Unit 03: Chemical Magic

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

Practice 1. Asking questions (for science) and defining problems (for engineering)
Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.

Ask questions about what would happen if a variable is changed.

Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

Use prior knowledge to describe problems that can be solved.

Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.

Practice 2. 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.

Identify limitations of models.

Collaboratively develop and/or revise a model based on evidence that shows the relationships among variables for frequent and regular occurring events.

Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.

Develop and/or use models to describe and/or predict phenomena.

Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.

Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

Practice 3. 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.

Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Make predictions about what would happen if a variable changes.

Practice 4. Analyzing and interpreting data
Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital

tools should be used.

Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.

Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.

Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.

Analyze data to refine a problem statement or the design of a proposed object, tool, or process.

Use data to evaluate and refine design solutions.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)
Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).

Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.

Identify the evidence that supports particular points in an explanation.

Apply scientific ideas to solve design problems.

Practice 7. Engaging in argument from evidence
Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.

Construct and/or support an argument with evidence, data, and/or a model.

Use data to evaluate claims about cause and effect.

Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

Practice 8. Obtaining, evaluating, and communicating information
Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.

Connections to the Nature of Science: Most Closely Associated with Practices
Scientific Investigations Use a Variety of Methods

Science methods are determined by questions.

Science investigations use a variety of methods, tools, and techniques.

Scientific Knowledge is Based on Empirical Evidence

Science findings are based on recognizing patterns.

Science uses tools and technologies to make accurate measurements and observations.

Scientific Knowledge is Open to Revision in Light of New Evidence

Science explanations can change based on new evidence.

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Science theories are based on a body of evidence and many tests.

Science explanations describe the mechanisms for natural events.

Crosscutting Statements
1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.

Patterns of change can be used to make predictions.

Patterns can be used as evidence to support an explanation.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

Cause and effect relationships are routinely identified, tested, and used to explain change.

Events that occur together with regularity might or might not be a cause and effect relationship.

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.

5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

Matter is made of particles.

Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems.

Energy can be transferred in various ways and between objects.

Connections to Engineering, Technology and Applications of Science
Interdependence of Science, Engineering, and Technology

Science and technology support each other.

Tools and instruments are used to answer scientific questions, while scientific discoveries lead to the development of new technologies.

Influence of Engineering, Technology, and Science and the Natural World

People's needs and wants change over time, as do their demands for new and improved technologies.

When new technologies become available, they can bring about changes in the way people live and interact with one another.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts

Science is a Way of Knowing

Science is both a body of knowledge and processes that add new knowledge.

Science is a way of knowing that is used by many people.

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Science assumes consistent patterns in natural systems.

Basic laws of nature are the same everywhere in the universe.

Science is a Human Endeavor

Science affects everyday life.

Creativity and imagination are important to science.

PS1: Matter and Its Interactions
PS1.A: Structure and Properties of Matter

Matter of any type can be subdivided intoparticles that are too small to see, but even then the matter still exists and can be detected by other means. A model shows 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; the effects of air on larger particles or objects. (5-PS1-1)

The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)

Measurements of a variety of properties canbe used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

PS1.B: Chemical Reactions

When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)

No matter what reaction or change inproperties occurs, the total weight of the substances does not change. (Boundary:Mass and weight are not distinguished at thisgrade level.) (5-PS1-2)

SCI.2-PS1	Matter and Its Interactions
SCI.2.PS1.A	Structure and Properties of Matter
SCI.2.PS1.B	Chemical Reactions

Integration of Career Readiness, Life Literacies and Key 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.CRP3	Attend to personal health and financial well-being.
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 / Integration of Computer Science and Design Thinking

TECH.8.1.5	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.5.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
TECH.8.2.5	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.5.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.5.A.4	Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
	Craft and Structure
LA.K-12.NJSLSA.R4	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
	Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.RI.5	Reading Informational Text
LA.K-12.NJSLSA.W	Writing
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.5.7	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.K-12.NJSLSA.W8	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
LA.K-12.NJSLSA.SL	Speaking and Listening
	Comprehension and Collaboration
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.K-12.NJSLSA.SL2	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
LA.K-12.NJSLSA.L	Language
	Vocabulary Acquisition and Use
LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
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.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.5.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.5.1.B	Follow agreed-upon rules for discussions and carry out assigned roles.
LA.SL.5.1.C	Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
LA.SL.5.1.D	Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
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.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.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

This unit helps students develop the concepts of “substances” and “chemical reactions.” Students see that chemical reactions enable us to make new materials by transforming the ones we have. The results of these reactions are interesting and sometimes profoundly useful.

Meaning

Essential Questions

Essential Questions

How can we create new substances?

What is all matter made of?

