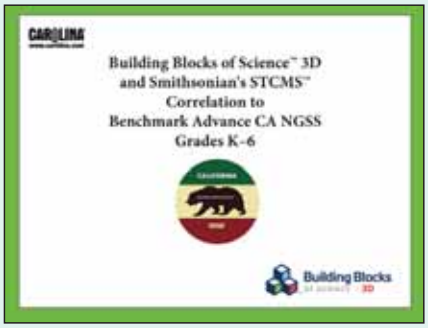
Se te desafía a determinar el volumen y la masa de tres sólidos y un líquido. Para todos los materiales, utilizarás una balanza para calcular la masa. ¿Pero cómo calcularás el volumen? Dibuja una línea desde cada uno de los materiales hasta la manera de encontrar su volumen.

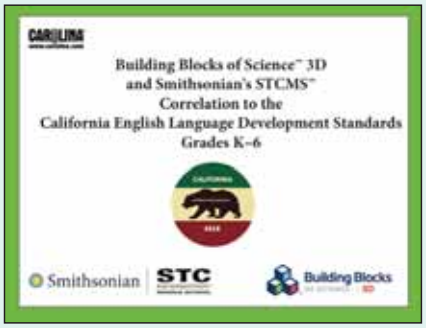
Materiales	Maneras de calcular el volumen
Bloque de cera	Probeta
Agua	Desplazamiento (una probeta, agua y matemática)
10 canicas	Regla y matemática
Plastilina	

District Lens and Helpful Supports	Evidence from Structure and Properties of Matter
3. 5Es	The 5Es are referenced for each lesson: • Lesson Overview Charts (pgs. xxv-xxx) • Side column at the start of each investigation (pg. 66) **Investigation A: Pre-Unit Assessment: Why Does Matter Matter?** **5Es:** Engage As a class, students share what they know about matter and categorize different objects based on the type of matter ■ **Teacher Preparation:** 10 minutes ■ **Lesson:** 30 minutes **Tell Me More!** Volume is how much space an object takes up. If the volume of water in a bottle increases, do you expect the mass to increase too? Why or why not?
4. Alignment to ELA Programs and ELD Standards	Correlations to Benchmark, Wonders, and CA ELD Standards are found at www.carolina.com/cascience • **Click on:** Building Blocks of Science 3D > Correlations
5. Common Core Math and ELA	The Language Arts and Math Standards are identified for each lesson: • Lesson Overview Charts (pgs. xxv-xxx) **Language Arts and Math Standards** **Language Arts** ■ **L.5.2:** Conventions of Standard English ■ **RF.5.3:** Phonics and Word Recognition ■ **SL.5.1:** Comprehension and Collaboration





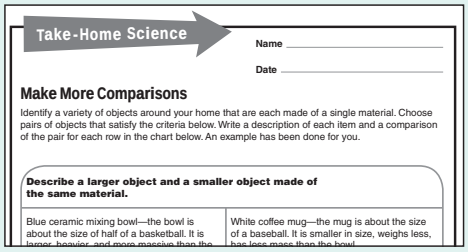




Structure and Properties of Matter, Grade 5

To access resources online, visit **www.carolina.com/bbs3dreview** and click on ***Structure and Properties of Matter.***

District Lens and Helpful Supports	vidence from Structure and Properties of Matter
6. Take-Home Science	Take-Home Science Activities reinforce learning. (pgs. 55-57)
7. Safety	Safety, pgs. xvii-xviii
8. Literacy Support	• Literacy Articles provide additional informational text to support investigations. (Literacy Article 2B) • Literacy Connections (Appendix B, pgs. 198-199) provide additional literacy strategies
9. Science in the News	Pull phenomena from today's news into your classroom with these projects. (pgs. 200-203)


Take-Home Science

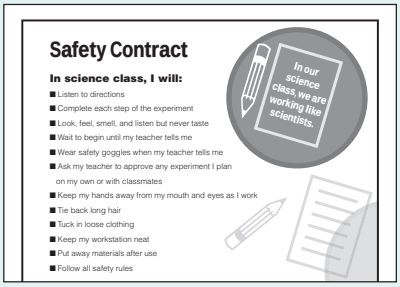
Name _____

Date _____

Make More Comparisons

Identify a variety of objects around your home that are each made of a single material. Choose pairs of objects that satisfy the criteria below. Write a description of each item and a comparison of the pair for each row in the chart below. An example has been done for you.

