

Englewood on the Palisades Charter School

Science Curriculum

Grade 8

Aligned With the 2026 New Jersey Student Learning Standards

The Vision for Science Education in New Jersey

2026 New Jersey Student Learning Standards for Science

The New Jersey Student Learning Standards for Science (NJSLS-S) describe the expectations for what students should know and be able to do as well as promote three-dimensional science instruction across the three science domains (i.e., physical sciences, life science, Earth and space sciences). From the earliest grades, the expectation is that students will engage in learning experiences that enable them to investigate phenomena, design solutions to problems, make sense of evidence to construct arguments, and critique and discuss those arguments (in appropriate ways relative to their grade level).

The foundation of the NJSLS-S reflects three dimensions — science and engineering practices, disciplinary core ideas, and crosscutting concepts. The performance expectations are derived from the interplay of these three dimensions. It is essential that these three components are integrated into all learning experiences. Within each standard document, the three dimensions are intentionally presented as integrated components to foster sensemaking and designing solutions to problems. Because the NJSLS-S is built on the notions of coherence and contextuality, each of the science and engineering practices and crosscutting concepts appear multiple times across topics and at every grade level. Additionally, the three dimensions should be an integral part of every curriculum unit and should not be taught in isolation.

Mission

All students will possess an understanding of scientific concepts and processes required for personal decision-making, participation in civic life, and preparation for careers in STEM fields (for those that chose).

Vision

Prepare students to become scientifically literate individuals who can effectively:

- Apply scientific thinking, skills, and understanding to real-world phenomena and problems;

- Engage in systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned;
- Conduct investigations, solve problems, and engage in discussions;
- Discuss open-ended questions that focus on the strength of the evidence used to generate claims;
- Read and evaluate multiple sources, including science-related magazine and journal articles and web-based resources to gain knowledge about current and past science problems and solutions and develop well-reasoned claims; and
- Communicate ideas through journal articles, reports, posters, and media presentations that explain and argue.

(NJ DOE, 2022)

New Jersey Legislative Statutes and Administrative Code

Science

Amistad Law: *N.J.S.A. 18A 52:164-88*

[African Americans in Science](#)
[8 Amazing Black Scientists and How They Changed History](#)
[African American Scientists and Inventors](#)

Holocaust Law: *N.J.S.A. 18A:35-28*

[Georg Bredig: Scientist, Humanist, and Holocaust Survivor](#)

LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*

<https://prideinstem.org/>
[LGBTQ+ Scientists Through History](#)
[Celebrating Scientists With Disabilities](#)

--

Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*

Ada Twist, Scientist by Andrea Beaty [Ada Twist, Scientist Activities](#)
How Many Stars in the Sky by Lenny Hort [How Many Stars in the Sky? | RIF.org](#)
Mae Among the Stars by Roda Amhed [Mae Among the Stars STEM Activity](#)
The Outdoor Scientist by Temple Grandin

8th Grade Science Curriculum

Scientific and technological advancements have expanded significantly, now influencing nearly every part of life in the 21st century. It is becoming ever more crucial for everyone in society to have an understanding of scientific and engineering concepts and processes. In this course students will learn to construct scientific explanations and design evidence-based solutions equips students with the skills to think critically about personal and societal issues. This knowledge enables them to contribute effectively to decision-making processes, including discussions on climate change, new health care methods, and innovative solutions to both local and global challenges.

This 8th-grade science curriculum aligns with the New Jersey Student Learning Standards (NJSLS) and provides young learners with a solid foundation in scientific inquiry skills and early understanding of key science concepts. Throughout the year, the curriculum should incorporate hands-on activities, observations, and exploration to engage 8th-grade students and make learning science interactive and fun. Formative assessments, observations, and ongoing progress monitoring should be used to ensure that students are meeting the learning objectives. The curriculum should be flexible and adaptable to meet the individual needs and learning styles of the students.

Grade Eight Units and Pacing	
Unit 1: Structure and Properties of Matter	6 weeks

Unit 2: Changes in Matter	6 weeks
Unit 3: Chemical Reactions	6 weeks
Unit 4: Forces and Motion	6 weeks
Unit 5: Relationships Among Forms of Energy/Thermal Energy	6 weeks
Unit 6: Waves/Electromagnetic Spectrum	6 weeks
Total Number of Weeks:	36 weeks

Unit 1: Structure and Properties of Matter

Unit Goals:

Students build understandings of what occurs at the atomic and molecular scale. Students apply their understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level account to explain states of matter and changes between states. The crosscutting concepts of cause and effect, scale, proportion and quantity, structure and function, interdependence of science, engineering, and technology; and the influence of science, engineering and technology on society and the natural world provide a framework for understanding the disciplinary core ideas. Students demonstrate grade appropriate proficiency in developing and using models and obtaining, evaluating, and communicating information. Students are also expected to use these scientific and engineering practices to demonstrate understanding of the core ideas.

Duration: 6 weeks

Essential Questions:

- If all things are made of the same basic building blocks, why do objects look and act differently?
- What changes do heating and cooling cause?
- What makes something a solid, liquid or a gas?

Enduring Understandings: ● Pure substances (elements and compounds) are made from different types of atoms which combine with one another in various ways and can range in size from two to thousands of atoms. ● All matter can be described and identified by its chemical and physical properties. ● A mixture is formed when two or more substances are mixed together, but their atoms do not chemically bond.		
Key NJSLS Strands: ● MS-PS1-3: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. ● 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.		
Science & Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Developing and Using Models ● Develop a model to predict and/or describe phenomena. (MS-PS1-1) Analyzing and Interpreting Data ● Analyze and interpret data to determine similarities and differences in findings. (MS-PS1-2)	PS1.A: Structure and Properties of Matter ● 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. (MS-PS1-1) ● Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1) ● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2)	Scale, Proportion, and Quantity ● Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1) Patterns ● Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-2) Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence ● Science knowledge is based upon logical and conceptual connections

	PS1.B: Chemical Reactions 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. (MS-PS1-2)	between evidence and explanations (MS-PS1-2)
--	---	--

Interdisciplinary Connections		
English Language Arts - RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. - RST.6-8.7 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).		
Math - MP.2 Reason abstractly and quantitatively. - MP.4 Model with mathematics. 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. 8.EE.A.3 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. 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 6.SP.B.5 Summarize numerical data sets in relation to their context.		
21st-Century Skills		
9.4.8.IML.3 Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. 9.4.8.IML.4 Ask insightful questions to organize different types of data and create meaningful visualizations.		

9.4.8.TL.3 Select appropriate tools to organize and present information digitally.
Career Ready Practices
- CRP-2: Students use knowledge and skills through their lab work. - CRP-12: Students work productively in collaborative groups using culturally global competence. - CRP-4: Communicate clearly and effectively and with reason.
Technology Integration
8.1.8.DA.1 Organize and transform data collected using computational tools to make it usable for a specific purpose.

