Science

Grade 7

Prepared by:

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Superintendent of Schools:

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Approved by the Midland Park Board of Education on

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Born on **June 20, 2022**

Science 7

Course Description:

Science 7 is taught in eight units throughout the school year. The science curriculum is a hands-on, open-ended and sequential process of investigating the biological and physical world. As part of the spiraling curriculum, aspects of physical science, life science, earth & space science, and engineering; technology & applications of science are taught throughout the year. A guided inquiry program gives students the opportunity to explore topics and concepts though investigations.

Participating in this hands-on program helps students:

1. To foster a lifelong enjoyment of learning science.
2. To observe science in the world around them.
3. To meet the science standards for New Jersey Public Schools.

Course Sequence:

Unit 1: Structure and Properties of Matter: 35 days

Unit 2: Interactions of Matter: 30 days

Unit 3: Chemical Reactions: 25 days

Unit 4: Structure and Function: 20 days

Unit 5: Body Systems: 15 days

Unit 6: Inheritance and Variation of Traits: 15 days

Unit 7: Organization for Matter and Energy Flow in Organisms: 15 days

Unit 8: Earth Systems: 25 days

Prerequisite: Grade 6 Science

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time.*

Content Area: Science

Unit Title: Structure and Properties of Matter

Grade Level: 7th

Core Ideas: Molecule, Atom, Pure Substance, States of Matter

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 accounts 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 the scientific and engineering practices to demonstrate an understanding of the core ideas.

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
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	-Develop a model to predict and/or describe phenomena. -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.
Disciplinary Core Ideas PS1.A	-Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. -Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.

Crosscutting Concepts	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
Crosscutting Concepts	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.
Career Readiness, Life Literacies, and Key Skills	
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas
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.
Computer Science and Design Thinking	
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions

ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim
Interdisciplinary Connection	
NJSLSA.R.1	Cite specific textual evidence to support analysis of science and technical texts on the characteristic properties of pure substances. Attend to precise details of explanations or descriptions about the properties of substances before and after they undergo a chemical process.
NJSLSA.R7	Integrate information (flowcharts, diagrams, models, graphs, or tables) about the characteristic properties of substances before and after a chemical process has occurred with a version of that information expressed visually, or integrate technical information about the characteristic properties of substances before and after a chemical process has occurred with a version of that information expressed visually.
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.
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
RST.6-8.9	Compare and contrast the information gained from experiments, simulation, video, or multimedia sources with that gained from reading a text on the same topic.
WHST.6-8.2	Write informative/explanatory texts, including the narration of scientific procedures/experiments.

Math	Integrate quantitative or technical information about the composition of simple molecules and extended structures that is expressed in words in a text with a version of that information expressed in a model.
Math	Reason quantitatively (with amounts, numbers, sizes) and abstractly (with variables).
Math	Develop a mathematical model to describe the atomic composition of simple molecules and extended structures.

Unit Essential Question(s):

- How is it that everything is made of the same atoms? ● What is the universe made of?
- Is it possible to tell if two substances mixed or if they reacted with each other?

Unit Enduring Understandings:

●Substances are made from different types of atoms. o Atoms are the basic units of matter.
● Substances combine with one another in various ways.
o Molecules are two or more atoms joined together.
● Atoms form molecules that range in size from two to
thousands of atoms.
o Molecules can be simple or very complex.
● Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals)
● Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. ● Substances react chemically in characteristic ways. ● In a chemical process, the atoms that make up the original substances are regrouped into different molecules; these new substances have different properties from those of the reactants.
● The analysis of data on the properties of products and reactants can be used to determine whether a chemical process has occurred.
● Density, melting point, boiling point, solubility, flammability, and odor are characteristic properties that can be used to identify a pure substance.
● Macroscopic patterns are related to the nature of the atomic-level structure of a substance.

Formative Assessments:

- **Develop a model of a simple molecule.**
- **Use the model of the simple molecule to describe its atomic composition.**
- **Develop a model of an extended structure.**

- **Use the model of the extended structure to describe its repeating subunits.**

Summative/Benchmark Assessment(s):

- **Analyze and interpret data to determine similarities and differences between the results of chemical reactions between substances before and after they undergo a chemical process.**
- **Analyze and interpret data on the properties of substances before and after they undergo a chemical process.**
- **Identify and describe possible correlation and causation relationships evidenced in chemical reactions.**
- **Make logical and conceptual connections between evidence that chemical reactions have occurred and explanations of the properties of substances before and after they undergo a chemical process.**

Alternative Assessments:

- **Use a model of a simple molecule.**
- **Use a model of the extended structure to describe its repeating subunit.**

