Science Department

Grade 6 Science Curriculum

UNIT ONE

Timeframe (approximate)	Key Concepts To Cover
6 weeks	• Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation, and crystallization, and precipitation, as well as downhill flows on land. • Global movements of water and its changes in form are propelled by sunlight and gravity. • The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity. • Within Earth's systems, the transfer of energy drives the motion and/or cycling of water.
6 weeks	• The motions and complex interactions of air masses result in changes in weather conditions. • The complex patterns of the changes in and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. • Examples of data that can be used to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions include weather maps, diagrams, and visualizations; other examples can be obtained through laboratory experiments. • Air masses flow from regions of high pressure to regions of low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time. • Because patterns of the changes and the movement of water in the atmosphere are so complex, weather can only be predicted probabilistically. • Sudden changes in weather can result when different air masses collide. • Weather can be predicted within probabilistic ranges. • Cause-and effect-relationships may be used to predict changes in weather.
4 weeks	• Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. • Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution. • Atmospheric circulation that, in part, determines regional climates is the result of sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds. • Ocean circulation that, in part, determines regional climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. • Models that can be used to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates can be diagrams, maps, and globes, or digital representations.

Standards in Action: Climate Change Earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities. Global climate change has already resulted in a wide range of impacts across New Jersey and in many sectors of its economy. The addition of academic standards that focus on climate change is important so that all students will have a basic understanding of the climate system, including the natural and human-caused factors that affect it. The underpinnings of climate change span across physical, life, as well as Earth and space sciences. The goal is for students to understand climate science as a way to inform decisions that improve quality of life for themselves, their community, and globally and to know how engineering solutions can allow us to mitigate impacts, adapt practices, and build resilient systems. The topic of climate change can easily be integrated into science classes. At each grade level in which systems thinking, managing uncertainty, and building arguments based on multiple lines of data are included, there are opportunities for students to develop essential knowledge and skills that will help them

understand the impacts of climate change on humans, animals, and the environment. For example, in the earlier grades, students can use data from first hand investigations of the school-yard habitat to justify recommendations for design improvements to the school-yard habitat for plants, animals, and humans. In the middle grades, students use resources from New Jersey Department of Environmental Protection, the National Oceanic and Atmospheric Administration (NOAA), and National Aeronautics and Space Administration (NASA), to inform their actions as they engage in designing, testing, and modifying an engineered solution to mitigate the impact of climate change on their community. In high school, students can construct models they develop of a proposed solution to mitigate the negative health effects of unusually high summer temperatures resulting from heat islands in cities across the globe and share in the appropriate setting. (NJDOE, Standards Draft Approval, 2020)

Unit 1	
Weather and Climate	
Summary and Rationale	
Students make sense of how Earth's geosystems operate by modeling the flow of energy and the cycling of matter within and among different systems. A systems approach is also important here, examining the feedback between systems as energy from the Sun is transferred between systems and circulates through the ocean and atmosphere. The crosscutting concepts of cause and effect, systems and system models, and energy and matter are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in developing and using models and planning and carrying out investigations as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate an understanding of the core ideas.	
Recommended Pacing	
16 weeks	
Standards	
MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]
MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a

	fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]
MS_ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps, and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop and use a model to describe phenomena. (MS-ESS2-1),(MS-ESS2-6)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Planning and Carrying Out Investigations
Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.
- Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)

Analyzing and Interpreting Data
Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- 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 nature operate today as they did in the past and will continue to do so in the future. (MS-ESS2-2)

Connections to Nature of Science

Scientific Knowledge is Open to Revision in Light of New Evidence
- Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. *(HS.ESS1.C GBE),(secondary to MS-ESS2-3)*

ESS2.A: Earth's Materials and Systems
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- 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. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions
- 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. (MS-ESS2-3)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

ESS2.D: Weather and Climate
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

Crosscutting Concepts

Patterns
- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

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-ESS2-2)

Systems and System Models
- Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

Energy and Matter
- Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Stability and Change
- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)

Interdisciplinary Connections	
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
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.6-8.8	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.

SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
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 (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.
Integration of Technology	
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
Career Readiness, Life Literacies and Key Skills	
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
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 (e.g., MS-ETS1-2).

Enduring Understandings:	**Essential Questions:**
Energy from the Sun is transferred between systems and circulates through the ocean and atmosphere.	What factors interact and influence weather and climate?

