Week	Marking Period 1	Week	Marking Period 3
1	Scientific Practice/Engineering-Design	21	History of Earth: Geoscience Processes Changed Earth's Surface
2	Scientific Practice/Engineering-Design	22	History of Earth: Geoscience Processes Spatial Scales
3	Physical Science: Newton's Three Laws	23	History of Earth: Fossils and Rocks
4	Physical Science: Motion and Forces	24	History of Earth: Seafloor Structure
5	Physical Science: Motion and Forces	25	History of Earth Geologic Time Scale
6	Physical Science: Motion and Forces	26	History of Earth Geologic Time Scale
7	Physical Science: Electric and Magnetic Forces/Gravitational Interactions	27	History of Earth Human Impact
8	Physical Science: Kinetic and Potential Energy	28	Structure and Properties of Matter: Atomic Composition of Simple Molecules
9	Physical Science: Kinetic and Potential Energy	29	Structure and Properties of Matter: Atomic Composition of Extended Structures
10	Physical Science: Energy Transfer	30	Structure and Properties of Matter: Synthetic Materials Functions
Week	Marking Period 2	**Week**	Marking Period 4
11	Physical Science: Energy Transfer	31	Structure and Properties of Matter: Cause and Effect Relationships
12	Physical Science: Energy in Waves	32	Structure and Properties of Matter: Cause and Effect Relationships
13	Physical Science: Waves: Reflected, Absorbed, and Transmitted	33	Chemical Reactions: Physical and Chemical Properties

14	Physical Science: Engineering-Design Project. Roller coasters	34	Chemical Reactions: Physical and Chemical Properties
15	Physical Science: Engineering-Design Project. Roller coasters	35	Chemical Reactions: Macroscopic Patterns
16	Physical Science: Engineering-Design Project. Roller coasters	36	Chemical Reactions: Conservation of Matter
17	History of Earth: Interior of Earth	37	Chemical Reactions: Energy and Matter
18	History of Earth: Evidence of Geoscience Processes	38	Chemical Reactions: Developing Possible Solutions
19	History of Earth: Evidence of Geoscience Processes	39	Chemical Reactions: Optimizing the Design Solution
20	History of Earth: Geoscience Processes Changed Earth's Surface	40	Final Benchmark

Department Science Course Grade 8

Time Frame	2 Weeks

Topic

Science Practices: Understand Science Explanations, Generate Scientific Evidence through Active Investigation, Reflect on Scientific Knowledge, Participate Productively in Science

Science Practices: **Students can articulate the importance of accurate data collection and record keeping in science, and are able to demonstrate good practices for data collection, and identify common sources of error.**

Essential Questions

- How do we build and refine models that describe and explain the natural and designed world?
- What constitutes useful scientific evidence?
- How is scientific knowledge constructed?
- How does scientific knowledge benefit, deepen, and broaden from scientists sharing and debating ideas and information with peers

Enduring Understandings

- Measurement and observation tools are used to categorize, represent, and interpret the natural world.
- Evidence is used for building, refining, and/or critiquing scientific explanations.
- Scientific knowledge builds upon itself over time.
- The growth of scientific knowledge involves critique and communication – social practices that are governed by a core set of values and norms.

Alignment to NGSS

MS-ESS2-3, MS-ESS1-4, MS-ESS2-2, MS-ESS2-3, MS-PS1-5, MS-PS1-2, MS-PS1-6, MS-PS1-5, MS-PS1-2

Key Practices and Skills

- Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.
- Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
- Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation.
- Apply scientific ideas or principles to design an object, tool, process or system.
- Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
- Science knowledge is based upon logical and conceptual connections between evidence and explanations.
- Analyze and interpret data to provide evidence for phenomena.
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will

continue to do so in the future.

- Science findings are frequently revised and/or reinterpreted based on new evidence.

- Develop a model to describe unobservable mechanisms.
- Analyze and interpret data to determine similarities and differences in findings.
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- Laws are regularities or mathematical descriptions of natural phenomena.
- Science knowledge is based upon logical and conceptual connections between evidence and explanations.

- Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.
- Results of observation and measurement can be used to build conceptual-based models and to search for core explanation.
- Evidence is generated and evaluated as part of building and refining models and explanations.
- Mathematics and technology are used to gather, analyze, and communicate results.
- Carefully collected evidence is used to construct and defend arguments. Scientific reasoning is used to support scientific conclusions.
- Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.
- Predictions and explanations are revised to account more completely for available evidence.
- Science is a practice is which an established body of knowledge is continually revised, refined, and extended.
- Science involves practicing productive social interactions with peers, such as partner talk, whole group discussions, and small-group work.
- In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models and theories.
- Instruments of measurement can be used to safely gather accurate information for making scientific investigations and model-building.

Learning Activities

- Pre-benchmark
- Lab Safety Activity
- Pendulum lab
- Claim Evidence Reasoning Introductory Activity
- Reading and Creating graphs
- Engaging in argument from evidence
- Planning and carrying out investigations
- Analyze and interpret data
- Developing and refining models
- Generate, discuss, and analyze data
- Engage in both spoken and written explanations and argumentation

Assessments

- Lab Safety Quiz
- Observational Assessment
- Reading the Meniscus Station Lab Activity
- Checks Lab
- Sink or Float Challenge

21st Century Skills

x	Creativity	x	Critical Thinking	x	Communication	x	Collaboration
x	Life & Career Skills	x	Digital Libraries	x	Media Literacy		

Interdisciplinary Connections

- Math
  - Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities
  - Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations
  - Recognize and represent proportional relationships between quantities.
  - Reason abstractly and quantitatively.
- Language Arts
  - Cite specific textual evidence to support analysis of science and technical text
  - Draw evidence from informational texts to support analysis reflection, and research.
  - Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions

Technology Integration

- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest
- Smart Board Activities
- Digital Libraries
- Use of mobile media devices as tools for data collection, as well as online data sets
- Online collaboration, conferencing, and communication tools for authentic research with peers and scientists
- Electronic portfolios
- Computer-aided design, modeling software, and simulation software
- Digital production tools (digital photography and video)
- Graphics software (drawing, painting, image editing)
  Multimedia resources (images, video, audio, animations, simulations, and educational games)

Department Science Course Grade 8

Time Frame	14 Weeks

Topic

Physical Science: Forces and Interactions, Energy, Waves and Electromagnetic Radiation

Physical Science: Engineering-Design Project.

Science Practices: Students are able to describe how science and engineering involve creative processes that include generating and testing ideas, making observations, and formulating explanations; and can apply these processes in their own investigations.

Essential Questions

- How do we know that things have energy?
- How can energy be transformed from one material to another?
- What happens to a material when energy is transferred to it?
- How can energy be transferred from one material to another?
- What happens to a material when energy is transferred to it?

Enduring Understandings

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law).
- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).
- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun.
- Temperature is not a measure of energy; the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.
- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.
- A system of objects may also contain stored (potential) energy, depending on their relative positions.
- When the motion energy of an object changes, there is inevitably some other change in energy at the same time.

- The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.
- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.
- However, because light can travel through space, it cannot be a matter wave, like sound or water waves.

Alignment NGSS

- NGSS: MS-PS2- 1, MS-PS2- 2, MS-PS2-3, MS-PS2- 4, MS-PS2-5, MS-PS3- 1, MS-PS3- 2, MS-PS3- 3, MS-PS3- 4, MS-PS3-5, MS-PS4- 1, MS-PS4- 2, MS-PS4- 3

Key Practices and Skills

- Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects
- Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object
- Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact
- Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
- Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer
- Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
- Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

Department Science Course Grade 8

Learning Activities

- Forces and Motion Activities
- Electromagnetic Power! Activity
- Inspector Detector Challenge
- Photogate labs using a car and ramp
- Constructing Explanations
- Engaging in argument from evidence
- Planning and carrying out investigations
- Analyze and interpret data
- Developing models
- Refining models
- Generate, discuss, and analyze data
- Engage in both spoken and written explanations and argumentation
- Reflect on their own understanding

Assessments

- Observational Assessments
- Writing Conclusions
- Photogate labs using a car and ramp
- Parachute Lab
- Friction lab
- Rollercoaster Challenge
- Catapult Challenge

- Rollercoaster Challenge
- Kinetic/Potential Energy Formula Quiz
- Heat Transfer Station Lab Quiz
- Forces Quiz
- Chapter Tests (Energy & Motion/Forces)

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	~~Skills~~ Multimedia Resources	**X**	Digital Libraries	**x**	Media Literacy		

Interdisciplinary Connections

- ELA/Literacy
  - Cite specific textual evidence to support analysis of science and technical text
  - Draw evidence from informational texts to support analysis reflection, and research.
  - Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions
- Engineering/Math: Rollercoaster Challenge
- Math: Multiple Labs (Speed & Momentum)

- Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities
- Use ratio and rate reasoning to solve real-world and mathematical problems.
- Recognize and represent proportional relationships between quantities.
- Reason abstractly and quantitatively.