Skills	Instructional Topics	Assessment	Resources	Vocabulary
Discuss the benefits of the SI system and convert to metric units.	Introduction to the SI System and Metric Conversions	Formative Assessments: Lab Reports/CER Responses	Materials: Whiteboard	SI System
Explain mass and weight as properties of matter.	Understanding Mass and Weight	Lab Skills Rubric	Markers	Metric Conversions
Measure volume of solids and liquids.	Volume Measurement	Lesson Quizzes	SI system reference charts	Mass
Calculate the density of solids and liquids to determine the density does not depend on the quantity of the	Density and Its Properties	Lesson Self-assessment	Metric conversion charts	Weight
	Properties of Matter	Teacher Observations	Manipulative tools for conversions (e.g., meter sticks, gram weights)	Volume
	The Periodic Table and Element Organization	Class Discussions		Graduated Cylinder
	Chemical Formulas and Compound Composition	Classwork/ Homework	Balances (digital or beam)	Density
	Separating Mixtures and	Exit Slips/Google Form		Property of Matter
				Physical Property
				Chemical Property

material. Calculate, analyze, and describe properties of matter of various substances. Analyze and interpret data to determine whether substances are the same based upon characteristic properties. Study the organization of the periodic table and how physical and chemical properties are used to organize the elements. Identify the number and types of atoms that make up compounds, and make connections to chemical formulas. Identify a pure substance from a mixture.	Identifying Pure Substances	Summative Assessments: Topic/Unit Assessments Constructed Response Questions Projects Cumulative Tests Performance Assessments Alternate and Benchmark Assessments: Progress Monitoring Assessments Cumulative/Benchmark Assessments	Various objects of known mass Weighing dishes or containers Classroom scale Graduated cylinders Water Irregularly shaped objects Measuring tape or ruler Various liquids with different densities (e.g., water, oil, syrup) Solid objects (e.g., wood blocks, metal cubes) Containers for liquid layering demonstration Samples of different substances (e.g., metals, plastics, liquids)	Periodic Table Element Compound Chemical Formula Mixture Pure Substance Filtration Distillation Chromatography Characteristic Property
---	------------------------------------	---	--	--

			Observation sheets or notebooks Magnifying glasses or microscopes Safety goggles Periodic table charts or posters Laptops or tablets with internet access for online simulations Poster boards or chart paper Markers, colored pencils, or crayons Whiteboard or chalkboard Molecular model kits Compound cards or flashcards Writing materials	
--	--	--	--	--

			Various mixtures (e.g., sand and salt, oil and water) Filtration setup (e.g., filter paper, funnel, beaker) Distillation apparatus Chromatography materials (e.g., chromatography paper, solvents) Vocabulary foldables Activities/Links: Group discussion on the advantages of the SI system Interactive activity converting metric units using online tools or physical manipulatives Hands-on experiment using balances to measure the mass of objects	
--	--	--	---	--

			Class debate on the differences between mass and weight Laboratory activity measuring the volume of irregularly shaped objects using displacement Group challenge to estimate and measure the volume of various containers Demonstration of density by layering liquids of different densities Inquiry-based experiment to calculate the density of solids and liquids Station activity where students observe and record the properties of different substances	
--	--	--	--	--

			Gallery walk to analyze and compare data on substances' properties Interactive lesson using online periodic table simulations to explore trends in element properties Group project to create a visual representation of element groups and trends Guided practice session on writing chemical formulas for common compounds Cooperative learning activity to decode chemical formulas and identify the elements present Hands-on lab rotations where students perform	
--	--	--	--	--

			various separation techniques on mixtures Critical thinking task to identify pure substances from complex mixtures based on characteristic properties Modeling Molecules Volume Lab Density Lab Classifying Matter Element Superhero/Villian Project	
--	--	--	---	--

Modifications and Accommodations

Tier II and III Strategies	Small group instruction (Tier II) ● Explicit instruction ● Schema-based instruction ● Use visuals ● Use manipulatives ● Use a multi-sensory approach ● Guided notes and/or scaffold outline for written assignments ● Introduce key vocabulary before lesson
-----------------------------------	---

	● Lesson taught again using a differentiated approach Small group or Individual instruction (Tier III) ● Intensive instruction ● Practice fact retrieval ● Lesson taught again using a differentiated approach ● Allow answers to be given orally or dictated ● Use visuals / Anchor Charts
Students with IEPs and 504 Plans	● Follow all the IEP/504 plan modifications ● Allow extra time to complete assignments or tests ● Guided notes and/or scaffold outline for written assignments ● Work in a small group ● Solidify and refine concepts through repetition ● Allow answers to be given orally or dictated ● Use multi-sensory teaching approaches ● Utilize assistive technology and materials ● Use large print books, Braille, or books on CD (digital text) ● Text to speech/audio recorded selections ● Amplification system as needed ● Leveled texts according to ability ● Fine motor skill stations embedded in rotation as needed ● Modified or constrained spelling word lists ● Provide anchor charts with high frequency words and phonemic patterns ● Students might need guidance as to what actions happen during partner work time. Invite students to discuss what it looks like when they are working with their partner while exploring the connecting cubes. Generate a list of shared expectations for partner work. ● Invite students to plan a strategy before they begin working. If time allows, invite students to share their plan with a partner. ● Some students may benefit from feedback that emphasizes effort and time on

	task. For example, moving counters in the squares of the 5-frame or filling the 5-frame with one counter in each square.
Multi-language Learners	• Work toward longer passages as skills in English increase • Use visuals • Introduce/highlight key vocabulary before lesson • Teacher models reading aloud daily • Provide peer tutoring • Utilize translation supports including bilingual dictionary, translation device, assistive technology, and peers • Guided notes and/or scaffold outline for written assignments • Provide students with English Learner leveled readers • Support recommended by the grade specific “can do” list outlined by WIDA, including Key Uses Edition and Descriptor Name Charts • As students share ideas, include a drawing or annotation to illustrate connections. • Invite students to use gestures as they count.
Accelerating Students	• Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles) • Provide options, alternatives and choices to differentiate and broaden the curriculum • Organize and offer flexible small group learning activities • Provide whole group enrichment explorations • Teach cognitive and methodological skills • Use center, stations, or contracts • Organize integrated problem-solving simulations • Propose interest-based extension activities • Expose students to beyond level texts.

Unit 2: Changes in Matter

Unit Goals:

In this unit, students will explore the changes that occur at the atomic and molecular level when substances transition between states. They will learn that pure substances have distinct properties and consist of a single type of atom or molecule. Students will be able to explain how the absorption and release of thermal energy affect particle movement, leading to changes in physical properties. They will also provide molecular-level explanations for different states of matter and the transitions between them. This knowledge will be applied to real-world problems and solutions.