Describe a larger object and a smaller object made of the same material.	
Blue ceramic mixing bowl—the bowl is about the size of half of a basketball. It is	White coffee mug—the mug is about the size of a baseball. It is smaller in size, weighs less,


Safety Contract

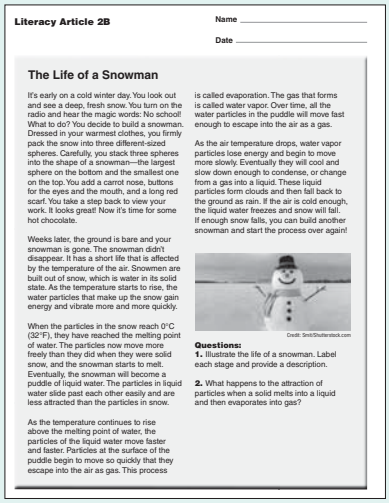
In science class, I will:

- Listen to directions
- Complete each step of the experiment
- Look, feel, smell, and listen but never taste
- Wait to begin until my teacher tells me
- Wear safety goggles when my teacher tells me
- Ask my teacher to approve any experiment I plan on my own or with classmates
- Keep my hands away from my mouth and eyes as I work
- Tie back long hair
- Tuck in loose clothing
- Keep my workstation neat
- Put away materials after use
- Follow all safety rules

In our science class we are working like scientists.

Literacy Reader Connections: *Structure and Properties of Matter*

Students have wide and varied reading abilities and comprehension levels. Because of this, Building Blocks of Science® includes literacy components that can be incorporated into language arts or science sessions or that can be used outside of the classroom. These components can be completed and reviewed with the whole class, in small groups, in peer-teaching pairs, or individually to complement the inquiries, concepts, and core ideas presented in the unit. Literacy components can also be assigned to differentiate instruction. English language learners and developing readers may especially benefit from using these resources in small groups or high-ability/low-ability peer groups.


Literacy Article 2B

Name _____

Date _____

The Life of a Snowman

It's early on a cold winter day. You look out and see a deep, fresh snow. You turn on the radio and hear the magic words: No school! What to do? You decide to build a snowman. Dressed in your warmest clothes, you firmly pack the snow into three different-sized spheres. Carefully, you stack three spheres into the shape of a snowman—the largest sphere on the bottom and the smallest one on the top. You add a carrot nose, buttons for the eyes and the mouth, and a long red scarf. You take a step back to view your work. It looks great! Now it's time for some hot chocolate.

Weeks later, the ground is bare and your snowman is gone. The snowman didn't disappear. It has a short life that is affected by the temperature of the air. Snowmen are built out of snow, which is water in its solid state. As the temperature starts to rise, the water particles that make up the snow gain energy and vibrate more and more quickly.

When the particles in the snow reach 0°C (32°F), they have reached the melting point of water. The particles now move more freely than they did when they were solid snow, and the snowman starts to melt. Eventually, the snowman will become a puddle of liquid water. The particles in liquid water slide past each other easily and are less attracted than the particles in snow.

As the temperature continues to rise above the melting point of water, the particles of the liquid water move faster and faster. Particles at the surface of the puddle begin to move so quickly that they escape into the air as gas. This process is called evaporation. The gas that forms is called water vapor. Over time, all the water particles in the puddle will move fast enough to escape into the air as a gas.

As the air temperature drops, water vapor particles lose energy and begin to move more slowly. Eventually they will cool and slow down enough to condense, or change from a gas into a liquid. These liquid particles form clouds and then fall back to the ground as rain. If the air is cold enough, the liquid water freezes and snow will fall. If enough snow falls, you can build another snowman and start the process over again!

Credit: Smit/Shutterstock.com

Questions:

1. Illustrate the life of a snowman. Label each stage and provide a description.

2. What happens to the attraction of particles when a solid melts into a liquid and then evaporates into gas?

Teacher Sheet: Science in the News Article Report

To help students understand a concept, it is often helpful to associate it with an event or phenomenon. Depending on the topic, students may be able to draw connections to recent events in the news or to historical events in your area. Using a literacy tool like an article report is a helpful way to bring in literacy, reading comprehension, and science topics at any grade level.

