Unit: Matter

Content Area: **Science**
Course(s): **Integrated Science 6**
Time Period: **1 marking period**
Length: **8 Weeks**
Status: **Published**

Unit Overview

Apply the concepts of conservation of matter and energy transfer to model atoms, molecules, particle motion, state changes, and chemical reactions; and explore engineering solutions involving chemical reactions.

Transfer

Students will be able to independently use their learning to:

- Use models to describe the different particles and how they combine.

- Describe substances by their properties.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand...

how substances are made of tiny particles called atoms.

how the particle motion of atoms and molecules results in the three common states of matter that you can

observe.

how to identify chemical reactions and model how matter and energy flow through these systems.

Essential Questions

What are the smallest particles of matter?

How are atoms combined to form different molecules and extended structures?

How can you tell one substance from another?

How do atoms and molecules move in solids, liquids, and gases?

How does energy affect state changes?

How do you know when a new substance forms?

What happens in atoms during chemical reactions?

What role does energy play in chemical reactions?

Why are chemicals and chemical reactions important to society?

Application of Knowledge and Skill

Students will know...

Students will know...

how substances are made of tiny particles called atoms.

how the particle motion of atoms and molecules results in the three common states of matter that you can observe.

how to identify chemical reactions and model how matter and energy flow through these systems.

Students will be skilled at...

Students will be skilled at...

Obtaining information using various texts, text features (e.g. headings, table of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question.

Developing a model to represent patterns in the natural world.

Making observations from several sources to construct an evidence-based account for natural phenomena.

Using evidence (e.g. measurements, observations patterns) to construct or support an explanation or design.

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

Analyzing and interpret data to make sense of phenomena using logical reasoning.

Academic Vocabulary

Lesson 1	**Lesson 4**	**Lesson 7**
element	state of matter	chemical equation
atom	solid	law of conservation of matter
criteria	liquid	scientific law
constraint	gas	
atomic mass	melting point	**Lesson 8**
periodic table of the elements	boiling point	exothermic reaction
chemical symbol	pressure	endothermic reaction
	Lesson 5	prototype
Lesson 2	thermal energy	
chemical bond	temperature	**Lesson 9**
molecule	heat	natural resource
model	evaporate	synthetic material
atomic composition	sublime	food additive
chemical structure	condense	biodegradeable
crystal	deposit	
polymer		
extended structure	**Lesson 6**	

	chemical reaction	
Lesson 3	reactant	
substance	product	
macroscopic	scientific evidence	
mass	clinical trial	
property		
density		
solubility		

Learning Goal 1

Develop models to describe the atomic composition of simple molecules and extended structures.

SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.

Target 1

Lesson 1- Explore how everything is made of matter. Explore how the periodic table was developed.

Target 2

Lesson 2- Use different tools to model simple molecules and more complex extended structures.

Learning Goal 2

Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design

	solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Target 1

Lesson 3- Learn about different properties that can be used to identify a substance. Identify an unknown substance from other ones that look similar but have different properties.

Target 2

Lesson 6- Test the properties of reactants and products to determine whether or not a chemical reaction has occurred.

Learning Goal 3

Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

SCI.MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Target 1

Lesson 4- Develop a model that shows the relationship between particle motion and states of matter. Predict state changes as a result of pressure and temperature changes.

Target 2

Lesson 5- Compare the difference between heat, temperature, and thermal energy. Identify how thermal energy affects state changes.

Learning Goal 4

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Target 1

Lesson 9- Research and investigate different substances that have had profound impacts on society

Learning Goal 5

Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

Target 1

Lesson 7- Model the atoms before and after a chemical reaction to observe the changes to substances.

Learning Goal 6

Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

SCI.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

Target 1

Lesson 8- Investigate exothermic and endothermic reactions that can be used for a chemical hand warmer or a cold pack.

Formative Assessment and Performance Opportunities

- Lesson Game
- Interactive Tutorial
- Interactive Student Notebook
- Vocabulary Cards
- Class Participation
- Performance Assessments

Summative Assessment

LinkIt! Common Assessment

NGSS- Designed Lesson Assessment: Atoms and Elements

NGSS- Designed Lesson Assessment: Molecules and Extended Structures

NGSS- Designed Lesson Assessment: Substances and Their Properties

NGSS- Designed Lesson Assessment: The Motion of Particles

NGSS- Designed Lesson Assessment: Heat, Temperature, and State Changes

NGSS- Designed Lesson Assessment: Identifying Chemical Reactions

NGSS- Designed Lesson Assessment: Atoms in Chemical Reactions

NGSS- Designed Lesson Assessment: Energy in Chemical Reactions

NGSS- Designed Lesson Assessment: Chemical Engineering and Society

21st Century Life and Careers

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Accommodations/Modifications

Quicker Coverage

- At the end of the investigation, students are asked to research a molecule with an extended structure and build a model of it. Eliminate this part of the Lesson Guide and move on to the Wrap Up. (Lesson 2)

- Eliminate objects. (Lesson 3)

- Eliminate stations. (Lesson 5)

- Investigation 2 asks students to create three different reactions. Instead, have each group perform one reaction or two. All three reactions should be performed by different groups—for example, each reaction should be assigned to one-third of the class. (Lesson 7)

- Eliminate reactions. (Lesson 8)

Deeper Coverage (Advanced Learners)

- Students can investigate the topic by conducting further research and writing an explanation.

- Have students suggest alternative explanations that are supported by the available evidence.

- Have students answer an additional question at each station. (Lesson 5)

- Discuss source reliability. (Lesson 9)

English Language Learners

- Pre-teach science vocabulary.

- Print presentation slides.

- Allow students to use pictures.

- Use students' background knowledge.

- Work with a reading partner.

- Use text audio.

Students with Special Needs

- Use graphic organizers.

- Assign students specific roles.

- Place students in mixed ability pairs

- Provide possible topic options (Lesson 1)

- Pre-build models. (Lesson 2)

- Model the solubility experiment. (Lesson 3)

- Assist with measurements. (Lesson 8)

Unit Resources

TCI Online Manual/ Materials

Vocabulary Cards

TCI Kit

Student chromebooks

Interdisciplinary Connections

LA.W.6.1.A	Introduce claim(s) and organize the reasons and evidence clearly.
LA.W.6.1.B	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.
LA.W.6.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
LA.W.6.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.W.6.7	Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
LA.W.6.8	Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
LA.W.6.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.RL.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
MA.6.EE.A.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
MA.6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
MA.6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.6.SP.A.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.