Technology Integration

- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest
- Smart Board Activities
- Digital Libraries
- Use of mobile media devices as tools for data collection, as well as online data sets
- Online collaboration, conferencing, and communication tools for authentic research with peers and scientists
- Electronic portfolios
- Computer-aided design, modeling software, and simulation software
- Digital production tools (digital photography and video)
- Graphics software (drawing, painting, image editing)
  Multimedia resources (images, video, audio, animations, simulations, and educational games)

Time Frame	**11 Weeks**

Topic

Earth Science: History of Earth

Essential Questions

- To what extent does the exchange of energy within the Earth drive geologic events on the surface?

- How do changes in one part of an Earth system affect other parts of the system?
- How do geologic events occurring today provide insight on Earth's past?

Enduring Understandings

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches.
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
- Patterns in rates of change and other numerical relationships can provide information about natural systems
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
- How do changes in one part of an Earth system affect other parts of the system?
- Energy flow and movement of a material from the Earth's interior causes geologic events on the Earth's surface.
- Earth's components form systems.
- These systems continually interact at different rates of time, affecting the shape of the Earth's surface regionally and globally.

Alignment to NGSS

- NGSS: MS-ESS1- 4, MS-ESS2- 2, MS-ESS2- 3, MS-ESS3-2, MS-ESS3-3,MS-ESS3-4

Key Practices and Skills

- Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
- Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
- Science findings are frequently revised and/or reinterpreted based on new evidence
- Analyze and interpret data to provide evidence for phenomena.
- Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects
- Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

- Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- 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.
- Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- *The rock cycle is a model of creation and transformation of rocks from one form (sedimentary, igneous, and metamorphic) to another.*
- *Rock families are determined by the origin and transformations of the rock. Rocks and rock formations contain evidence that tell a story about their past.*
- The story is dependent on the minerals, materials, tectonic conditions, and erosion forces that created them.
- Soil consists of weathered rocks and decomposed organic material. Soils are often found in layers.
- Physical & chemical changes take place in Earth's materials when Earth features are modified through weathering & erosion.
- Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from the motion of plates.
- Sea-floor spreading, revealed in mapping of the Mid-Atlantic Ridge, and subduction zones are evidence for the theory of plate tectonics.
- Earth's magnetic field has a north and south poles and lines of force that are used for navigation.

- Today's planet is very different than early Earth.

- Evidence for one-celled forms of life (bacteria) extends back more than 3.5 billion years ago.
- Fossils provide evidence of how life and environmental conditions on Earth as they changed throughout geologic time.

Learning Activities

- Investigating Erosion
- Modeling Sea Level: Lateral and Vertical Facies Changes
- Virtual Lab-Fossil Dating
- Pangaea/ Plate Tectonic Puzzle
- Interactives-Dynamic Earth
- Continental Drift Activity
- Sea Floor Spreading Made Easy
- Unit Plan :Change and Earth's History-Clues to Past Environments
- Musical Plates-A Study of earthquakes and Plate Tectonics

- *Unknown Mineral Lab*
- *Rock/Mineral Station Lab*
- Chemical & Mechanical Weathering Lab
- Isoseismic Map Activity
- Epicenter Lab
- Earth's Layers Foldable

- Earthquake Letter

- Cartoon/Travel Brochure to Highlight One Era (and Periods Within)
- Radioactive Decay Lab
- Geologic Time Station Lab
- *Law of Superposition Activity*

- Constructing Explanations
- Engaging in argument from evidence
- Planning and carrying out investigations
- Analyze and interpret data
- Developing models
- Refining models
- Generate, discuss, and analyze data
- Engage in both spoken and written explanations and argumentation
- Reflect on their own understanding