Duration: 6 weeks

Essential Questions:

- What is the difference between a chemical property and a physical property?
- Where can you find information on the chemical and physical properties of different substances?
- How is energy involved in a physical and a chemical change?
- What are different types of energy that may be given off or taken in during a chemical reaction?
- What happens to the molecules in a substance when it is heated? Cooled?

Enduring Understandings:

- Physical properties are characteristics of a substance that can be observed without changing the identity of the substance. Examples of physical properties are color, shape, hardness, texture, mass, weight, density and volume.
- Chemical properties are the ways in which substances change into new substances. Examples of chemical properties are flammability and reactivity.
- Energy is involved in chemical and physical change.
- Different types of energy are given off or taken in during chemical or physical change.
- Molecules move faster when energy is increased, slower when energy is decreased.
- Chemical and physical reactions may release or require energy.

Key NJSLS Strands:

- MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures.
- 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.

Science & Engineering Practices

Disciplinary Core Ideas

Cross-cutting Concepts

Obtaining, Evaluating, and Communicating Information 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. (MS-PS1-3) Developing and Using Models Develop a model to predict and/or describe phenomena. (MS-PS1-4)	PS1.A: Structure and Properties of Matter - Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3) - Gasses and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) - 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. (MS-PS1-4) PS1.B: Chemical Reactions - 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	Structure and Function Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3) Cause and Effect Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4) Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology 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. (MS-PS1-3) Influence of Science, Engineering and Technology on Society and the Natural World 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
---	--	--

	different properties from those of the reactants. (MS-PS1-2), (MS-PS1-3) PS3.A: Definitions of Energy • The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4) • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The	factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)
--	--	---

	total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)	
--	---	--

Interdisciplinary Connections

English Language Arts

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS1-2), (MS-PS1-3)
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)
- RST.6-8.7 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). (MS-PS1-1), (MS-PS1-2), (MS-PS1-4), (MS-PS1-5)
- WHST.6-8.7 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. (MS-PS1-6)
- WHST.6-8.8 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. (MS-PS1-3)

Math

- MP.2 Reason abstractly and quantitatively. (MS-PS1-1), (MS-PS1-2), (MS-PS1-5)
- MP.4 Model with mathematics. (MS-PS1-1), (MS-PS1-5)
- 8.EE.A.3 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. (MS-PS1-1)

21st-Century Skills
9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short and long term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
Career Ready Practices
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Technology Integration
8.2.8.ED.1 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. 8.2.8.ED.2 Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3 Develop a proposal for a solution to a real-world problem that includes a model. 8.2.8.ED.5 Explain the need for optimization in a design process. 8.2.8.ED.6 Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7 Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs. 8.2.8.ETW.2 Analyze the impact of modifying resources in a product or system.

Skills	Instructional Topics	Assessment	Resources	Vocabulary
Identify the three states of matter. Explain how ice, water, and water vapor are formed.	Introduction to States of Matter Atomic and Molecular Structure Thermal Energy and	Formative Assessments: Lab Reports/CER Responses Lab Skills Rubric	Materials: Research journals and articles Books and pens	Atom Molecule Substance Characteristic

Describe, observe, model, and draw the different states of matter: solid, liquid, and gas. Observe, make predictions, record results, and explain what happens when different types of matter are mixed together.	Particle Movement Phase Transitions Properties of Pure Substances Molecular-Level Explanations Real-World Applications Lab Activities and Experiments Energy and Phase Change Calculations Environmental and Societal Impacts (Climate Change)	Lesson Quizzes Lesson Self-assessment Teacher Observations Class Discussions Classwork/ Homework Exit Slips/Google Form Summative Assessments: Topic/Unit Assessments Constructed Response Questions Projects Cumulative Tests Performance Assessments Alternate and Benchmark Assessments: Progress Monitoring Assessments Cumulative/Benchmark Assessments	Reference books on natural resources and chemical processes Presentation materials (poster boards, markers, etc.) Project planning templates Whole milk White vinegar Heat source (stove or hot plate) Saucepan Spoon Strainer Paper towels Measuring cups and spoons Mold or shaping tools	Thermal energy Particle Movement Physical properties Absorption Release Transition State of matter Pure Explanation Real-world Application Solution
---	--	---	---	--

			Samples of various solids (e.g., metals, plastics, glass, crystals) Magnifying glass Hardness testing tools (e.g., Mohs hardness scale kit) Density measurement tools (graduated cylinders, scales) Conductivity testers Various liquid samples (water, oil, alcohol, syrup) Graduated cylinders Beakers Thermometers Viscosity testing tools (e.g., funnels, timers) Droppers Lab worksheets or digital lab guides	
--	--	--	---	--

			Ice Water Scissors Glue sticks Printed diagrams of different states of matter and transitions Flow chart templates Markers or colored pencils Examples of state changes (e.g., melting, freezing, condensation) Printed words for cut and paste activities (e.g., melting, boiling, sublimation) Graph paper Rulers Samples of data for graphing Vocabulary foldables	
--	--	--	---	--

			Activities/Links: Plan a research project with a focus on any natural resource undergoing a chemical process to make synthetic material (Example of new material could include new medicine, fuel and alternative fuels) Plastics From Milk Lab Identifying Types of Solids Properties of Liquids Investigation States of Matter and Phase Changes - Digital Lab States of Matter Quick Lab.docx Change of State Cut and Paste	
--	--	--	--	--

			Changes of State Flow Chart Instructions Change of State Flow Chart Change of State Flow Chart Words Changes of State of Matter Graph and Questions	
--	--	--	--	--

Modifications and Accommodations	
Tier II and III Strategies	Small group instruction (Tier II) ● Explicit instruction ● Schema-based instruction ● Use visuals ● Use manipulatives ● Use a multi-sensory approach ● Guided notes and/or scaffold outline for written assignments ● Introduce key vocabulary before lesson ● Lesson taught again using a differentiated approach Small group or Individual instruction (Tier III) ● Intensive instruction ● Practice fact retrieval ● Lesson taught again using a differentiated approach ● Allow answers to be given orally or dictated

	● Use visuals / Anchor Charts
Students with IEPs and 504 Plans	● Follow all the IEP/504 plan modifications ● Allow extra time to complete assignments or tests ● Guided notes and/or scaffold outline for written assignments ● Work in a small group ● Solidify and refine concepts through repetition ● Allow answers to be given orally or dictated ● Use multi-sensory teaching approaches ● Utilize assistive technology and materials ● Use large print books, Braille, or books on CD (digital text) ● Text to speech/audio recorded selections ● Amplification system as needed ● Leveled texts according to ability ● Fine motor skill stations embedded in rotation as needed ● Modified or constrained spelling word lists ● Provide anchor charts with high frequency words and phonemic patterns ● Students might need guidance as to what actions happen during partner work time. Invite students to discuss what it looks like when they are working with their partner while exploring the connecting cubes. Generate a list of shared expectations for partner work. ● Invite students to plan a strategy before they begin working. If time allows, invite students to share their plan with a partner. ● Some students may benefit from feedback that emphasizes effort and time on task. For example, moving counters in the squares of the 5-frame or filling the 5-frame with one counter in each square.
Multi-language Learners	● Work toward longer passages as skills in English increase ● Use visuals ● Introduce/highlight key vocabulary before lesson ● Teacher models reading aloud daily