Science in the News articles can be assigned at any point during a unit to assist students in seeing the "real-world connection" to a particular concept. These articles should be provided by the teacher in lower grades, but students in grades 3-5 may be ready for the challenge of selecting their own articles independently. The following guidelines will help you find appropriate articles. If you ask students to locate their own articles, you may wish to provide some of these guidelines along with the specific requirements for the assignment. Students at all grades are provided with an article report sheet to help them analyze their article and draw connections between it and the unit concepts. For students in grades 3–5, a rubric is provided in this appendix to help them to evaluate an article for bias and credibility.

District Lens and Helpful Supports	Evidence from Structure and Properties of Matter
10. Innovators in Science	A diverse group of STEM professionals have impacted science. These scientists and engineers help students see themselves in these careers. Accessible at www.carolina.com/bbs3dreview • **Click on:** Unit Overview > Unit Resources > Digital Resources > Innovators in Science
11. Rubrics for Science	• Teacher Sheet 6: Filtration Design Rubric (pg. 184) • Appendix A: General Rubric (pg. 196) • Science in the News: Article Credibility Rubric (pg. 203)

Teacher Sheet 6

Filtration Design Rubric

	Design	Problem-Solving	Presentation
4	The design uses appropriate materials and methods to separate the mixture into distinct components. The water appears to be clean.	Students analyzed problems and determined solutions to improve their design and make it more successful.	The presentation clearly described the process of designing the filtration system. Students shared their results and identified what they would have done differently.
3	The design uses appropriate materials and methods to separate the mixture. There is evidence of other components in the water.	Students were able to recognize problems with their design and respond appropriately.	The presentation described the process of designing the filtration system and shared results or ideas about changing the design.
2	The design uses appropriate materials and methods, but the mixture was not separated well. There is evidence of other components in the water.	Students recognized problems with their design, but did not make an effort to improve it.	The presentation described the process of designing and testing the filtration system, but did not offer results or suggest design changes. It is unclear if students completed the challenge successfully.
1	The design does not use appropriate materials or methods to separate the mixture. The water is not separated from the original mixture.	Students did not acknowledge any problems with their design and made no attempt to improve it.	The presentation did not describe the process of designing or testing the filtration system. Students did not discuss results or changes to their design.

General Rubric

	Exploration	Vocabulary	Concept Building	Science Notebook
4	Student displays a high level of interest by asking questions, building on concepts, and testing ideas. Provides input and participates in group settings.	Student uses a rich and varied vocabulary that includes appropriate scientific vocabulary that is used in an accurate manner. Writing displays a deep level of understanding of a concept.	Student's responses indicate a higher level of thinking by drawing connections between unit concepts and phenomena. Claims are supported with strong evidence and reasoning.	Student's entries display informative, in-depth responses that demonstrate an understanding of the content. Diagrams are detailed and labeled when applicable. Student draws strong conclusions.
3	Student remains engaged by participating, building on concepts, and testing ideas. Rarely asks questions but is cooperative in group settings.	Student uses a varied vocabulary that includes appropriate scientific vocabulary. Writing accurately describes a concept or experience.	Student's responses during investigations, conversations, and class discussions reflect growth of knowledge. Student understands concepts but may not be able to make strong connections. Claims are supported with evidence and reasoning.	Student's entries provide accurate and descriptive responses. Visual aids, such as data tables and diagrams, are included when applicable. Student draws a conclusion.
2	Student participates in investigations but does not appear to be building on concepts, asking questions, or providing input in a group setting.	Student's vocabulary is limited. Appropriate scientific vocabulary is used occasionally but may not be in the correct context. Writing describes an experience but may not be accurate or detailed.	Student's responses indicate knowledge of the material but do not demonstrate growth. Connections are not readily made, and misconceptions may be noted. Claims are supported, but sometimes evidence and reasoning have inaccuracies.	Student's entries lack accuracy. Student misses key ideas and struggles to form in-depth responses and conclusions. Visual aids are missing detail.
1	Student may not participate in investigations and/or may struggle with building upon concepts. Student rarely asks questions or provides input.	Student struggles to describe experiences in writing. Appropriate scientific vocabulary is missing or used incorrectly.	Student's responses do not indicate knowledge of the material. Concepts are misunderstood, and connections are inaccurate or nonexistent. Claims are not supported by accurate evidence and reasoning.	Student's entries poorly or inaccurately address the concepts. Student does not provide support for his/her responses.