Assessments

- Geologic Time Station Lab
- Radioactive Decay Lab
- Geologic Time Station Lab
- Musical Plates-A Study of earthquakes and Plate Tectonics
- Designer Animal Project

- *Unknown Mineral Lab*
- *Rock/Mineral Station Lab*
- Isoseismic Map Activity
- Epicenter Lab
- Geologic Time Quest
- Unit Test

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	GIS and GPS tools	**X**	Digital Libraries	**x**	Media Literacy		

Interdisciplinary Connections

- ELA/Literacy
  - Cite specific textual evidence to support analysis of science and technical texts
  - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
  - Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table)
  - Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic
  - Conduct short research projects to answer a question (including a self-generated

question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
    - Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
    - Draw evidence from informational texts to support analysis reflection, and research.
    - Rock Cycle Presentations: Language Arts, Art & Music
    - Technology, Social Studies, Language Arts: Musical Plate Activity

- Math:
    - Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
    - Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
    - Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities
    - Recognize and represent proportional relationships between quantities.
    - Reason abstractly and quantitatively.
    - Radioactive Decay Lab
- Math & Social Studies: Epicenter Lab
- Social Studies & Art: Pangaea Puzzle

- Language Arts & Social Studies; Evolutionary Adaptation of Mammals
- Art, Language Arts & Technology; Cartoon/Travel Brochure

Technology Integration

- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
- Smart Board Activities
- Digital Libraries
- Use of mobile media devices as tools for data collection, as well as online data sets
- Online collaboration, conferencing, and communication tools for authentic research with peers and scientists
- Electronic portfolios
- Computer-aided design, modeling software, and simulation software
- Digital production tools (digital photography and video)
- Graphics software (drawing, painting, image editing)
  Multimedia resources (images, video, audio, animations, simulations, and educational games)
- GIS and GPS online tools
- WebQuest on Plate Tectonics (Integration with Musical Plates Activity)

Department Science Course Grade 8

Time Frame	5 Weeks

Topic

Chemistry: Structure and Properties of Matter

Essential Questions

- How do the properties of materials determine their use?
- How does the conservation of mass apply to their interaction of materials in a closed system?

Enduring Understandings

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.
- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.
- Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.
- All matter is made of atoms.
- Matter made only of one type of atom is called an element.
- All substances are composed of one or more of approximately 100 elements.
- Properties of solids, liquids, and gases are explained by a model of matter as composed of tiny particles of motion.
- The Periodic Table organizes elements into families of elements with similar properties.
- Elements are a class of substances that are composed of a single kind of atom. Compounds are substances that are chemically formed and have physical and chemical properties that differ from the reacting substances.

- Substances such as metals, non-metals, acids and bases are classified according to their physical and chemical properties.

Alignment to NGSS

- MS-PS1-1, MS-PS1-3, MS-PS1-4

Key Practices and Skills

- Develop models to describe the atomic composition of simple molecules and extended structures.
- Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- 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.
- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.

Learning Activities

- Molecules in Motion
- States of Matter Basics
- Build-a-Molecule
- Changes of State
- Changing State - Evaporation
- Topic Worksheets
  - "Density Identities"
  - "Density Diver"
  - "Space Case"
  - "Properties of Matter – White Before Your Eyes" Lab
  - "The Atoms Family"
  - "Compounds vs. Mixtures"
  - "Classifying Matter"
  - "Full of Hot Air"
  - "Phases of Matter Cartoon"
  - "Solution Shapes"
  - "Arranging the Elements"
  - "Periodic Table Challenge"
  - "Periodic Table Scrabble"
  - "A World Famous Table"
- Project / Performance Assessments – "Elemental Superhero" (moved to assessment)

Assessments

- Project / Performance Assessments – "Elemental Superhero"
- "Element Research Project"
- "Periodic Table WebQuest"
- Constructing Explanations
- Engaging in argument from evidence
- Planning and carrying out investigations
- Analyze and interpret data
- Developing models
- Refining models

- Generate, discuss, and analyze data
- Engage in both spoken and written explanations and argumentation
- Reflect on their own understanding

21st Century Skills

X	Creativity	**X**	Critical Thinking	**X**	Communication	**X**	Collaboration
X	Skills	**X**	Digital Library	**X**	Media Literacy		

Interdisciplinary Connections

- Language Arts
  - Open-Ended and Real World Application Questions, Short Story about Changes in State.
  - Cite specific textual evidence to support analysis of science and technical texts.
  - Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table)
  - Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- Mathematics: Computation for Finding the Number of Subatomic Particles.
  - 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.
  - Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations
  - Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
  - Reason abstractly and quantitatively
- Social Studies: History of Atoms and their Discovery, Historical Perspective of the Periodic Table.
- Fine Arts: Phases of Matter, Atoms and Periodic Table Illustrations.