	● Provide peer tutoring ● Utilize translation supports including bilingual dictionary, translation device, assistive technology, and peers ● Guided notes and/or scaffold outline for written assignments ● Provide students with English Learner leveled readers ● Support recommended by the grade specific “can do” list outlined by WIDA, including Key Uses Edition and Descriptor Name Charts ● As students share ideas, include a drawing or annotation to illustrate connections. ● Invite students to use gestures as they count.
Accelerating Students	● Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles) ● Provide options, alternatives and choices to differentiate and broaden the curriculum ● Organize and offer flexible small group learning activities ● Provide whole group enrichment explorations ● Teach cognitive and methodological skills ● Use center, stations, or contracts ● Organize integrated problem-solving simulations ● Propose interest-based extension activities ● Expose students to beyond level texts.

Unit 3: Chemical Reactions

Unit Goals:

In this unit, students will deepen their understanding of chemical reactions by exploring physical and chemical properties, identifying chemical reactions, and describing molecular-level changes. They will engage in hands-on experiments, investigate real-world scenarios, and apply the engineering design process to improve products and analyze synthetic materials and their societal impacts. This unit integrates core scientific concepts with practical applications, fostering a comprehensive understanding of

chemical reactions and their significance in real-world contexts. Students will develop critical thinking and problem-solving skills by engaging in activities that bridge theoretical knowledge and practical implementation.

Duration: 6 weeks

Essential Questions:

- Why don't all chemical reactions result in explosions, sparks, and flames?
- How can products that involve chemical reactions benefit people and the environment?

Enduring Understandings:

- 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.
- Natural resources can undergo a chemical process to form synthetic material.

Key NJSLS Strands:

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.

MS-PS1-6: Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

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.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Developing and Using Models Develop a model to describe unobservable mechanisms. (MS-PS1-5)	PS1.B: Chemical Reactions • Substances react chemically in characteristic ways. In a chemical	Energy and Matter • Matter is conserved because atoms are

Constructing Explanations and Designing Solutions Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. (MS-PS1-6) Analyzing and Interpreting Data Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)	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. (MS-PS1-5) • The total number of each type of atom is conserved, and thus the mass doesn't change. (MS-PS1-5) • Some chemical reactions release energy, others store energy. (MS-PS1-6) ETS1.B: Developing Possible Solutions • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (secondary to MS-PS1-6) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than	conserved in physical and chemical processes. (MS-PS1-5) • The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS1-6) <i>Connections to Nature Of Science</i> Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena • Laws are regularities or mathematical descriptions of natural phenomena. (MS-PS1-5)
--	--	--

	any of its predecessors. (MS-ETS1-3) ETS1.C: Optimizing the Design Solution Although one design may not perform the best across all tests, identifying the characteristics of the design that performed 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. (secondary to MS-PS1-6)	
--	--	--

Interdisciplinary Connections

English Language Arts

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.3 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).
- RST.6-8.7 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- WHST.6-8.7 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.
- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems.

Math

- MP.2 Reason abstractly and quantitatively.
- MP.4 Model with mathematics.
- 7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

21st-Century Skills

- 9.4.8.CT.1 Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective.
- 9.4.8.GCA.2 Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.IML.3 Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping.
- 9.4.8.IML.7 Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose.
- 9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.
- 9.4.8.TL.3 Select appropriate tools to organize and present information digitally.
- 9.4.8.TL.6 Collaborate to develop and publish work that provides perspectives on a real-world problem.

Career Ready Practices

- CRP1: Act as a responsible and contributing citizen and employee.
- CRP2: Apply appropriate academic and technical skills.
- CRP3: Attend to personal health and financial well-being.
- CRP4: Communicate clearly and effectively and with reason.
- CRP5: Consider the environmental, social and economic impacts of decisions.

Technology Integration

- 8.2.8.ED.1 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

- 8.2.8.ED.2 Identify the steps in the design process that could be used to solve a problem.
- 8.2.8.ED.3 Develop a proposal for a solution to a real-world problem that includes a model.
- 8.2.8.ED.5 Explain the need for optimization in a design process.
- 8.2.8.ED.6 Analyze how trade-offs can impact the design of a product.
- 8.2.8.ED.7 Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs.
- 8.2.8.ETW.2 Analyze the impact of modifying resources in a product or system.

Skills	Instructional Topics	Assessment	Resources	Vocabulary
Express chemical reaction through a chemical equation. Provide examples for different types of chemical reactions. Predict the products of chemical reactions. Apply concepts learnt in everyday problems.	Introduction to Chemical Reactions Molecular-Level Changes in Chemical Reactions States of Matter and Phase Changes Energy and Matter in Chemical Reactions Real-World Applications Engineering Design Process Science and Engineering Practices	Formative Assessments: Lab Reports/CER Responses Lab Skills Rubric Lesson Quizzes Lesson Self-assessment Teacher Observations Class Discussions Classwork/ Homework Exit Slips/Google Form Summative Assessments: Topic/Unit Assessments	Materials: Beakers Graduated cylinders Thermometers Hot plates Ice Water Vinegar Baking soda Lemon juice pH paper pH probes	Chemical equation Reactants Products Coefficients Subscripts Balancing equations Synthesis reaction Decomposition reaction Single replacement reaction Double replacement reaction

		Constructed Response Questions Projects Cumulative Tests Performance Assessments Alternate and Benchmark Assessments: Progress Monitoring Assessments Cumulative/Benchmark Assessments	Computers with internet access Periodic table charts Colored pencils or markers Element samples Safety goggles Lab aprons Digital scales Measuring spoons Data recording sheets Graph paper Climate change data sets Scientific calculators Whiteboards and markers Lab notebooks Access to climate change impact simulations	Combustion reaction Acid-base reaction Precipitate Oxidation Reduction Predicting products Chemical formula Everyday applications Reaction types Stoichiometry Chemical change Molecular structure Chemical properties Physical properties Reaction rate Catalyst Activation energy
--	--	--	--	--

			Plastic cups Stirring rods Chemical reagents (as needed for specific reactions) Lab safety instructions Handouts on chemical and physical changes Molecular model kits Gloves Environmental sensors (e.g., CO ₂ sensors) Vocabulary foldables Activities/Links: Molecules in Motion Physical & Chemical Changes Station Lab acs.org Gizmos Lab - pH analysis	
--	--	--	---	--