Resources/Materials: http://scienceworld.scholastic.com/ NSTA Design and Build a Biosuit https://phet.colorado.edu/en/simulation/legacy/build-an atom https://phet.colorado.edu/en/simulation/legacy/hydrogen atom https://phet.colorado.edu/en/simulation/legacy/rutherford scattering http://www.middleschoolchemistry.com/lessonplans/chapte r1 http://www.middleschoolchemistry.com/lessonplans/chapte r3 lessons 1&3 http://www.middleschoolchemistry.com/lessonplans/chapte r4 lessons 1&2 https://concord.org/stem-resources/states-matter http://concord.org/stem-resources/molecular-view-gas http://concord.org/stem-resources/molecular-view-liquid http://concord.org/stem-resources/molecular-view-solid NSTA The Nature of Science-An Activity for the First Day of Class	**Key Vocabulary:** Molecule, Atom, Pure Substance, Mixture, Particle, States of Matter

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**

			Entire Unit: 35 Days
Structural Models	Develop and use models to represent molecules and their movement as well as models to represent the atoms in the molecules	- Molecules Matter - Molecules in motion - The ups and downs of thermometers	10 Days
Characteristic Properties	Determine that the characteristic properties of substances are a result of their chemical makeup and can thus be used to identify the substances	- Moving Molecules in solid - Air, It's really there - Changes of state	25 Days
Teacher Notes:			

Additional Resources:

http://www.state.nj.us/education/modelcurriculum/sci/7u2.shtml

NSTA Translating the NGSS for Classroom Instruction

Middleschoolchemistry.com/lesson plans

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504Students
· Consult with Guidance Counselors and follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary	·Assign a buddy, same language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions	·Provide extension activities ·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	·Provide extended time to complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	·Allow errors ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participation on any

and appropriate	·Accept participation at any level, even one word			level, even one word ·Consult with Case Managers and follow IEP accommodations/modifications

Midland Park Public Schools

Content Area: Science	
Unit Title: Interactions of Matter	
Grade Level: 7th	
Core Ideas: Molecular Movement, Thermal Energy, Synthetic Material Making 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 accounts 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 the scientific and engineering practices to demonstrate an understanding of the core ideas.	
Standards (Content and Technology)**:**	
CPI#:	**Statement:**
Performance Expectations (NJSLS)	

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	-Develop a model to predict and/or describe phenomena. -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.
Disciplinary Core Ideas PS1.A	-Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. -In a liquid the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. -The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
Disciplinary Core Ideas PS1.B	-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.
Disciplinary Core Ideas PS1.C	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 total thermal energy (sometimes called 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.
Crosscutting Concepts	-Cause and effect relationships may be used to predict phenomena in natural or designed systems. -Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. -Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have leld to the development of entire industries and engineered systems.
Career Readiness, Life Literacies, and Key Skills	
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem

Computer Science and Design Thinking	
8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
8.2.8.ITH.2	Compare how technologies have influenced society over time.
8.2.8.EC.1	Explain ethical issues that may arise from the use of new technologies.
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	

ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim
Interdisciplinary Connection	
NJSLSA.R1	Cite specific text to support the analysis of evidence that synthetic materials formed from natural resources affect society. Attend to the precise details of explanations or descriptions.

NJSLSA.W8	Gather relevant information from multiple print and digital sources about the impact on society of synthetic materials that are formed from natural resources. Use 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.
NJSLSA.R4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
NJSLSA.R9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance.
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.
RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

RST.6-8.9	Compare and contrast the information gained from experiments, simulation, video, or multimedia sources with that gained from reading a text on the same topic.
WHST.6-8.2	Write informative/explanatory texts, including the narration of scientific procedures/experiments.
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.
Math	Integrate quantitative information about changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed that is expressed in words with a version of that information that is expressed visually.
Math	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Use positive and negative numbers to represent changes in particle motion and temperature when thermal energy is added or removed, explaining the meaning of zero in each situation.

Unit Essential Question(s):	**Unit Enduring Understandings:**
● How can you tell what the molecules are doing in a substance? ● How can we trace synthetic materials back to natural ingredients?	● Changes in particle motion, temperature, and state of a pure substance occur when thermal energy is added or removed. ● Qualitative molecular-level models of solids, liquids, and gases can be used to show that adding or removing thermal energy increases or decreases the kinetic energy of the particles until a change of state occurs. ● Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. ● In a liquid, the molecules are constantly in contact with others. ● In a gas, the molecules 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. ● The changes of state that occur with variations in temperature or pressure can be described and predicted using models of matter. ● The term heat as used in everyday language refers both to thermal energy and the transfer of thermal energy from one object to another. ● Thermal energy is the motion of atoms or molecules within a substance. ● In science, heat is used to refer to the energy transferred due to the temperature difference between two objects. ● 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 the relationship between the average internal kinetic energy and the potential energy per atom or molecule 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 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. ● Cause-and-effect relationships may be used to predict and describe changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed in natural systems. ● Each pure substance has characteristic physical and chemical properties that can be used to identify it. ● Substances react chemically in characteristic ways. ● In a chemical process, the atoms that make up the original substances are regrouped into different molecules. ● New substances that result from chemical processes have different properties from those of the reactants. ● Natural resources can undergo a chemical process to form synthetic material. ● Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used. ● Engineering advances have led to discoveries of important synthetic materials, and scientific discoveries have led to the development of entire industries and engineered systems using these materials. ● Technology use varies from region to region and over time. ● The uses of technologies (engineered/synthetic materials) and any limitations on their use are driven by individual or societal needs, desires, and values. ● The uses of technologies (engineered/synthetic materials) and any limitations on their use are driven by the findings

	of scientific research and by differences in such factors as climate, natural

	resources, and economic conditions.