Science in the News: Article Credibility Rubric

Directions: Use the rubric to determine the credibility of your Science in the News article.

Criteria	3	2	1	Rating
Author	The author's name is easy to find.	Author's name is not easy to find.	The author's name cannot be found.	
Source/ Publisher	The source of the article is well-known and contains many news reports.	The source of the article does not contain many news reports. I have never heard of the publisher.	The source of this article does not have many news reports.	
Update frequency	This event occurred recently.	This event occurred within the past five years.	This event occurred many years ago.	
Opinion/ Bias	The article reports on an event and does not provide opinion.	The article contains facts, but also the author's opinion.	The article contains the author's opinion and presents information that may not be fact.	
Science Impact	Scientific findings and results appear to be accurate and has strong evidence for support.	The scientific findings might be exaggerated and do not have evidence. I do not understand the scientific findings.	The science discussed in the article is incorrect and there is no evidence.	

1. Do you think this news article is credible? Explain why or why not. _____

District Lens and Helpful Supports	Evidence from Structure and Properties of Matter

12. Differentiated Instruction

- Cross-curricular Extensions (pg. 127)
- Teaching Tips (pg. 46)
- Differentiated Strategies (pg. 100)

ASSESSMENT STRATEGIES

1. Investigation A

- Use Student Investigation Sheet 4A: *Can Mixtures Be Separated?* to determine if students concluded that by the total mass of the mixture at the beginning of the investigation was maintained and that matter was conserved.
- Use students' responses to the Tell Me More question to determine their ability to use properties like magnetism or buoyancy to separate objects. If students appear to struggle with these concepts, you may wish to provide supplemental review.

Teaching Tip

Students will use the practice of making claims supported with evidence and reasoning throughout this unit. For more information about using this practice, refer to the "Sensemaking: Developing Claims Supported with Evidence and Reasoning" in the front of this Teacher's Guide.

Differentiation Strategy

Ask above-level students to connect density to an object's ability to float. Guide students to the understanding that materials that float in water are less dense than water, while materials that sink are more dense.

13. Teacher Preparation and Support

- Background Information (pg. 37)
- Teacher Preparation for investigations (pg. 64)
- Teacher Answer Keys (Student Investigation Sheet 2A: Teacher's Version, pg. 86)
- Teaching Tips (pg. 67)

BACKGROUND INFORMATION

For students, "all stuff is made of matter" is an accurate generalization. Students learn early on that examples of **matter** are a **solid**, **liquid**, or **gas**. However, the working definition of "matter"—anything that has mass and takes up space—requires that students also understand the concepts of mass and volume. These two concepts can have meaning for students apart from specific measurements, but practice quantifying mass and volume helps transform the concepts from abstract to concrete.

Students might not realize the difference between mass and weight because they are different (though closely related) concepts that are commonly used interchangeably.

- **Mass** is a measurement of the amount of matter something contains; weight is the measure of

Teaching Tip

Students may struggle to understand that solids like modeling clay have a definite shape. Explain that the modeling clay is malleable, or can change its shape, but that the individual particles that make up the modeling clay do not change in shape.

TEACHER PREPARATION

Investigation A

1. Make a copy of Student Investigation Sheet 2A: *What Are the States of Matter?* for each student.

2. Prepare materials for each of the two demonstrations as directed below:

Demonstration #1:

- Solids: Obtain a small, rigid, solid object (such as a plastic toy car). Use modeling clay to make a shape similar to the small, solid object you selected.
- Liquids: Obtain three clear containers of different shapes and fill them with equal volumes of water. Use food coloring to make the water in each a different color. Also have three empty jars (32 oz) from the kit available.
- Gases: Inflate and knot a balloon. Loosely inflate a gallon-size resealable plastic bag and seal the zipper.