Evidence of Learning (Assessments)

Upon completion of the unit, students will be able to engage in assessment tasks to show their ability to:

- Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- Model the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle.
- Collect data to serve as the basis for evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Objectives (SLO)

Students will know: Water continually cycles among land, oceans, and atmosphere via transpiration, evaporation, condensation, and crystallization, and precipitation, as well as downhill flows on land. Global movements of water and its changes in form are propelled by sunlight and gravity. The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity. Within Earth's systems, the transfer of energy drives the motion and/or cycling of water. The motions and complex interactions of air masses result in changes in weather conditions. The complex patterns of the changes in and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. Examples of data that can be used to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions include weather maps, diagrams, and visualizations; other examples can be obtained through laboratory experiments. Air masses flow from regions of high pressure to regions of low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time. Because patterns of the changes and the movement of water in the atmosphere are so complex, weather can only be predicted probabilistically. Sudden changes in weather can result when different air masses collide. Weather can be predicted within probabilistic ranges. Cause-and effect-relationships may be used to predict changes in weather. Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution. Atmospheric circulation that, in part, determines regional climates is the result of sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds. Ocean circulation that, in part, determines regional	Students will be able to: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Models that can be used to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates can be diagrams, maps, and globes, or digital representations.

Suggested Resources/Technology Tools

Curriculum skeleton built upon NJDOE Model Curriculum for MS.
Resources for the course are teacher designed and based upon class needs, curriculum and aligned to standards.
Framework resource for the curriculum is the STC system from Carolina for which the district owns:
Teacher Guides
Literacy Magazines
Laboratory Exploration Manuals
sustainablejerseyschools.com/resources/resource-library/climate-change-curriculum/
https://ngss.nsta.org/Resource.aspx?ResourceID=23
https://ngss.nsta.org/Resource.aspx?ResourceID=114
https://ngss.nsta.org/Resource.aspx?ResourceID=251
www.brainpop.com
www.brainpopjr.com
www.weather.com
https://nj.pbslearningmedia.org/subjects/science/earth-and-space-science/weather-and-climate
https://www.nsta.org/climate/
https://pmm.nasa.gov/education/weather-climate
https://www.ngssphenomena.com/
https://www.ducksters.com/science/climate.php
https://www.weatherwizkids.com/weather-climate.htm
www.youtube.com

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

Teachers can choose from any of the suggested modifications that follow based upon teaching style, instructional method and needs of individual students.

General Modifications for students struggling to learn:

- Focus on building relationships in the classroom.
- Control the stressors for the student and manage alternate pathways for completion of assignments.
- Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.
- Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate.

MLL

- Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response.
- Simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase to allow MLL students to hear the sentence and try to comprehend it.
- Rephrase idioms and teach their meanings as when learning a new language, translations are often very literal. IE "Take a stab at it." Ensure students understand what is meant.
- Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words.
- Allow the use of Google Translate where appropriate.
- Utilize bilingual reading texts provided by the STC program.

G/T

Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to:

- interdisciplinary and problem-based assignments with planned scope and sequence
- advance, accelerated, or compacted content
- abstract and advanced higher-level thinking
- allowance for individual student interests
- assignments geared to development in areas of affect, creativity, cognition, and research skills
- complex, in-depth assignments
- diverse enrichment that broadens learning
- variety in types of resources
- internships, mentorships and independent study where applicable

504/IEP

Modifications and accommodations must be aligned to stated plan and uphold expectations of the plan lawfully. Every student requires a different set of accommodations based upon need. Examples specific to science practice include, but are not limited to:

- Note taker or lab assistant
- Group lab assignments
- Use of scribe
- Adjustable tables and lab equipment within reach
- Classrooms, labs and field trips in accessible locations
- Additional time and separate room for test taking
- Additional time for in-class assignments
- Additional time in lab
- Visual and tactile instructional demonstrations
- Computer with voice output, spelling and grammar checker
- Seating in the front of the class
- Tactile drawings and graphs, and three-dimensional models
- Assignments in electronic format
- Large-print handouts, lab signs and equipment labels
- TV monitor connected to microscope to enlarge images
- Computer equipped to enlarge screen characters and images
- Auditory lab warning signals
- Adaptive lab equipment (talking calculators, talking thermometers, light probes, tactile timers)
- Staples on sticks to indicate units of measurement
- Visual warning system for lab emergencies

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- ❑ Act as a responsible and contributing citizen and employee.
- ❑ Apply appropriate academic and technical skills.
- ❑ Attend to personal health and financial well being.
- ❑ Communicate clearly and effectively and with reason.
- ❑ Consider the environmental social and economic impacts of decisions.
- ❑ Demonstrate creativity and innovation.
- ❑ Employ valid and reliable research strategies.
- ❑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ❑ Model integrity, ethical leadership, and effective management.
- ❑ Plan education and career paths aligned to personal goals.
- ❑ Use technology to enhance productivity.
- ❑ Work productively in teams while using cultural global competence.