Formative Assessments:

• Use cause-and-effect relationships to predict changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed in natural or designed systems.

• Obtain, evaluate, and communicate information to show that synthetic materials come from natural resources and affect society.

•Gather, read, and synthesize information about how synthetic materials formed from natural resources affect society. •Assess the credibility, accuracy, and possible bias of each publication and methods used within the publication. **Summative/Benchmark Assessment(s):**

•Develop a model that predicts and describes changes in particle motion that could include molecules or inert atoms or pure substances.

•Describe how information about how synthetic materials formed from natural resources affect society is supported or not supported by evidence.

Alternative Assessments:

•Evaluate, and communicate information to show that synthetic materials come from natural resources and affect society

Resources/Materials: http://www.state.nj.us/education/modelcurriculum/sci/7u 2.s html NSTA Translating the NGSS for Classroom Instruction Discoveryeducation.com - online textbook http://scienceworld.scholastic.com/ NSTA Our class periodic table http://www.middleschoolchemistry.com/lessonplans/cha pte r1 http://www.middleschoolchemistry.com/lessonplans/cha pte r2 http://www.middleschoolchemistry.com/lessonplans/cha pte r3/lessons1&3 http://www.middleschoolchemistry.com/lessonplans/cha pte r4/lessons1&2 https://phet.colorado.edu/en/simulation/balloons-and-static electricity https://concord.org/stem-resources/states-matter http://concord.org/stem-resources/molecular-view-gas http://concord.org/stem-resources/molecular-view-liquid http://concord.org/stem-resources/molecular-view-solid	**Key Vocabulary:** Molecule, Particle, Atom, Pure Substance, Thermal Energy, Synthetic Materials

http://calacademy.org/educators/lesson-plans/fossil-fuels air-pollution-and-the-greenhouse-effect http://calacademy.org/educators/lesson-plans/fossil-fuels chocolate-chip-mining http://calacademy.org/educators/lesson-plans/natural resources-bingo http://calacademy.org/educators/lesson-plans/slippery shores-oil-spill-clean-up NSTA An exploration of the physical nature of gases NSTA Lavoisier Measures with Polymers NSTA Smelling the chocolate: The perks of modeling habits of mind NSTA Conservation of mass and an unsuspected buoyancy effect	

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete Entire**

			Unit: 30 Days
States of Matter Model	- to use a model to predict change in molecular movement and arrangement when thermal energy is added or removed from a substance	- Heat, Temperature, and Conduction - Changing state – Evaporation - Changing state – Condensation - Changing state – Freezing - Changing state – Melting	15 Days
Synthetic Alternatives	- Finding and analyzing information to describe that chemical processes are used to convert natural resources into synthetic materials and products	- Natural Resources and Synthetic Materials Project	15 Days
Teacher Notes:			
Additional Resources:			

Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**504 Students**
Rephrase questions, directions and explanations·	·Assign a buddy, same	·Provide extension activities	·Provide extended time to	·Allow errors c

follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary and appropriate	language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions ·Accept participation at any level, even one word	·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participation on any level, even one word ·Consult with Case Managers and follow IEP accommodations/modifications

Content Area: Science
Unit Title: Chemical Reactions
Grade Level: 7th

Core Ideas: States of Matter, Chemical Reactions, Conservation of Mass

Students provide molecular-level accounts of states of matter and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and how of how atoms rearrange during chemical reactions. Students also apply their understanding of optimization design and process in engineering to chemical reaction systems. The crosscutting concept of energy and matter provides a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
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	-Develop a model to describe unobservable mechanisms. -Analyze and interpret data to determine similarities and differences in findings. -Science knowledge is based upon logical and conceptual connections between evidence and explanations.
Disciplinary Core Ideas PS1.B	-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.
Crosscutting Concepts	-Macroscopic patterns are related to the nature of microscopic and atomic level structure. -Matter is conserved because atoms are conserved in physical and chemical processes. -The transfer of energy can be tracked as energy flows through a designed or natural system.
Career Readiness, Life Literacies, and Key Skills	

9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem
Computer Science and Design Thinking	
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 (e.g., physical prototype, graphical/technical sketch).
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 (e.g., annotated sketches).

Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts

ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim
Interdisciplinary Connection	
NJSLSA.R1	Cite specific textual evidence to support analysis of science and technical texts on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance.
NJSLSA.R3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks related to chemical reactions that release energy and some that store energy
NJSLSA.R4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
NJSLSA.R9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance.
NJSLSA.W7	Conduct research on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance 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.