Demonstration #2:

- Fill one of the 100-mL glass beakers from the kit with ice cubes. Fill the second beaker about two-thirds of the way with water.
- Obtain a hot plate and an oven mitt, and the thermometer from the kit. If you do not have access to a hot plate, you can modify the demonstration. Ice can be allowed to melt at room temperature and observed incrementally. Water can be boiled in a hot pot and observed by students in small groups.
- Have a pair of safety goggles ready to distribute to each student. Have a pair for yourself as well.

3. Have available 20 marbles and one 32-oz clear plastic jar for each group of four students.

Student Investigation Sheet 2A: Teacher's Version

What Are the States of Matter?

	Solid	Liquid	Gas
Definition	*(A material that has a definite shape and volume.)*	*(A material that has a definite volume but takes the shape of its container.)*	*(A material with no definite shape or volume that can expand freely to fill a container of any size or shape.)*
Examples	*(Wood, metal, rubber, plastic, ice)*	*(Water, milk, juice, oil, syrup, shampoo)*	*(Air, helium we use to fill balloons, carbon dioxide in soda, water vapor)*
Description of arrangement of particles	*(Particles are close together and do not move freely past one another.)*	*(Particles are farther apart than in a solid and can slide past one another, allowing the material to flow.)*	*(Particles are not held together at all, but drift apart unless they are trapped in a closed container.)*
Drawing of arrangement of particles			

Summary of Evidence for *Structure and Properties of Matter*

How does a phenomenon/problem organize the learning?

The unit begins with a class discussion of an **Anchoring Phenomenon** and a viewing of a Phenomena Video to generate student-driven questions about the unit's central phenomena. Each lesson kicks off with an **Investigative Phenomenon**, sparking student questions that can be explored through that lesson's investigations, which put phenomena directly into students' hands. Questions are provided for the teacher to help guide instruction, dispel misconceptions, and connect concepts to prior learning as students engage with the unit's the three dimensions through hands-on investigations, data gathering and analysis, notebooking, and discourse.

How are learning opportunities sequenced to enable students to make sense of the phenomena or problems?

The sequence is clearly presented in the **Evidence of Instructional Scaffolding** chart in the front of the Teacher's Guide. Performance Expectations were initially mapped out along with the Crosscutting Concepts, Science and Engineering Practices, and Disciplinary Core Ideas to ensure grade-level instruction of NGSS. Each lesson connects to the previous, creating a seamless, connected instructional path for students. Where appropriate, engineering and other science-discipline PEs are integrated to eliminate any "silos of science." Students experience science and engineering as an integrated whole.

What is the path of student thinking from their prior knowledge to the expected three-dimensional learning outcomes?

By starting with an **Anchoring Phenomenon** and a **Pre-Assessment** lesson to tap into students' prior knowledge, the teacher is able to evaluate what understandings students bring to the sequence of learning for the new unit. Teacher questioning strategies are built into each investigation to tie to the unit's three dimensions, clarify any misconceptions, and help students make meaning out of what they discover in the investigations.

How do students show/demonstrate their three-dimensional understanding of the phenomenon?

- **Pre-Unit Assessment and Post-Unit Assessment Opportunities:** The pre-unit assessment asks students to draw upon previous knowledge, allowing teachers to gauge their levels of understanding. The post-unit assessment touches upon the topics and concepts from the entire unit and evaluates students' learning. Students are asked to compare the pre-unit assessment and post-unit assessment activities to evaluate growth.
- **Formative Assessment Strategies:** At the end of each lesson, specific strategies are listed for each investigation. These include ways to utilize Student Investigation Sheets and Tell Me More prompts as assessment tools. In lower grades, an Assessment Observation Sheet lists what to look for as you work with small groups of students.
- **Literacy and Digital Components:** These resources can be assigned to differentiate assignments and to assess student progress as needed.
- **General Rubric: Appendix A** includes a rubric that provides an expected progression of skills and understanding of science content. These guidelines can be used to assess students throughout the course of the unit.
- **Summative Assessment:** This unit-specific, cumulative assessment allows students to demonstrate their understanding of content presented by responding to questions in a variety of formats. Each question is aligned to performance expectations and provides insight on students' understanding of the concepts addressed. An answer key is provided, as well as a chart that indicates the performance expectation addressed by each question and lessons to revisit if remediation is required.
- **Digital Scenario-based Assessment:** This digital assessment resource supplies phenomena-driven questions that apply the unit's learning to new, authentic situations. It provides an alternative form of summative assessment that can be administered and corrected by the computer. Scores are sent to a report for the teacher.