			Changes in States of Matter Combining Elements to Form a Compound Periodic Table Color Coding Generate, discuss and analyze data Explore the Impacts of Climate Change on the Atmosphere	
--	--	--	---	--

Modifications and Accommodations	
Tier II and III Strategies	Small group instruction (Tier II) ● Explicit instruction ● Schema-based instruction ● Use visuals ● Use manipulatives ● Use a multi-sensory approach ● Guided notes and/or scaffold outline for written assignments ● Introduce key vocabulary before lesson ● Lesson taught again using a differentiated approach Small group or Individual instruction (Tier III) ● Intensive instruction ● Practice fact retrieval

	● Lesson taught again using a differentiated approach ● Allow answers to be given orally or dictated ● Use visuals / Anchor Charts
Students with IEPs and 504 Plans	● Follow all the IEP/504 plan modifications ● Allow extra time to complete assignments or tests ● Guided notes and/or scaffold outline for written assignments ● Work in a small group ● Solidify and refine concepts through repetition ● Allow answers to be given orally or dictated ● Use multi-sensory teaching approaches ● Utilize assistive technology and materials ● Use large print books, Braille, or books on CD (digital text) ● Text to speech/audio recorded selections ● Amplification system as needed ● Leveled texts according to ability ● Fine motor skill stations embedded in rotation as needed ● Modified or constrained spelling word lists ● Provide anchor charts with high frequency words and phonemic patterns ● Students might need guidance as to what actions happen during partner work time. Invite students to discuss what it looks like when they are working with their partner while exploring the connecting cubes. Generate a list of shared expectations for partner work. ● Invite students to plan a strategy before they begin working. If time allows, invite students to share their plan with a partner. ● Some students may benefit from feedback that emphasizes effort and time on task. For example, moving counters in the squares of the 5-frame or filling the 5-frame with one counter in each square.
Multi-language Learners	● Work toward longer passages as skills in English increase ● Use visuals

	● Introduce/highlight key vocabulary before lesson ● Teacher models reading aloud daily ● Provide peer tutoring ● Utilize translation supports including bilingual dictionary, translation device, assistive technology, and peers ● Guided notes and/or scaffold outline for written assignments ● Provide students with English Learner leveled readers ● Support recommended by the grade specific “can do” list outlined by WIDA, including Key Uses Edition and Descriptor Name Charts ● As students share ideas, include a drawing or annotation to illustrate connections. ● Invite students to use gestures as they count.
Accelerating Students	● Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles) ● Provide options, alternatives and choices to differentiate and broaden the curriculum ● Organize and offer flexible small group learning activities ● Provide whole group enrichment explorations ● Teach cognitive and methodological skills ● Use center, stations, or contracts ● Organize integrated problem-solving simulations ● Propose interest-based extension activities ● Expose students to beyond level texts.

Unit 4: Forces and Motion

Unit Goals:

In this unit, topics, they will begin by learning about the different types of forces and how they impact motion. They will analyze different systems to determine how and why objects move the way they do. This will also include a discussion about the force of gravity and objects in free fall. Throughout this topic, students will make

connections to Newton's Laws of Motion and then use their acquired knowledge to design different products to achieve certain criteria.		
Duration: 6 weeks		
Essential Questions: • What makes objects move the way they do? • How can Newton's Laws be applied to improve an object's performance?		
Enduring Understandings: • Theories and laws provide explanations in science. • The motion of an object can be described by its position, direction of motion and speed, and is determined by the sum of the forces acting on it. • A solution needs to be tested, and then modified on the basis of the test results in order to improve it. Models of all kinds are important for testing solutions.		
Key NJSLS Strands: • MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects. • MS-PS2-2 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. • 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. • MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. • 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. • 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.		
Science & Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts

Planning and Carrying Out Investigations ● 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 much data is needed to support a claim. (MS-PS2-2) Constructing Explanations and Designing Solutions ● Apply scientific ideas or principles to design an object, tool, process or system. (MS-PS2-1) Asking Questions and Defining Problems ● Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) Engaging in Argument from Evidence ● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)	PS2.A: Forces and Motion ● 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). (MS-PS2-1) ● 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. (MS-PS2-2) ● 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. (MS-PS2-2) ETS1.A: Defining and Delimiting Engineering Problems ● The more precisely a design task’s criteria and constraints can be defined, the more likely it is that the designed solution	Systems and System Models ● Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1) Stability and Change ● Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2) Connections to Engineering, Technology, and Application of Science Influence of Science, Engineering, and Technology on Society and the Natural World ● The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of
--	---	---

	will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2) ● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) ● Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) ● Models of all kinds are important for testing solutions. (MS-ETS1-4) ETS1.C: Optimizing the Design Solution ● Although one design may not perform the best	scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1) ● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1) ● The uses of technologies and 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. (MS-ETS1-1)
--	---	---

	across all tests, identifying the characteristics of the design that performed best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3) ● 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. (MS-ETS1-4)	
--	--	--

Interdisciplinary Connections

English Language Arts

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using searchterms 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.

- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.
- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- WHST.6-8.7 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.

Math

- MP.2 Reason abstractly and quantitatively.
- 6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.
- 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- 7.EE.B.4 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.
- 7.EE.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

21st-Century Skills

- 9.4.8.GCA.2 Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.IML.3 Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping.
- 9.4.8.TL.3 Select appropriate tools to organize and present information digitally.

Career Ready Practices

- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Technology Integration
8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools, 8.2.8.ED.2 Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.5 Explain the need for optimization in a design process. 8.2.8.ED.6 Analyze how trade-offs can impact the design of a product.

Skills	Instructional Topics	Assessment	Resources	Vocabulary
Investigate both contact and non-contact forces. Calculate and apply knowledge of balanced and unbalanced forces on an object's motion. Investigate gravity and air resistance (friction) to realize that all objects fall to the surface of the earth at the same rate in the absence of air resistance. Analyze the motion of objects by identifying a reference point, and	Introduction to Forces Gravity and Friction Newton's Laws of Motion Collisions between Objects	Formative Assessments: Lab Reports/CER Responses Lab Skills Rubric Lesson Quizzes Lesson Self-assessment Teacher Observations Class Discussions Classwork/ Homework Exit Slips/Google Form Summative Assessments: Topic/Unit Assessments	Materials: 2 Textbooks Meter sticks taped together Marble 3 pennies Cup with hole cut out Tape Ruler Wax Paper Piece of rug or carpet Sand Paper	Contact forces Non-contact forces Balanced forces Unbalanced forces Gravity Air resistance Friction motion Reference point Speed Direction Newton's first law of motion

then describe its motion by its speed and direction. Explore Newton's first law of motion and develop explanations of change by examining forces exerted on objects. Explore Newton's second law of motion and how mass, force, and acceleration are related. Understand Newton's third law of motion and be able to identify both reaction and action forces.		Constructed Response Questions Projects Cumulative Tests Performance Assessments Alternate and Benchmark Assessments: Progress Monitoring Assessments Cumulative/Benchmark Assessments	Metal Rods or round pencils String Rubber bands Paper clips Blocks of light wood Washers Vocabulary foldables Activities/Links: Newton's First Law - Resting Bodies Lab Newton's 2nd Law Newton's Second Law Pixel Art Balanced and Unbalance Forces Activity With Key Balloon Rocket Lab Forces & Motion PhET Simulation	Newton's second law of motion Mass Acceleration Newton's third law of motion Reaction force Action force
--	--	--	--	--