NJSLSA.W8	Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points on the design and modification of a device that controls the transfer of energy to the environment.
NJSLSA.W9	Draw evidence from informational texts to support analysis, reflection, and research on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance
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.

RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
RST.6-8.9	Compare and contrast the information gained from experiments, simulation, video, or multimedia sources with that gained from reading a text on the same topic.
WHST.6-8.2	Write informative/explanatory texts, including the narration of scientific procedures/experiments.
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.
Math	Integrate quantitative information expressed in words about atoms before and after a chemical process with a version of that information expressed in a physical model or drawing, including digital forms.
Math	Reason quantitatively and abstractly during communication about melting or boiling points.
Math	Use mathematics to model the law of conservation of matter.
Math	Use ratio and rate reasoning to describe how the total number of atoms does not change in a chemical reaction, and thus mass is conserved.
Math	Reason quantitatively and abstractly: Reason quantitatively using numbers to represent the criteria (amount, time, and temperature of substance) when testing a device that either releases or absorbs thermal energy by chemical processes; reason abstractly by assigning labels or symbols.

Unit Essential Question(s):	**Unit Enduring Understandings:**
● How do substances combine or change (react) to make new substances? ● What happens to the atoms in a chemical change?	● Substances react chemically in characteristic ways. ● In a chemical process, the atoms that make up the original substances are regrouped into different

● How can a device be designed, constructed, tested, and modified that either releases or absorbs thermal energy by chemical processes?	molecules. ● New substances created in a chemical process have different properties from those of the reactants. ● The total number of each type of atom in a chemical process is conserved, and thus the mass does not change (the law of conservation of matter). ● Matter is conserved because atoms are conserved in physical and chemical processes. ● The law of conservation of mass is a mathematical description of natural phenomena. ● Substances react chemically in characteristic ways. ● In a chemical process, the atoms that make up the original substances are regrouped into different molecules. ● New substances created in a chemical process have different properties from those of the reactants. ● The total number of each type of atom in a chemical process is conserved, and thus the mass does not change (the law of conservation of matter). ● Matter is conserved because atoms are conserved in physical and chemical processes. ● The law of conservation of mass is a mathematical description of natural phenomena. Some chemical reactions release energy, while others store energy. ● The transfer of thermal energy can be tracked as energy flows through a designed or natural system. ● Models of all kinds are important for testing solutions. ● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. ● 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. ● A solution needs to be tested and then modified on the basis of the test results in order to for it to be improved. ● Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process. ● Some of the characteristics identified as

	having the best performance may be incorporated into the new design.

Formative Assessments:

•Use physical models or drawings, including digital forms, to represent atoms in a chemical process. •Use mathematical descriptions to show that the number of atoms before and after a chemical process is the same.

•Specific criteria are limited to amount, time, and temperature of a substance.

Summative/Benchmark Assessment(s):

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

•Develop a model to generate data for testing a device that either releases or absorbs thermal energy by chemical processes, including those representing inputs and outputs of thermal energy.

•Track the transfer of thermal energy as energy flows through a designed system that either releases or absorbs thermal energy by chemical processes.

•Analyze and interpret data for the amount, time, and temperature of a substance in testing a device that either releases or absorbs thermal energy by chemical processes to determine similarities and differences in findings.

Alternative Assessments:

•Use physical models or drawings to represent atoms in a chemical process.

•Count up the atoms in reactants and products to show that the number of atoms before and after a chemical process is the same.

Resources/Materials: http://www.state.nj.us/education/modelcurriculum/sci/7u 2.s html NSTA Translating the NGSS for Classroom Instruction http://scienceworld.scholastic.com/ http://www.middleschoolchemistry.com/lessonplans/cha pte r4 lessons 1 & 2 http://www.middleschoolchemistry.com/lessonplans/cha pte r5 lessons 1,2, 3, 4, 5 & 9 http://www.middleschoolchemistry.com/lessonplans/cha pte r6 lessons 1, 2, 3, 11 http://www.westperry.org/cms/lib/PA09000117/Centrici ty/ Domain/560/Gumdrop%20lab.pdf	**Key Vocabulary:** Chemical Reaction, Reactants, Products, Precipitate, Catalyst, Acid, Base, Endothermic, Exothermic

https://www.teachengineering.org/activities/view/cub_mi x_ lesson1_activity1 http://www.myips.org/cms/lib8/IN01906626/Centricity/ Do main/8123/atomic%20structure%20and%20periodic%20t ab l e.pdf NSTA The Halloween lab Minnesota Science Teachers' Education Project- Investigate Chemical Changes - What are some signs of chemical change?	