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

LINKS TO CAREERS:

Careers in Meteorology and Atmospheric Science:

- www.ametsoc.org (American Meteorological Society)
- http://www.iamas.org (International Association of Meteorology and Atmospheric Sciences
- www.wmo.int (World Meteorological Organization)
- https://www.noaa.gov (National Oceanic and Atmospheric Administration)

UNIT TWO

Timeframe (approximate)	Earth's Place in the Universe
4 weeks	● Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) ● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)
4 weeks	● The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2) (MS-ESS1-3) ● This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) ● The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)
4 weeks	● 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. (MS-ESS1-4)

Unit 2

Earth's Place in the Universe

Summary and Rationale

This unit is broken down into three sub-ideas: the universe and its stars, Earth and the solar system, and the history of planet Earth. Students examine the Earth's place in relation to the solar system, the Milky Way galaxy, and the universe. There is a strong emphasis on a systems approach and using models of the solar system to explain the cyclical patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories explaining the formation and evolution of the universe. Students examine geosciences data in order to understand the processes and events in Earth's history. The crosscutting concepts of patterns, scale, proportion, and quantity and systems and systems models provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models and analyzing and interpreting data. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Recommended Pacing

12 weeks

Standards

MS-ESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.
MS-ESS1-4	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.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. • Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. • 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. (MS-ESS1-4)	**ESS1.A: The Universe and Its Stars** • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) **ESS1.B: Earth and the Solar System** • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3) • This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2) **ESS1.C: The History of Planet Earth** • 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. (MS-ESS1-4)	**Patterns** • Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1) **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-ESS1-3),(MS-ESS1-4) **Systems and System Models** • Models can be used to represent systems and their interactions. (MS-ESS1-2) ***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-ESS1-3) ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1-1),(MS-ESS1-2)

Interdisciplinary Connections	
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS1-3)
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-ESS1-3)
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS1-1),(MS-ESS1-2)
MP.2	Reason abstractly and quantitatively. (MS-ESS1-3)
MP.4	Model with mathematics. (MS-ESS1-1),(MS-ESS1-2)
6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS1-1),(MS-ESS1-2),(MS-ESS1-3)
7.RP.A.2	Recognize and represent proportional relationships between quantities. (MSESS1-1),(MS-ESS1-2),(MS-ESS1-3)
6.EE.B.6	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. (MS-ESS1-2)
7.EE.B.6	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. (MS-ESS1-2)
Integration of Technology	

8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
Career Readiness, Life Literacies and Key Skills	
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
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 (e.g., MS-ETS1-2).

Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. This model of the solar system can explain eclipses of the sun and moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. 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.	Why do objects in space appear to move? What is the cause of seasons? What is the cause of lunar phases? What causes solar and lunar eclipses? How did our solar system form? What role does gravity play in our solar system? What causes tides? How does the size of Earth compare to other objects in our solar system?

Evidence of Learning (Assessments)

Pre-Assessment
Do Now/Exit Tickets
Formal quiz/test assessments
Inquiries/Labs
Sun-Earth-Moon Unit Assessment

Objectives (SLO)

Students will know: Patterns in the apparent motion of the sun, moon, and stars in the sky can be observed, described, predicted, and explained with models. The Earth and solar system model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. Patterns can be used to identify cause-and-effect relationships that exist in the apparent motion of the sun, moon, and stars in the sky. Science assumes that objects and events in the solar system systems occur in consistent patterns that are understandable through measurement and observation. Gravity plays a role in the motions within galaxies and the solar system. Gravity is the force that holds together the solar system and the Milky Way galaxy and controls orbital motions within them. Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids, that are held in orbit around the sun by its gravitational pull on them. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. Models can be used to represent the role of gravity in the motions and interactions within galaxies and the solar system. Science assumes that objects and events in the solar systems occur in consistent patterns that are understandable through measurement and observation. Objects in the solar system have scale properties. Data from Earth-based instruments, space-based telescopes, and spacecraft can be used to determine similarities and differences among solar system objects. The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. Time, space, and energy phenomena in the solar system can be observed at various scales, using models to study systems that are too large.	Students will be able to: Develop and use a physical, graphical, or conceptual model to describe patterns in the apparent motion of the sun, moon, and stars in the sky. Develop and use models to explain the relationship between the tilt of Earth's axis and seasons. Analyze and interpret data to determine similarities and differences among objects in the solar system.