What are acids?

What are gases?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

• Chemical reactions can create new substances.

• Matter is made of individual particles too small to be seen.

• Acids are a group of substances known for being reactive.

• Gas is a form of matter that can be used to create explosions.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

• Some substances react with others to create new substances.

• Solid, liquid, and gas are all made of particles too small to be seen.

• A useful group of substances are acids because they react more with other substances.

• Explosions are often caused by a build-up of gases.

Skills

Skills

Student will be skilled at …

• Conduct an experiment demonstrating a chemical reaction.

• Give an example of when we can see that matter is made of particles too small to be seen.

• Analyze and describe observations that a chemical reaction has taken place.

• Demonstrate with baking soda and vinegar that a build-up of gases can cause an explosion.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Mystery Science Chemical Magic Videos

MS CM1: Are magic potions real?

MS CM2: Could you transform something worthless into gold?

MS CM3: What would happen if you drank acid?

MS CM4: What do fireworks, rubber, and silly putty have in common?

MS CM5: Why do some things explode?

Science Guided Reading List (Collingswood):

- *Properties of Matter* by Rebecca Hirsch
- *Composition of Matter* by Morgaine Paris
- *Conservation of Mass* by Jenna Winterberg

Cross-content Non-fiction NGSS Recommended Reading List:

- *Walliman, D. (2016). Professor Astrocat's atomic adventure.*

  Professor Astrocat takes the reader on a journey through the incredible world of physics. Learn about energy, power and the building blocks of you, me and the universe.

- Kelsey, E. (2012). You are stardust.

  Introduces the idea that every tiny atom in our bodies came from a star that exploded long before we were born and continues on to explain that we are intimately connected to the natural world.

- *Berne, J. (2016). On a beam of light: A story of Albert Einstein.*

  Provides an overview of Einstein's life and how his ideas shaped scientific thinking worldwide. Could be used to jumpstart a conversation on portraying complex ideas in a simple fashion.

- *Wells, R. (1995). What's smaller than a pygmy shrew?*

  Compares the size of a tiny animal (a pygmy shrew) to an insect (a ladybug), which is in turn contrasted with one-celled animals, bacteria, molecules, atoms, and sub-atomic particles.

- *Mason, A. (2006). Change it! Solids, liquids, gases and you.*

  Professor Astrocat takes the reader on a journey through the incredible world of physics. Learn about energy,

power and the building blocks of you, me and the universe.

- *Stille, D. (2004). Matter: See it, touch it, taste it, smell it.*

  The states of matter (solids, liquids, and gases) are explained and demonstrated. Includes an experiment to try.

- *Slade, S. (2014). Splat! Wile E. Coyote experiments with states of matter.*

  Wile E. Coyote wants nothing more than to get hold of Road Runner. Watch as he uses liquids, solids, and gases in clever ways to catch that bird. Will the states of matter help him succeed? Or will his schemes dry up in the hot desert sun?

- *Bang, M. (2017). Rivers of sunlight: How the sun moves water around the earth.*

  Readers will learn about the constant movement of water as it flows around the Earth and the sun's important role as water changes between liquid, vapor, and ice. From sea to sky, the sun both heats and cools water, ensuring that life can exist on Earth. How does the sun keep ocean currents moving, and lift fresh water from the seas?

- *Braun, E. (2012). Joe-Joe the wizard brews up solids, liquids and gases.*

  Joe Joe the wizard has a problem. His spell to turn homework into chocolate bars has gone to syrup! Come along to learn how solids, liquids, and gases help Joe Joe with his sticky mess.

- *Green, D. (2008). Physics: Why matter matters.*

  Portrays physics concepts as goofy characters with traits that help explain complex ideas.

- *Yorifuji, B. (2012). Wonderful life with the elements: The periodic table personified.*

  In this super periodic table, every element is a unique character whose properties are represented visually: heavy elements are fat, man-made elements are robots, and noble gases sport impressive afros. You'll also learn about each element's discovery, its common uses, and other vital stats like whether it floats—or

explodes—in water.

- *Munroe, R. (2015). Thing explainer: Complicated stuff in simple words.*

  Uses line drawings and simple words to provide explanations for some of the most interesting stuff there is, including the pieces everything is made of (the periodic table).

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Formative Assessment Strategies

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- Answering questions posted within Mystery Science videos
- Working with small groups to discuss observations during lab work
- Analysis of student-side pages of Interactive Notebooks

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- Mystery Science Spaceship Earth videos
- Hands-on lab activities for each lesson from Mystery Science
- Note-taking in teacher-led pages of Interactive Notebooks
- Non-fiction read-alouds and discussions
- Lecture

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of

using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.