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete Entire Unit: 25 Days**
Chemical Reaction Models	- 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.	- What is a chemical reaction? - Controlling amounts of products in a chemical reaction - Forming a precipitate	5 Days

Design Project	- Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.	- Using chemical reactions to identify an unknown - Energy Changes in chemical reactions - Chemical Reactions and Engineering Design	15 Days
Design Solutions	- 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.	- Chemical Reactions and Engineering Design	5 Days
Teacher Notes:			
Additional Resources: http://www.state.nj.us/education/modelcurriculum/sci/7u2.shtml NSTA Translating the NGSS for Classroom Instruction			

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	506Students

· Consult with Guidance Counselors and follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary and appropriate	·Assign a buddy, same language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions ·Accept participation at any level, even one word	·Provide extension activities ·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	·Provide extended time to complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	·Allow errors ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participation on any level, even one word ·Consult with Case Managers and follow IEP accommodations/modifications

Content Area: Science
Unit Title: Structure and Function
Grade Level: 7th

Core Ideas: Microscope, Cells, Organelles, Cell Theory

Students demonstrate age appropriate abilities to plan and carry out investigations to 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. The crosscutting concepts of scale, proportion, and quantity and structure and function provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
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.
Science & Engineering Practices	-Develop and use a model to describe phenomena. -Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.
Disciplinary Core Ideas LS1.A	-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 a one singe cell (unicellular) or many different number and types of cells (multicellular). -Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
Crosscutting Concepts	-Phenomena that can be observed at one scale may not be observable at another scale. -Complex and microscopic structure and systems can be visualized, modeled, and used to describe how their function depends on the relationships among it parts, therefore couples natural structures/systems can be anayzed to determine how they function.
Career Readiness, Life Literacies, and Key Skills	
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.

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.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
Computer Science and Design Thinking	
8.1.8.DA.5	Test, analyze, and refine computational models.

8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim

Interdisciplinary Connection	
NJSLSA.W1	Integrate multimedia and visual displays of cells and specific cell parts into presentations to clarify information, strengthen claims and evidence, and add interest.
NJSLSA.W7	Conduct a short research project collecting evidence that living things are made of cells to answer a question (including a self-generated question). Draw on several sources to generate additional related, focused questions that allow for multiple avenues of exploration.
WHST.6-8.1	Write arguments focused on discipline-specific 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.
Math	Use variables to represent two quantities, such as the number of cells that makes up an organism and units representing the size or type of the organism, and determine the relationship between these two variables.

Math	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.
Math	Use variables to represent two quantities in a real-world problem that change in relationship to one another—for example, determining the ratio of a cell's surface area to its volume. 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.

Unit Essential Question(s):	Unit Enduring Understandings:
● How do cells contribute to the functioning of an organism? ● How will astrobiologists know if they have found life elsewhere in the solar system? ● How do the functions of cells support an entire organism?	● 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. ● Engineering advances have led to important discoveries in the field of cell biology, and scientific discoveries have led to the development of entire industries and engineered systems. ● 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. ● Complex natural structures/systems can be analyzed to determine how they function. ● A model can be used to describe the function of a cell as a whole. ● A model can be used to describe how parts of cells contribute to the cell's function.

	● The structures of the cell wall and cell membrane are related to their function.

Formative Assessments:

•Conduct an investigation to produce data that provides evidence distinguishing between living and nonliving things. •Conduct an investigation to produce data supporting the concept that living things may be made of one cell or many and varied cells.

•Distinguish between living and nonliving things.

•Observe different types of cells that can be found in the makeup of living things.

•Develop and use a model to describe how parts of cells contribute to the cell's function.

•Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.

Summative/Benchmark Assessment(s):

•To catalogue examples of plant and animal cells and use them to identify a mystery cell

•Develop and use a model to describe the function of a cell as a whole.

Alternative Assessments:

•Use a model to describe how the cell membrane contributes to the cell's function.

Resources/Materials:	**Key Vocabulary:**
http://scienceworld.scholastic.com/ "Cells on Mars," Science Scope, March 2018, p. 61-69 NSTA Let's Talk Science: Seeding Argumentation About Cells and Growth NSTA Movement of Molecules Into Or Out of Cells NSTA Effect of the Environment on Plant Growth NSTA Lab 4: Cell Structure from "Argument Driven Inquiry in Life Science" NSTA Cell City Mystery Game	Cell, Organelle, Cell Wall, Microscope, Stage, Objective, Slide, Arm, Focus, Cell Theory, Nucleus, Mitochondria, Chloroplasts, Cell Membrane

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete**

			Entire Unit: 15 Days
Cell Investigation	Students identify a mystery "Martian" cell as either plant or animal by comparing and contrasting with observed and photographed examples of plant and animal cells	- Microscope skills - Cell organelles - Cell Identification	8 Days
Cell Model	Students create a model of the cell that describes how the nucleus, mitochondria, chloroplasts, cell wall and cell membrane each contribute to the cell's survival	- Animal Cell Model - Plant Cell Model - Organelle identification and purpose activity	7 Days

Teacher Notes:

Additional Resources:

http://www.state.nj.us/education/modelcurriculum/sci/7u2.shtml

NSTA Translating the NGSS for Classroom Instruction

Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**507Students**

· Consult with Guidance Counselors and follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary	·Assign a buddy, same language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions	·Provide extension activities ·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	·Provide extended time to complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	·Allow errors ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participation on any

and appropriate	·Accept participation at any level, even one word			level, even one word ·Consult with Case Managers and follow IEP accommodations/modifications