Engineering advances have led to important discoveries in space science, and scientific discoveries have led to the development of entire industries and engineered systems.	

Suggested Resources/Technology Tools

Carolina Science STC "Researching the Sun-Earth-Moon System"
Starry Night Enthusiast computer program
BrainPop:
- Seasons
- Solstice & Equinox
- Eclipses
- Tides
- Gravity
- Big Bang

Crash Course Kids Videos: Space Science Playlist
Seasons Interactive
PBS Why Do We Have Seasons?
TedED Reasons for the Seasons
Moon Giant
Lunar Cycle Challenge
Birthday Moons Assignment
Eclipse Interactive
National Geographic Solar Eclipse 101
National Geographic Lunar Eclipse 101
Newsela - How do animals react to eclipses?
Moon Phases and Tides Website
Tides Virtual Lab
Newsela: What are auroras?

Tier 1 Modifications and Accommodations

Including special education students, Multilingual Language Learners (MLLs), students at risk of school failure, gifted and talented students, and students with 504 plans;

Teachers can choose from any of the suggested modifications that follow based upon teaching style, instructional method and needs of individual students.

General Modifications for students struggling to learn:

- Focus on building relationships in the classroom.
- Control the stressors for the student and manage alternate pathways for completion of assignments.
- Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.
- Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate.

MLL

- Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response.
- Simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase to allow MLL students to hear the sentence and try to comprehend it.
- Rephrase idioms and teach their meanings as when learning a new language, translations are often very literal. IE "Take a stab at it." Ensure students understand what is meant.
- Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words.
- Allow the use of Google Translate where appropriate.
- Utilize bilingual reading texts provided by the STC program.

G/T

Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to:

- interdisciplinary and problem-based assignments with planned scope and sequence
- advance, accelerated, or compacted content
- abstract and advanced higher-level thinking
- allowance for individual student interests
- assignments geared to development in areas of affect, creativity, cognition, and research skills
- complex, in-depth assignments
- diverse enrichment that broadens learning
- variety in types of resources
- internships, mentorships and independent study where applicable

504/IEP

Modifications and accommodations must be aligned to stated plan and uphold expectations of the plan lawfully. Every student requires a different set of accommodations based upon need. Examples specific to science practice include, but are not limited to:

- Note taker or lab assistant
- Group lab assignments
- Use of scribe
- Adjustable tables and lab equipment within reach
- Classrooms, labs and field trips in accessible locations
- Additional time and separate room for test taking
- Additional time for in-class assignments
- Additional time in lab
- Visual and tactile instructional demonstrations
- Computer with voice output, spelling and grammar checker
- Seating in the front of the class
- Tactile drawings and graphs, and three-dimensional models
- Assignments in electronic format
- Large-print handouts, lab signs and equipment labels
- TV monitor connected to microscope to enlarge images
- Computer equipped to enlarge screen characters and images
- Auditory lab warning signals
- Adaptive lab equipment (talking calculators, talking thermometers, light probes, tactile timers)
- Staples on sticks to indicate units of measurement
- Visual warning system for lab emergencies

Career Readiness, Life Literacies, and Key Skills NJSLS

Please select all standards that apply to this unit of study:

- ❑ Act as a responsible and contributing citizen and employee.
- ❑ Apply appropriate academic and technical skills.
- ❑ Attend to personal health and financial well being.
- ❑ Communicate clearly and effectively and with reason.

- ❑ Consider the environmental social and economic impacts of decisions.
- ❑ Demonstrate creativity and innovation.
- ❑ Employ valid and reliable research strategies.
- ❑ Utilize critical thinking to make sense of problems and persevere in solving them.
- ❑ Model integrity, ethical leadership, and effective management.
- ❑ Plan education and career paths aligned to personal goals.
- ❑ Use technology to enhance productivity.
- ❑ Work productively in teams while using cultural global competence.

Suggestions on integrating these standards can be found at: https://www.nj.gov/education/standards/clicks/

LINKS TO CAREERS:

Science Buddies: Careers
Astronomer
Meteorologist
Aerospace Engineers
Mechanical Engineers
NASA jobs

Optional Extensions:

NASA Solar System Exploration
Pull of the Planets
Sunbeams and Sundials

UNIT THREE

Timeframe (approximate)	Key Concepts to Cover
4 weeks	● Distinguish between living and nonliving things. ● Cells are the smallest unit of life that can be said to be alive. ● All living things are made up of cells, either one cell or many different numbers and types of cells. ● Organisms may consist of one single cell (unicellular). ● Nonliving things can be composed of cells. ● Organisms may consist of many different numbers and types of cells (multicellular). ● Cells that can be observed at one scale may not be observable at another scale.
4 weeks	● The cell functions as a whole system. ● Identify parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. ● Within cells, special structures are responsible for particular functions. ● Within cells, the cell membrane forms the boundary that controls what enters and leaves the cell. ● Complex and microscopic structures and systems in cells can be visualized, modeled, and used to describe how the function of the cell depends on the relationships among its parts.

