March Grade 5 Unit 3: Changes in Matter

Content Area: **Science**
Course(s):
Time Period: **March**
Length: **6-8 Weeks**
Status: **Published**

Unit Overview

In this unit, students will learn what matter is made of, why materials are different, how substances can be identified, and how scientists know when a substance changes? They will learn what causes a substance to change, how changes to substances affects their weight, and what engineers do to improve materials.

Enduring Understandings

Matter is made up of tiny particles called atoms.

Materials are all different from one another.

We can identify substances by what they are made up of.

Scientists have methods to know when substances change.

Changes of **state** are caused by a transfer of energy.

These changes can affect substances wieght.

Engineers have developed methods to improve materials.

Essential Questions

What is matter made of?

Why are materials different?

How can we identify substances?

How do scientists know when a substance has changed?

What causes those changes?

Does changing a substance affect its weight?

How do engineers improve materials?

Instructional Strategies & Learning Activities

TEACHERS: THIS UNIT IS HOT LINKED BY CHAPTERS/QUESTIONS BELOW TO THE TCI SCIENCE ALIVE PROGRAM

What Is Matter Made Of?

Students observe and explain a series of demonstrations. Then they develop a model that describes matter as consisting of particles that are too small to be seen.

Reading Further: A Fourth State of Matter

- 2

Why Are Materials Different?

Students continue to develop their model of matter to show that matter is made of particles too small to be seen. They will model a solid, liquid, gas, and mixture.

Reading Further: Marie Curie

- 3

How Can Substances Be Identified?

Students act as detectives. They will observe unique properties of five different powders. They use these properties to identify an unknown mystery powder.

Reading Further: Substances That Glow

- 4

How Do Scientists Know When Substances Change?

Students practice making observations and inferences. They observe situations in which substances are changing and use this data as evidence to explain whether they think a new substance with different properties

was formed during each change.

Reading Further: Gold Quest

- 5

What Causes Substances to Change?

Students learn how to use fair tests to plan an investigation. They plan and carry out an investigation and mix together a variety of different substances. They use the plan they developed to identify which substances react together to form new substances.

Reading Further: Science in the Kitchen

- 6

How Do Changes to Substances Affect Their Weights?

Students measure the weight of substances before and after a change. By measuring and graphing quantities, they discover what happens to the weight of substances during different kinds of changes.

Reading Further: Star Stuff

- 7

How Do Engineers Improve Materials?

Students make glue from flour and water. Groups use the engineering design process to identify what makes “good” glue and test different processes to find the best solution.

Reading Further: Plenty of Polymers

Integration of Career Exploration, Life Literacies and Key Skills

Students work in cooperative groups.

Students use engineering design to create and improve a product.

	Collaboration with individuals with diverse perspectives can result in new ways of thinking and/or innovative solutions.
	An individual's passions, aptitude and skills can affect his/her employment and earning potential.
9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.2.5.CAP.2	Identify how you might like to earn an income.
9.2.5.CAP.3	Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.4.5.CI.3	Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a).
9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
9.4.5.CI.4	Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).
	The ability to solve problems effectively begins with gathering data, seeking resources, and applying critical thinking skills.
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology and Design Integration

online games at end of each section

Crash Course KIds

Generation Genius

Bill Nye

	Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.
8.2.5.ED.1	Explain the functions of a system and its subsystems.
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
8.2.5.ED.5	Describe how specifications and limitations impact the engineering design process.
8.2.5.ITH.1	Explain how societal needs and wants influence the development and function of a product and a system.
	A new tool may have favorable or unfavorable results as well as both positive and negative effects on society. Technology spurs new businesses and careers.
8.2.5.ITH.2	Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have.
TECH.8.1.5.A.CS1	Understand and use technology systems
TECH.8.1.5.A.CS2	Select and use applications effectively and productively.

Interdisciplinary Connections

Students will use drama to explain scientific principles.

Students use engineering design to create and improve a product.

LA.RI.5.1	Quote accurately from a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.RI.5.2	Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
LA.RI.5.3	Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
LA.RI.5.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.
LA.RI.5.5	Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.
LA.RI.5.6	Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
LA.RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
LA.RI.5.8	Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).
LA.RI.5.9	Integrate and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) information from several texts on the same topic in order to write or speak about the subject knowledgeably.
LA.RI.5.10	By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.RF.5.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding

	words.
LA.RF.5.4	Read with sufficient accuracy and fluency to support comprehension.
LA.W.5.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LA.W.5.4	Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
LA.W.5.5	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
LA.W.5.6	With some guidance and support from adults and peers, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.
LA.W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different perspectives of a topic.
LA.W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
LA.W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.SL.5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.5.2	Summarize a written text read aloud or information presented in diverse media and formats (e.g., visually, quantitatively, and orally).
LA.SL.5.3	Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.
LA.SL.5.4	Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
LA.SL.5.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
LA.SL.5.6	Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation.
LA.L.5.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
LA.L.5.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
LA.L.5.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
LA.L.5.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.
LA.L.5.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships (e.g., however, although, nevertheless, similarly, moreover, in addition).

Differentiation

- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.

- **Definitions of Differentiation Components**:

    - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
    - Process – how the student will acquire the content information.
    - Product – how the student will demonstrate understanding of the content.
    - Learning Environment – the environment where learning is taking place including physical location and/or student grouping

Differentiation occurring in this unit:

Utilize differentiation suggestions in the TCI Science Alive! program for enrichment and support.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

utilize 504 and IEP accommodations where required

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

DRA

Additional Benchmarks used in this unit:

online games

unit tests

lab reports

standardized state test

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

TCI worksheets, quizzes

Discussion

Teacher observation

Labs and Hands on activities

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of

ways to combine these approaches.

Summative assessments for this unit:

Unit assessments in the TCI program

Instructional Materials

Materials for labs indicated in TCI program

Standards

5-PS1	Matter and its Interactions
5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
	Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.
PS1.A	Structure and Properties of Matter
	Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.
	Scale, Proportion, and Quantity
	Natural objects exist from the very small to the immensely large.
5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
	Planning and Carrying Out Investigations
	Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
	Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
PS1.B	Chemical Reactions
	When two or more different substances are mixed, a new substance with different properties may be formed.
	Cause and Effect
	Cause and effect relationships are routinely identified, tested, and used to explain change.
5-LS2	Ecosystems: Interactions, Energy, and Dynamics

5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth. Assessment does not include molecular explanations. Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model to describe phenomena. The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
LS2.B	Cycles of Matter and Energy Transfer in Ecosystems Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. Systems and System Models A system can be described in terms of its components and their interactions.
SCI.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.
SCI.5-PS1-3	Make observations and measurements to identify materials based on their properties.