Evidence of Instructional Scaffolding

Scaffolding is a crucial yet natural element in all classrooms. Building Blocks of Science strives to simplify this instructional strategy by integrating this guided process into each unit, systematically building upon student knowledge, using hands-on learning to reinforce concepts, and employing student-driven inquiry. These strategies introduce new concepts and, with practice and review, lead students toward mastery. It is important to integrate scaffolding not only throughout the unit but also throughout each lesson. As students demonstrate understanding of a concept, they should be encouraged to take a leadership role in class or to attempt assignments independently. Additionally, scaffolding reveals opportunities for differentiation. Below-level learners require more reinforcement as they learn new skills, so the process toward mastery will need to be adjusted. Above-level learners do not need as much support and achieve mastery more quickly; therefore, these students can be assigned more independent study.

	Lesson 1 ▸	Lesson 2 ▸	Lesson 3 ▸
OBJECTIVES	■ Develop a working definition of the term "matter." ■ Make observations to differentiate between solids, liquids, and gases. ■ Construct an argument about the properties of each state of matter. ■ Determine the best method for determining the mass and volume of objects. ■ Analyze data to prove that matter takes up space and has mass.	■ Make observations to gather evidence that the movement of and attraction between particles change as energy is added to matter. ■ Develop a model to explain the movement of particles in each state of matter. ■ Identify phase changes as physical properties of matter, specifically using evaporation and condensation. ■ Use data to graph quantities and provide support for concepts related to matter conservation. ■ Develop a scenario to describe matter conservation.	■ Identify additional physical properties of matter, including buoyancy, hardness, magnetism, and viscosity. ■ Plan an investigation for testing buoyancy, hardness, and magnetism, and use collected data to make connections between a material and its uses. ■ Determine the density of a liquid by testing the rate at which it flows. ■ Define "density" by making connections to the behavior of matter particles.
SCAFFOLDING	Students should know: ■ Matter is anything that takes up space and has mass. ■ Mass and volume are properties of matter. ■ Volume can be measured using displacement of water. ■ There are three states of matter that each have unique properties. ■ Matter can change states.	Students should know: ■ Each state of matter is unique based on the behavior of its particles. ■ Particles change in motion and attraction as energy is added or removed from matter. ■ Physical properties of matter include the temperatures at which it can change state. ■ Matter is conserved as it changes state.	Students should know: ■ Matter can be identified using physical properties like magnetism, buoyancy, hardness, and viscosity. ■ The properties of matter can be used to determine a function for a specific material or substance. ■ The density of a substance affects its ability to float or flow. ■ Density relates to the attraction of particles.

Structure and Properties of Matter, Grade 5

	Lesson 4 ▸	Lesson 5 ▸	Lesson 6
OBJECTIVES	■ Use measurements to provide evidence that matter is conserved when it is mixed. ■ Identify the connection between mixtures and solutions. ■ Compare the behaviors of solids and liquids when they are mixed. ■ Understand solubility as a property used to describe matter. ■ Plan an investigation to separate mixtures based on their properties.	■ Distinguish between physical and chemical changes using evidence. ■ Provide evidence that mixing substances results in physical or chemical changes. ■ Observe chemical reactions to draw conclusions about identity changes. ■ Demonstrate that the total mass of materials mixed together will not change regardless of chemical or physical changes.	■ Identify methods to separate mixtures based on the properties of the matter in the mixture. ■ Plan, build, test, and evaluate a model of a water purification system. ■ Self-assess comprehension of unit content. ■ Develop a quiz about the content from the unit.
SCAFFOLDING	Students should know: ■ When matter is combined, it forms a mixture. ■ Being mixed may change the properties of some types of matter. ■ Different states of matter can be mixed. ■ Solutions are mixtures that display solubility, or the dissolving of one substance in another. ■ Solubility includes a solute and a solvent. ■ Some mixtures can be easily separated, while others are more difficult to separate. ■ The ability for a mixture to be separated depends on the physical properties of the components of the mixture.	Students should know: ■ Mixing materials can cause chemical or physical changes. ■ Chemical changes cause matter to change in identity, while physical changes may only change in shape, color, or state. ■ Matter is conserved in physical or chemical changes. ■ The behavior of particles of matter changes in both physical and chemical changes, but the organization of particles changes in chemical changes.	Students should know: ■ Systems can be designed to separate matter based on their physical properties. ■ Both physical changes and chemical reactions can be used to separate matter. ■ Engineers use the properties of matter to design filtration systems. ■ Evaporation is a frequently used method to separate solutes from water.