			Friction Prediction Stations Sail Car Lab Speed, Velocity, and Acceleration Pixel Art	
--	--	--	---	--

Modifications and Accommodations	
Tier II and III Strategies	Small group instruction (Tier II) ● Explicit instruction ● Schema-based instruction ● Use visuals ● Use manipulatives ● Use a multi-sensory approach ● Guided notes and/or scaffold outline for written assignments ● Introduce key vocabulary before lesson ● Lesson taught again using a differentiated approach Small group or Individual instruction (Tier III) ● Intensive instruction ● Practice fact retrieval ● Lesson taught again using a differentiated approach ● Allow answers to be given orally or dictated ● Use visuals / Anchor Charts
Students with IEPs and 504 Plans	● Follow all the IEP/504 plan modifications ● Allow extra time to complete assignments or tests ● Guided notes and/or scaffold outline for written assignments ● Work in a small group

	● Solidify and refine concepts through repetition ● Allow answers to be given orally or dictated ● Use multi-sensory teaching approaches ● Utilize assistive technology and materials ● Use large print books, Braille, or books on CD (digital text) ● Text to speech/audio recorded selections ● Amplification system as needed ● Leveled texts according to ability ● Fine motor skill stations embedded in rotation as needed ● Modified or constrained spelling word lists ● Provide anchor charts with high frequency words and phonemic patterns ● Students might need guidance as to what actions happen during partner work time. Invite students to discuss what it looks like when they are working with their partner while exploring the connecting cubes. Generate a list of shared expectations for partner work. ● Invite students to plan a strategy before they begin working. If time allows, invite students to share their plan with a partner. ● Some students may benefit from feedback that emphasizes effort and time on task. For example, moving counters in the squares of the 5-frame or filling the 5-frame with one counter in each square.
Multi-language Learners	● Work toward longer passages as skills in English increase ● Use visuals ● Introduce/highlight key vocabulary before lesson ● Teacher models reading aloud daily ● Provide peer tutoring ● Utilize translation supports including bilingual dictionary, translation device, assistive technology, and peers ● Guided notes and/or scaffold outline for written assignments ● Provide students with English Learner leveled readers ● Support recommended by the grade specific “can do” list outlined by WIDA,

	including Key Uses Edition and Descriptor Name Charts • As students share ideas, include a drawing or annotation to illustrate connections. • Invite students to use gestures as they count.
Accelerating Students	• Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles) • Provide options, alternatives and choices to differentiate and broaden the curriculum • Organize and offer flexible small group learning activities • Provide whole group enrichment explorations • Teach cognitive and methodological skills • Use center, stations, or contracts • Organize integrated problem-solving simulations • Propose interest-based extension activities • Expose students to beyond level texts.

Unit 5: Relationships Among Forms of Energy/Thermal Energy

Unit Goals: In this unit, students utilize concepts of cause and effect, system and system models, and stability and change to comprehend ideas that explain why certain materials are attracted to each other while others are not. They employ their understanding of gravitational, electrical, and magnetic forces to explain various phenomena, including initial concepts surrounding attraction and repulsion between materials. Specifically, students cultivate the understanding that gravitational interactions are universally attractive, whereas electrical and magnetic forces can manifest as both attraction and repulsion. Additionally, students will develop the concept that objects can exert forces on each other despite lacking physical contact, through the concept of fields.
Duration: 6 weeks
Essential Questions: • What is energy?

• What does it look like? • How can energy be transferred from one object or system to another?		
Enduring Understandings: • Energy is essential for life and other processes on Earth. It can change an object's motion, color, shape, temperature, etc. • Energy can be transferred from one object to another, but the total amount of energy is conserved.		
Key NJSLS Strands: • MS-PS3-1 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. • MS-PS3-2 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. • MS-PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. • MS-PS3-4 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. • MS-PS3-5 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.		
Science & Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Developing and Using Models • Develop a model to describe unobservable mechanisms. (MS-PS3-2) Analyzing and Interpreting Data • Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1) Engaging in Argument from Evidence • Construct, use, and present oral and written arguments supported by empirical	PS3.A: Definitions of Energy • 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. (MS-PS3-1) • A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) PS3.B: Conservation of Energy and Energy Transfer	Scale, Proportion, and Quantity • Proportional Relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1) Systems and System Models • Models can be used to represent systems and their interactions – such as

evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5) Connections to Nature Of Science Scientific Knowledge is Based on Empirical Evidence Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS3-5)	- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) PS3.C: Relationship Between Energy and Forces - When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)	inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2) Energy and Matter Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5)
---	---	--

Interdisciplinary Connections English Language Arts - RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. - RST.6-8.7 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). - WHST.6-8.1 Write arguments focused on discipline content. - WHST.6-8.7 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. - SL.8 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. Math - MP.2 Reason abstractly and quantitatively. 6.RP.A.1 Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. ● 6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
--

- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-PS3-1), (MS-PS3-5)
- 8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.
- **8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.**
- 8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

21st-Century Skills

- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short and long term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task.

Career Ready Practices

- CRP4: Communicate clearly and effectively and with reason.
- CRP6: Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Technology Integration

- 8.2.8.ED.1 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
- 8.2.8.ED.2 Identify the steps in the design process that could be used to solve a problem.
- 8.2.8.ED.5 Explain the need for optimization in a design process.