Content Area: Science

Unit Title: Body Systems

Grade Level: 7th

Core Ideas: Cells, Tissue, Organs, Organ Systems, Body Systems

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-interacting subsystems that form a hierarchy, from cells to the body. Students construct explanations for the interactions of systems in cells and organisms and how organisms gather and use information from the environment. The crosscutting concepts of systems and system models and cause and effect provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in engaging in argument from evidence and obtaining, evaluating, and communicating information. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
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 & Engineering Practices	-Develop and use a model to describe phenomena. -Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.
Disciplinary Core Ideas LS1.A	-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 a one singe cell (unicellular) or many different number and types of cells (multicellular). -Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
Disciplinary Core Ideas LS1.D	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.

Crosscutting Concepts	-Phenomena that can be observed at one scale may not be observable at another scale. -Complex and microscopic structure and systems can be visualized, modeled, and used to describe how their function depends on the relationships among it parts, therefore couples natural structures/systems can be anayzed to determine how they function.
Career Readiness, Life Literacies, and Key Skills	
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal
Computer Science and Design Thinking	
8.1.8.DA.5	Test, analyze, and refine computational models.
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 (e.g., physical prototype, graphical/technical sketch).
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting

ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim
Interdisciplinary Connection	
NJSLSA.R1	Cite specific textual evidence to support analysis of science and technical texts that provide evidence for how the body is a system of interacting subsystems composed of cells.
NJSLSA.R8	Trace and evaluate a text's argument that the body is a system of interacting subsystems composed of cells, distinguishing claims that are supported by reasons and evidence from claims that are not.
NJSLSA.R8	Gather relevant information concerning how sensory receptors function by responding to stimuli, then sending messages to the brain, which responds immediately through some form or behavior or by storing the messages as memory.
NJSLSA.W1	Write arguments, supported by evidence, for how the body is a system of interacting subsystems composed of groups of cells.
NJSLSA.W8	Quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

WHST.6-8.1	Write arguments focused on discipline-specific content.
WHST.6-8.2	Write informative/explanatory texts, including the narration of scientific procedures/experiments.

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.

Unit Essential Question(s):

- What are humans made of?
- What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells?
- How do organisms receive and respond to information from their environment?

Unit Enduring Understandings:

- 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.
- Scientists and engineers are guided by habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.
- Sense receptors respond to different inputs (electromagnetic, mechanical, chemical).
- Sense receptors transmit responses as signals that travel along nerve cells to the brain.
- Signals are then processed in the brain.
- Brain processing results in immediate behaviors or memories.
- Cause-and-effect relationships may be used to predict response to stimuli in natural systems.

Formative Assessments:

- Gather, read, and synthesize information from multiple appropriate sources about sensory receptors' responses to stimuli.
- Assess the credibility, accuracy, and possible bias of each publication and methods used.
- Describe how publications and methods used are supported or not supported by evidence.

Summative/Benchmark Assessment(s):

● Use an oral and written argument supported by evidence to support or refute an explanation or a model of how the body is a system of interacting subsystems composed of groups of cells.

Alternative Assessments:

● Read and synthesize provided information from appropriate sources about sensory receptors' responses to stimuli.

● Use an oral or written argument supported by evidence to support or refute an explanation or a model of how the body is a system of interacting subsystems composed of groups of cells.

Resources/Materials:	**Key Vocabulary:** Cell, Tissue, Organ, Organ System, Body System, Multicellular, Sensory Receptors, Stimuli
http://scienceworld.scholastic.com/ https://learn.concord.org/resources/1171/reaction-time NSTA No Ordinary Coronary NOVA body + brain Animal Communications Vote for your favorite smart animal Mind Controlled Bionic Arm - Teacher Video Nova Science Now: What Are Animals Thinking? Decision-making Bees and the Human Brain https://www.openscied.org/wp content/uploads/2019/08/OpenSciEd-Unit-7.3-Metabolic Reactions-Storyline.pdf	

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete Entire Unit: 15 Days**
Body Systems Project	- to demonstrate an understanding of how the body systems' organs interact to coordinate survival of a multicellular human.	- From cell to Organ - Organ System Investigation - Metabolic Reactions Storyline (M'Kenna) Lessons 1-8	10 Days

Sensory Receptor Project	- to gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories	- Metabolic Reactions Storyling (M'Kenna) Lessons 9-15	5 Days

Teacher Notes:

Additional Resources:

http://www.state.nj.us/education/modelcurriculum/sci/7u2.shtml

NJ DOE Science grade 7 Unit 5: Body Systems

NSTA Translating the NGSS for Classroom Instruction

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	508Students

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Content Area: Science

Unit Title: Inheritance and Variation of Traits

Grade Level: 7th

Core Ideas: Genetics, Gene Mutations, Sexual Reproduction, Asexual Reproduction

Students develop and use models to describe how gene mutations and sexual reproduction contribute to genetic variation. Students understand how genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications of sexual and asexual reproduction. The crosscutting concepts of cause and effect and structure and function provide a framework for understanding how gene structure determines differences in the functioning of organisms. Students are expected to demonstrate proficiency in developing and using models. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
MS-LS3-1	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
MS-LS3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
Science & Engineering Practices	-Develop and use a model to describe phenomena. -Construct a scientific explanation based on valid and reliable evidence obtained from sources (including 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.
Disciplinary Core Ideas LS1.B	-Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring.
Disciplinary Core Ideas LS3.A	-Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.