Technology Integration

- Smart Board Activities
- Digital Libraries
- Use of mobile media devices as tools for data collection, as well as online data sets
- Online collaboration, conferencing, and communication tools for authentic research with peers and scientists

- Electronic portfolios
- Computer-aided design, modeling software, and simulation software
- Digital production tools (digital photography and video)
- Graphics software (drawing, painting, image editing)
  Multimedia resources (images, video, audio, animations, simulations, and educational games)

Time Frame	**7 Weeks**

Topic

- **Chemistry: Chemical Reactions**

Essential Questions

- How does the conservation of mass apply to the interaction of materials in a closed system?

Enduring Understandings

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
- The total number of each type of atom is conserved, and thus the mass does not change.
- Some chemical reactions release energy, others store energy.
- A solution needs to be tested, and then modified on the basis of the test results in order to improve it.
- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

- When materials interact within a closed system, the total mass of the system remains the same.
- Substances can undergo physical and chemical changes to form new substances.
- Each change involves energy.

Alignment to NGSS

- NGSS: MS-PS1-2, MS-PS1-5, MS-PS1-6

Key Practices and Skills

- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- 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.
- Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
- When substances undergo chemical change, the number and kinds of atoms in the reactants are the same as the number and kinds of atoms in the products.
- The mass of the reactants is the same as the mass of the products.
- Chemical changes can occur when two substances, elements, or compounds react and produce one or more different substances.
- The physical and chemical properties of the products are different from those of the reacting substances.

Learning Activities

- Can You Copperplate?
- Balancing Chemical Equations
- Baggie Chemistry
- Design and Build a Biscuit
- "Two ways to change"
- "Demonstration with a Crunch"
- "Exploring Changes in Matter"
- "Combining Elements to Form a Compound"
- "Describing a Chemical Reaction"
- "Isn't it Ionic?"
- "Bonding with a Buddy"
- Constructing Explanations
- Engaging in argument from evidence
- Planning and carrying out investigations
- Analyze and interpret data
- Developing models
- Refining models
- Generate, discuss, and analyze data
- Engage in both spoken and written explanations and argumentation
- Reflect on their own understanding

Assessments

- Observational assessment / Lab Participation
- Project / Performance Assessments – "Building Atomic Models"
- "Physical and Chemical Changes" Lab
- "Using Chemical Changes to Identify an Unknown"

- Energy Changes in Chemical Reactions Lab

21st Century Skills

x	Creativity	**x**	Critical Thinking	**x**	Communication	**x**	Collaboration
x	Skills	**x**	Digital Libraries	**x**	Media Literacy		

Interdisciplinary Connections

- Language Arts: Journal Entries, Open-Ended and Real World Application Questions,
  - Cite specific textual evidence to support analysis of science and technical texts.
  - Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
  - Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
  - Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- Mathematics: Balancing equations, massing products and reactants, converting metric units
  - Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
  - Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
  - Summarize numerical data sets in relation to their context.
  - Reason abstractly and quantitatively.
  - Model with mathematics.
- Social Studies: "The Right Stuff" Manufacturing Challenge
- Fine Arts: Compound Illustrations, Chemical Changes Song

Technology Integration

- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

- Digital Libraries
- Use of mobile media devices as tools for data collection, as well as online data sets
- Online collaboration, conferencing, and communication tools for authentic research with peers and scientists
- Electronic portfolios
- Computer-aided design, modeling software, and simulation software

- Digital production tools (digital photography and video)
- Graphics software (drawing, painting, image editing)
  Multimedia resources (images, video, audio, animations, simulations, and educational games)
- Chemical Changes Student Animations
- "SciLinks" Activities