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Learning Framework

Kindergarten	**Push, Pull, Go** *K-PS2-1; K-PS2-2; K-2-ETS1-1; K-2-ETS1-2*	**Living Things and Their Needs** *K-LS1-1; K-ESS2-2; K-ESS3-1; K-ESS3-3; K-2-ETS1-2*	**Weather and Sky** *K-PS1-1; K-PS3-1; K-PS3-2; K-ESS2-1; K-ESS3-2; K-2-ETS1-1; K-2-ETS1-2*
1st Grade	**Light and Sound Waves** *1-PS4-1; 1-PS4-2; 1-PS4-3; 1-PS4-4; K-2-ETS1-1; K-2-ETS1-2*	**Exploring Organisms** *1-LS1-1; 1-LS1-2; 1-LS3-1; K-2-ETS1-2*	**Sky Watchers** *1-ESS1-1; 1-ESS1-2*
2nd Grade	**Matter** *2-PS1-1; 2-PS1-2; 2-PS1-3; 2-PS1-4; K-2-ETS1-1; K-2-ETS1-2*	**Ecosystem Diversity** *2-LS2-1; 2-LS2-2; 2-LS4-1; K-2-ETS1-2; K-2-ETS1-3*	**Earth Materials** *2-PS1-1; 2-ESS1-1; 2-ESS2-1; 2-ESS2-2; 2-ESS2-3; K-2-ETS1-1; K-2-ETS1-2*
3rd Grade	**Forces and Interactions** *3-PS2-1; 3-PS2-2; 3-PS2-3; 3-PS2-4; 3-5-ETS1-1; 3-5 ETS1-2*	**Life in Ecosystems** *3-LS1-1; 3-LS2-1; 3-LS3-1; 3-LS3-2; 3-LS4-1; 3-LS4-2; 3-LS4-3; 3-LS4-4; 3-5-ETS1-2*	**Weather and Climate Patterns** *3-ESS2-1; 3-ESS2-2; 3-ESS2-3; 3-ESS3-1; 3-5-ETS1-2*
4th Grade	**Energy Works** *4-PS3-1; 4-PS3-2; 4-PS3-3; 4-PS3-4; 4-PS4-1; 4-PS4-3; 4-ESS3-1; 3-5 ETS1-2; 3-5-ETS1-3*	**Plant and Animal Structures** *4-LS1-1; 4-LS1-2; 4-PS4-2; 3-5-ETS1-2*	**Changing Earth** *4-ESS1-1; 4-ESS2-1; 4-ESS2-2; 4-ESS3-2; 3-5-ETS1-2*
5th Grade	**Structure and Properties of Matter** *5-PS1-1; 5-PS1-2; 5-PS1-3; 5-PS1-4; 3-5-ETS1-2*	**Matter and Energy in Ecosystems** *5-PS3-1; 5-LS1-1; 5-LS2-1; 5-ESS2-1; 5-ESS3-1; 3-5-ETS1-3*	**Earth and Space Systems** *5-PS2-1; 5-ESS1-1; 5-ESS1-2; 5-ESS2-1; 5-ESS2-2; 5-ESS3-1; 3-5-ETS1-2*

Have questions? Please join us at www.carolina.com/bbs or www.carolina.com/cascience, or contact us at cascience@carolina.com.

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