	-Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
Disciplinary Core Ideas LS3.B Disciplinary Core Ideas LS3.B	-In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. -In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism.
Crosscutting Concepts	-Cause and effect relationships may be used to predict phenomena in natural systems. -Complex and microscopic structure and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore natural structures/systems can be analyzed to determine how they function.
Career Readiness, Life Literacies, and Key Skills	
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal
Computer Science and Design Thinking	
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
8.1.8.DA.5	Test, analyze, and refine computational models.
8.2.8.ED.3	: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
8.2.8.EC.1	Explain ethical issues that may arise from the use of new technologies.

Intercultural Statements (Amistad, Holocaust, LGBT, etc…)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science

ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim
Interdisciplinary Connection	
NJSLSA.R1	Cite specific textual evidence to support analysis of science and technical texts about structural changes to genes (mutations) located on chromosomes that may affect proteins and may result in harmful, beneficial, or neutral effects on structure and function of the organism.
NJSLSA.R4	Determine the meaning of symbols, key terms, and other domain-specific phrases as they are used to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects on the structure and function of the organism.
NJSLSA.R7	Integrate quantitative or technical information about why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects on the structure and function of the organism that is expressed in words with a version of that information expressed visually in a flowchart, diagram, model, graph, or table.
NJSLSA.W9	Include multimedia components and visual displays in presentations about structural changes to genes (mutations) located on chromosomes that may affect proteins and may result in harmful, beneficial, or neutral effects on the structure and function of the organism to clarify claims and findings and emphasize salient points.
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

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.6-8.2	Write informative/explanatory texts, including the narration of scientific procedures/experiments.
WHST.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.
Math	Use mathematics to model why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
Math	Summarize numerical data sets that describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation in relation to their context.

Unit Essential Question(s):	**Unit Enduring Understandings:**
● Why do kids look similar to their parents? ● How do structural changes to genes (mutations) located on chromosomes affect proteins or affect the structure and function of an organism? ● How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?	● Complex and microscopic structures and systems, such as genes located on chromosomes, can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among the parts of the system; therefore, complex natural structures/systems can be analyzed to determine how they function. ● Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. ● Each distinct gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual. ● In addition to variations that arise from sexual reproduction, genetic information can be altered due to mutations. ● Some changes to genetic material are beneficial, others harmful, and some neutral to the organism. ● Changes in genetic material may result in the production of different proteins. ● Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. ● Structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism ● Though rare, mutations may result in changes to the structure and function of proteins.

	● Organisms reproduce either sexually or asexually and transfer their genetic information to their offspring. ● Asexual reproduction results in offspring with identical genetic information. ● Sexual reproduction results in offspring with genetic variation. ● Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. ● In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. ● Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. ● Punnett squares, diagrams, and simulations can be used to describe the cause-and-effect relationship of gene transmission from parent to offspring and resulting genetic variation.

Formative Assessments:

•Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects on the structure and function of the organism.

•Use models such as Punnett squares, diagrams, and simulations to describe the cause-and effect-relationship of gene transmission from parent(s) to offspring and resulting genetic variation

Summative/Benchmark Assessment(s):

•Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information.

•Develop and use a model to describe why sexual reproduction results in offspring with genetic variation.

Alternative Assessments:

•Use a model to describe why asexual reproduction results in offspring with identical genetic information.

•Use a model to describe why sexual reproduction results in offspring with genetic variation.

Resources/Materials: http://scienceworld.scholastic.com/ Geniverse.concord.org NSTA Meiosis: How Does the Process of Meiosis Reduce the Number of Chromosomes in Reproductive Cells? NSTA Reproduction NSTA Junior's Family Tree NSTA Monstrous Mutations Adaptation: Mutations & Variations Activity NSTA A Recipe for Traits http://www.hhmi.org/biointeractive/pedigrees-and inheritance-lactose-intolerance http://www.calacademy.org/educators/lesson-plans/color vision-genetics http://www.calacademy.org/educators/lesson-plans/invent an-insect http://www.calacademy.org/educators/lesson plans/observing-variation http://www.calacademy.org/educators/lesson-plans/flowers seeking-pollinators https://serendipstudio.org/exchange/waldron/dragongenetic s2	**Key Vocabulary:** Genes, Mutations, Chromosomes, Chromatid, DNA, Sexual Reproduction, Asexual Reproduction, Genetic Variation, Meiosis, Mitosis, Alleles, Dominant, Recessive, Phenotype, Genotype