4 weeks	● In multicellular organisms, the body is a system of multiple, interacting subsystems. ● Subsystems are groups of cells that work together to form tissues. ● Organs are groups of tissues that work together to perform a particular body function. ● Tissues and organs are specialized for particular body functions. ● Systems may interact with other systems. ● Systems may have subsystems and be part of larger complex systems. ● Interactions are limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.

Unit 3

From Molecules to Organisms

Summary and Rationale

Students develop evidence that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells.

Students develop a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. Students will construct explanations for the interactions of systems in cells and organisms. Students understand that special structures are responsible for particular functions in organisms, and that for many organisms, the body is a system of multiple-interaction subsystems that form a hierarchy, from cells to the body.

Recommended Pacing

12 weeks

Standards

MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
MS-LS1-3	Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Science and Engineering Practices

Developing and Using Models
Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
- Develop and use a model to describe phenomena. (MS-LS1-2)
- Develop a model to describe unobservable mechanisms. (MS-LS1-7)

Planning and Carrying Out Investigations
Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.
- Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.
- 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. (MS-LS1-5),(MS-LS1-6)

Engaging in Argument from Evidence
Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)
- Use an oral and written argument 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. (MS-LS1-4)

Obtaining, Evaluating, and Communicating Information
OObtaining, evaluating, and communicating information in 6-8 builds on K-5 experiences and progresses to evaluating the merit and validity of ideas and methods.
- 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-LS1-8)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence
- Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)

Disciplinary Core Ideas

LS1.A: Structure and Function
- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

LS1.B: Growth and Development of Organisms
- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)

LS1.C: Organization for Matter and Energy Flow in Organisms
- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

LS1.D: Information Processing
- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

PS3.D: Energy in Chemical Processes and Everyday Life
- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. *(secondary to MS-LS1-6)*
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. *(secondary to MS-LS1-7)*

Crosscutting Concepts

Cause and Effect
- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)
- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MS-LS1-5)

Scale, Proportion, and Quantity
- Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)

Systems and System Models
- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3)

Energy and Matter
- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)

Structure and Function
- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)

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-LS1-1)

Connections to Nature of Science

Science is a Human Endeavor
- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

Interdisciplinary Connections	
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.
RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
WHST.6-8.1	Write arguments focused on discipline content.
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant 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.
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.
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
6.SP.A.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6.SP.B.4	Summarize numerical data sets in relation to their context.
Integration of Technology	
SL.8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.
SL.8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
Career Readiness, Life Literacies and Key Skills	

9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
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 (e.g., MS-ETS1-2).

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Evidence of Learning (Assessments)

Pre-Assessment
Entrance/Exit Tickets
Formal quiz/Test assessments
Inquiries/Labs
From Molecules to Organisms Unit Assessment

Objectives (SLO)

Students will know: The difference between living and non-living things. The structure and function of the parts of the cell. The body systems and their subsystems. The chemical reactions for the production of energy in the process of creating and digesting food.	Students will be able to: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants

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Suggested Resources/Technology Tools

Curriculum skeleton built upon NJDOE Model Curriculum for MS.
Resources for the course are teacher designed and based upon class needs, curriculum and aligned to standards.
Framework resource for the curriculum is the STC system from Carolina for which the district owns:
Teacher Guides
Literacy Magazines
Laboratory Exploration Manuals
Carolina Science STC: "Investigating Digestion and Motion"
Biology4Kids
BrainPop
Cells Alive!
Cells Rap Song
Human Body Systems
Newsela
Google Classroom
Schoology

Tier 1 Modifications and Accommodations

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LINKS TO CAREERS:

Agricultural Inspector
Agricultural Technician
Animal Breeder
Animal Trainer
Anthropologist
Athletic Trainer
Biochemist
Biological Technician
Biologist
Biology Teacher
Marine Biologist
Microbiologist
Plant Scientist
Science Manager
Veterinarian
Veterinary Technologist & Technician
Zoologist and Wildlife Biologist

OPTIONAL EXTENSIONS:

Cell Organelle Chart
The Organ Trail