Skills	Instructional Topics	Assessment	Resources	Vocabulary
--------	----------------------	------------	-----------	------------

Discuss the difference between kinetic energy (KE) and potential energy (PE). Calculate KE and PE. Apply knowledge of KE and GPE to mechanical energy. Investigate and discuss work and power. Classify different forms of energy as kinetic or potential. Design and redesign a toy or roller coaster to teach potential energy. Manipulate factors that affect kinetic and potential energy to increase and decrease the energy in an object. Determine the type of energy transformations that	Introduction to Energy Kinetic and Potential Energy Lab: Optimize a Toy to Teach Potential Energy, Parts One and Two Potential Energy Energy Transfer Changes in Energy	Formative Assessments: Lab Reports/CER Responses Lab Skills Rubric Lesson Quizzes Lesson Self-assessment Teacher Observations Class Discussions Classwork/ Homework Exit Slips/Google Form Summative Assessments: Topic/Unit Assessments Constructed Response Questions Projects Cumulative Tests Performance Assessments	Materials: Spring scales Ramp Stopwatch Meter stick Toy cars Weights Different toy prototypes Notebook Graph paper Markers Rulers Scissors Glue Tape Paper clips	Energy Work Power Joule Kinetic Energy Potential Energy Mechanical Energy Gravitational Potential Energy Elastic Potential Energy Optimization Prototype Variable Hypothesis Data Analysis Chemical Potential Energy
---	--	--	---	---

occur in a variety of scenarios.		Alternate and Benchmark Assessments: Progress Monitoring Assessments Cumulative/Benchmark Assessments	Energy conversion kits Batteries Wires Light bulbs Motors Magnets Simulation software Computers Internet access Thermometers Metal rods Insulating materials Heat sources Containers of different materials	Electrical Potential Energy Magnetic Potential Energy Nuclear Potential Energy Conduction Convection Radiation Thermal Energy Energy Conservation Energy Transformation Efficiency Law of Conservation of Energy
----------------------------------	--	--	--	---

			Hot water Cold water Styrofoam cups Vocabulary foldables Activities/Links: Potential and Kinetic Energy Lab Optimize A Toy Lab Part One Optimize A Toy Lab Part Two Energy Transformations Energy Skate Park Lab Thermal Energy Transfer Lab The Energy Project Rubric Whole New Ball Game Lab	
--	--	--	--	--

			Roller Coaster STEM Build Energy Conversions Stations	
--	--	--	--	--

Modifications and Accommodations	
Tier II and III Strategies	Small group instruction (Tier II) ● Explicit instruction ● Schema-based instruction ● Use visuals ● Use manipulatives ● Use a multi-sensory approach ● Guided notes and/or scaffold outline for written assignments ● Introduce key vocabulary before lesson ● Lesson taught again using a differentiated approach Small group or Individual instruction (Tier III) ● Intensive instruction ● Practice fact retrieval ● Lesson taught again using a differentiated approach ● Allow answers to be given orally or dictated ● Use visuals / Anchor Charts
Students with IEPs and 504 Plans	● Follow all the IEP/504 plan modifications ● Allow extra time to complete assignments or tests ● Guided notes and/or scaffold outline for written assignments ● Work in a small group

	● Solidify and refine concepts through repetition ● Allow answers to be given orally or dictated ● Use multi-sensory teaching approaches ● Utilize assistive technology and materials ● Use large print books, Braille, or books on CD (digital text) ● Text to speech/audio recorded selections ● Amplification system as needed ● Leveled texts according to ability ● Fine motor skill stations embedded in rotation as needed ● Modified or constrained spelling word lists ● Provide anchor charts with high frequency words and phonemic patterns ● Students might need guidance as to what actions happen during partner work time. Invite students to discuss what it looks like when they are working with their partner while exploring the connecting cubes. Generate a list of shared expectations for partner work. ● Invite students to plan a strategy before they begin working. If time allows, invite students to share their plan with a partner. ● Some students may benefit from feedback that emphasizes effort and time on task. For example, moving counters in the squares of the 5-frame or filling the 5-frame with one counter in each square.
Multi-language Learners	● Work toward longer passages as skills in English increase ● Use visuals ● Introduce/highlight key vocabulary before lesson ● Teacher models reading aloud daily ● Provide peer tutoring ● Utilize translation supports including bilingual dictionary, translation device, assistive technology, and peers ● Guided notes and/or scaffold outline for written assignments ● Provide students with English Learner leveled readers ● Support recommended by the grade specific “can do” list outlined by WIDA,

	including Key Uses Edition and Descriptor Name Charts • As students share ideas, include a drawing or annotation to illustrate connections. • Invite students to use gestures as they count.
Accelerating Students	• Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles) • Provide options, alternatives and choices to differentiate and broaden the curriculum • Organize and offer flexible small group learning activities • Provide whole group enrichment explorations • Teach cognitive and methodological skills • Use center, stations, or contracts • Organize integrated problem-solving simulations • Propose interest-based extension activities • Expose students to beyond level texts.

Unit 6: Waves/Electromagnetic Spectrum

Unit Goals:

In this unit of study, students develop and use models, use mathematical thinking, and obtain, evaluate, and communicate information in order to describe and predict characteristic properties and behaviors of waves. Students also apply their understanding of waves as a means of sending digital information. The crosscutting concepts of patterns and structure and function reused as organizing concepts for these disciplinary core ideas. Students develop and use models, use mathematical thinking, and obtain, evaluate, and communicate information. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Duration: 6 weeks

Essential Questions:

- What are the characteristic properties of waves and how can they be used?
- What happens to waves as they pass through various materials?
- What qualitative scientific and technical information can be integrated to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals?
- How are waves used to transfer energy and information?
- How do sound waves and light waves carry energy differently?
- How are instruments that transmit and detect waves used to expand human senses?

Enduring Understandings:

- Different types of waves have unique properties.
- Waves can be used for communication purposes.
- Wave-related technologies have both advantages and limitations.
- Investigate the making of different types of waves.
- Participate in activities to understand and explore amplitude, frequency, and speed and to graph and label wave properties.
- Discuss the electromagnetic spectrum and how light behaves.
- Compare sound waves and light waves.
- Read and discuss waves in communication technologies.
- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.
- Graphs and charts can be used to identify patterns in data.
- 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.
- Waves are reflected, absorbed, or transmitted through various materials.
- A sound wave needs a medium through which it is transmitted.
- Because light can travel through space, it cannot be a matter (mechanical) wave, like sound or water waves.
- Waves can be used for communication purposes.

Key NJSL Strands:

- MS-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

● MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. ● MS-PS4-3 Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.		
Science & Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Using Mathematics and Computational Thinking ● Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1) Developing and Using Models ● Develop and use a model to describe phenomena. (MS-PS4-2) Obtaining, Evaluating, and Communicating Information ● Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3) Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence ● Science knowledge is based upon logical and conceptual connections between evidence and explanations (MS-PS4-1)	PS4.A: Wave Properties ● A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) ● A sound wave needs a medium through which it is transmitted. (MS-PS4-2) PS4.B: Electromagnetic Radiation ● 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. (MS-PS4-2) ● 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. (MS-PS4-2) ● A wave model of light is useful for explaining brightness, color, and the	Patterns ● Graphs and charts can be used to identify patterns in data. (MS-PS4-1) Structure and Function ● Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2) ● Structures can be designed to serve particular functions. (MS-PS4-3) Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World ● Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3)

	frequency-dependent bending of light at a surface between media. (MS-PS4-2) • However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) PS4.C: Information Technologies and Instrumentation • Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)	Connections to Nature of Science Science is a Human Endeavor • Advances in technology influence the progress of science and science has influenced advances in technology. (MS-PS4-3)
--	--	---

Interdisciplinary Connections

English Language Arts

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic.
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.
- SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Math

- MP.2 Reason abstractly and quantitatively.
- MP.4 Model with mathematics.
- 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems.

• 7.RP.A.2 Recognize and represent proportional relationships between quantities. • 8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
21st-Century Skills
• 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. • 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
Career Ready Practices
• CRP4: Communicate clearly and effectively and with reason. • CRP6: Demonstrate creativity and innovation. • CRP8: Utilize critical thinking to make sense of problems and persevere in solving them. • CRP11: Use technology to enhance productivity.
Technology Integration
• 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools • 8.2.8.ITH.2 Compare how technologies have influenced society over time.

Skills	Instructional Topics	Assessment	Resources	Vocabulary
• Label the parts of a wave (crest, trough, wavelength, amplitude) • Describe the relationship between frequency of a wave	Introduction to Waves The Behavior of Mechanical Waves Generate Mechanical Waves	Formative Assessments: Lab Reports/CER Responses Lab Skills Rubric Lesson Quizzes	Materials: Slinky Graph paper Charts Penlight	Crest Trough Wavelength Amplitude

and energy of a wave. Analyze the wavelengths of light used by astronomers and explain why astronomers use infrared radio waves and microwaves to take pictures of the universe.	Light Waves The Behavior of Light Waves Information Transfer Communication and Waves Analog and Digital Sounds Transmit and Record a Signal Communication Technology	Lesson Self-assessment Teacher Observations Class Discussions Classwork/ Homework Exit Slips/Google Form Summative Assessments: Topic/Unit Assessments Constructed Response Questions Projects Cumulative Tests Performance Assessments Alternate and Benchmark Assessments: Progress Monitoring Assessments Cumulative/Benchmark Assessments	Transparent materials (e.g., air, water, glass) Prism Screen Paper Pencil Glass Alarm clock Computer (for simulations) Internet access Sound waves simulation software Electromagnetic math materials Materials for constructing models (e.g., cardboard, markers, scissors, glue)	Frequency Energy Infrared Radio waves Microwaves Light Astronomers Spectrum Electromagnetic waves Wave speed Photon Visible light Ultraviolet Gamma rays X-rays Redshift Blueshift Optical telescopes
---	---	---	--	---

			Materials for electromagnetic spectrum models Analog devices (e.g., clocks, recording devices) Digital devices (e.g., digital clocks, digital recording devices) Measurement tools Ripple tank Mirrors Virtual lab software Spectroscope Poster board Markers Elements and compounds samples Worksheets (e.g., measuring waves practice.pdf)	Non-optical telescopes Spectroscopy Doppler effect
--	--	--	--	---

			Rulers Calculators Vocabulary foldables Activities/Links: Use a slinky to make a small wave, and then increase the energy input and observe that an increase in energy results in an increase in the amplitude of the wave. Use teacher provided graphs and charts to identify patterns in the data Representations that students can use as evidence to provide scientific conclusions about amplitude and energy of the wave. Waves on a string (Students will learn	
--	--	--	--	--

			about frequency, amplitude, how to calculate the speed of sound, and sound waves) Develop and use models to describe the movement of waves in various mediums. Use a penlight and trace the path that light travels between different transparent materials (e.g., air and water, air and glass. Students could also shine a light through a prism onto a screen or piece of paper; observe a pencil in a glass of water. <u>Alarm Clock Demonstration</u> <u>Sound Waves Simulation</u> <u>Electromagnetic Math</u>	
--	--	--	--	--

			Construct models of the Electromagnetic Spectrum Ripple Tank Making Waves: Wave Interaction Lab Mirror Maze Challenge Properties of Waves Virtual Lab Part 1 Properties of Waves Virtual Lab Part 2 Spectroscope Activity The Electromagnetic Spectrum Poster Project Guess the element/compound Measuring waves practice.pdf	
--	--	--	--	--

Modifications and Accommodations	
Tier II and III Strategies	Small group instruction (Tier II) • Explicit instruction

	● Schema-based instruction ● Use visuals ● Use manipulatives ● Use a multi-sensory approach ● Guided notes and/or scaffold outline for written assignments ● Introduce key vocabulary before lesson ● Lesson taught again using a differentiated approach Small group or Individual instruction (Tier III) ● Intensive instruction ● Practice fact retrieval ● Lesson taught again using a differentiated approach ● Allow answers to be given orally or dictated ● Use visuals / Anchor Charts
Students with IEPs and 504 Plans	● Follow all the IEP/504 plan modifications ● Allow extra time to complete assignments or tests ● Guided notes and/or scaffold outline for written assignments ● Work in a small group ● Solidify and refine concepts through repetition ● Allow answers to be given orally or dictated ● Use multi-sensory teaching approaches ● Utilize assistive technology and materials ● Use large print books, Braille, or books on CD (digital text) ● Text to speech/audio recorded selections ● Amplification system as needed ● Leveled texts according to ability ● Fine motor skill stations embedded in rotation as needed ● Modified or constrained spelling word lists ● Provide anchor charts with high frequency words and phonemic patterns ● Students might need guidance as to what actions happen during partner work

	time. Invite students to discuss what it looks like when they are working with their partner while exploring the connecting cubes. Generate a list of shared expectations for partner work. • Invite students to plan a strategy before they begin working. If time allows, invite students to share their plan with a partner. • Some students may benefit from feedback that emphasizes effort and time on task. For example, moving counters in the squares of the 5-frame or filling the 5-frame with one counter in each square.
Multi-language Learners	• Work toward longer passages as skills in English increase • Use visuals • Introduce/highlight key vocabulary before lesson • Teacher models reading aloud daily • Provide peer tutoring • Utilize translation supports including bilingual dictionary, translation device, assistive technology, and peers • Guided notes and/or scaffold outline for written assignments • Provide students with English Learner leveled readers • Support recommended by the grade specific “can do” list outlined by WIDA, including Key Uses Edition and Descriptor Name Charts • As students share ideas, include a drawing or annotation to illustrate connections. • Invite students to use gestures as they count.
Accelerating Students	• Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles) • Provide options, alternatives and choices to differentiate and broaden the curriculum • Organize and offer flexible small group learning activities • Provide whole group enrichment explorations • Teach cognitive and methodological skills • Use center, stations, or contracts

	● Organize integrated problem-solving simulations ● Propose interest-based extension activities ● Expose students to beyond level texts.
--	--

Prepared by Julie Lang, MA

References

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By States*. Washington, DC: The National Academies Press.

NJ DOE. (2024). *New Jersey Science 2023 Student Learning Standards*. Office of Standards, Division of Teaching and Learning Services, New Jersey Department of Education. <https://www.nj.gov/education/standards/science/Index.shtml>