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete Entire Unit: 15 Days**
Sexual Reproduction Model	- to create a model that shows how sexual reproduction affects the genetic variation in offspring	- Mendel Genetics Intro - Dragon Genetics: Understanding Inheritance	5 Days
Meiosis and Fertilization	- to explore meiosis and fertilization in a special lab that gives students the power to recombine genes	- Dragon Genetics: Understanding Inheritance - Meiosis Vs. Mitosis	10 Days

Teacher Notes:

Additional Resources:

http://www.state.nj.us/education/modelcurriculum/sci/7u2.shtml

Investigating Reproductive Strategies

NSTA Translating the NGSS for Classroom Instruction

Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**509Students**

· Consult with Guidance Counselors and follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary and appropriate	·Assign a buddy, same language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions ·Accept participation at any level, even one word	·Provide extension activities ·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	·Provide extended time to complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	·Allow errors ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participation on any level, even one word ·Consult with Case Managers and follow IEP accommodations/modifications

Content Area: Science
Unit Title: Organization for Matter and Energy Flow in Organisms
Grade Level: 7th

Core Ideas: Photosynthesis, Transfer of Energy, Cycling of Matter

Students provide a mechanistic account for how cells provide a structure for the plant process of photosynthesis in the movement of matter and energy needed for the cell. Students use conceptual and physical models to explain the transfer of energy and the cycling of matter as they construct explanations for the role of photosynthesis in cycling matter in ecosystems. They construct scientific explanations for the cycling of matter in organisms and the interactions of organisms to obtain matter and energy from an ecosystem to survive and grow. They understand that sustaining life requires substantial energy and matter inputs, and that the structure and functions of organisms contribute to the capture, transformation, transport, release, and elimination of matter and energy. The crosscutting concepts of matter and energy and structure and function provide a framework for understanding of the cycling of matter and energy flow into and out of organisms. Students are also expected to demonstrate proficiency in developing and using models. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
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.
Science & Engineering Practices	-Develop and use a model to describe phenomena. -Develp a model to describe unobservable mechanisms. -Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.
Disciplinary Core Ideas LS1.C	Plants, algae (including phytoplankton), and may 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.
Crosscutting Concepts	-Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
Career Readiness, Life Literacies, and Key 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.
Computer Science and Design Thinking	
8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
8.2.8.ITH.2	Compare how technologies have influenced society over time.

Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science
ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim

Interdisciplinary Connection	
NJSLSA.R1	Cite specific textual evidence to support analysis of science and technical texts about the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
NJSLSA.R2	Determine the central ideas about the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
NJSLSA.W2	Write informative/explanatory texts to examine the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms, and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
NJSLSA.W9	Draw evidence from informational texts to support analysis, reflection, and research about the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
NJSLSA.R7	Integrate multimedia and visual displays into presentations about how food is rearranged through chemical reactions to form new molecules that support growth and/or release energy as the matter moves through an organism to clarify information, strengthen claims and evidence, and add interest.
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 any prior knowledge or opinions.

WHST.6-8.2	Write informative/explanatory texts, including the narration of scientific procedures/experiments.
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
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	Use variables to represent two quantities involved in the process whereby photosynthesis plays a part in the cycling of matter and energy into and out of organisms. 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.

Unit Essential Question(s):	Unit Enduring Understandings:
● How do some organisms turn electromagnetic radiation into matter and energy? ● What is the role of photosynthesis in the cycling of matter and flow of energy into and out of an organism?	● Photosynthesis has a role in the cycling of matter and flow of energy into and out of organisms. ● The flow of energy and the cycling of matter can be traced. ● 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. ● 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. ● Sugars produced by plants can be used immediately or stored for growth or later use. ● Within a natural system, the transfer of energy drives the motion and/or cycling of matter. ● Food is rearranged through chemical reactions, forming new molecules that support growth. ● Food is rearranged through chemical reactions, forming new molecules that release energy as this matter moves through an organism. ● Molecules are broken apart and put back together to form new substances, and in this process, energy is released. ● Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. Students who understand the concepts are able to: ● Develop and use a model to describe how food is rearranged through chemical reactions. ● In cellular respiration, complex molecules containing

	carbon react with oxygen to produce carbon dioxide and other materials. ● 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. ● Matter is conserved during cellular respiration because atoms are conserved in physical and chemical processes.

Formative Assessments:

● Develop and use a model to describe how food is rearranged through chemical reactions

Summative/Benchmark Assessment(s):

● Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on valid and reliable evidence obtained from sources (including the students' own experiments).

● Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms based on 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.

Alternative Assessments:

● Use a model to describe how food is rearranged through chemical reactions.

Resources/Materials: "Teaching Photosynthesis: More Than a Lecture, but Less than a Lab," Science Scope, Summer 2004, p. 15-17 https://www.calacademy.org/educators/lesson plans/photosynthesis-seen-from-space http://scienceworld.scholastic.com/ TED ED: The Simple Story of Photosynthesis and Food (Video) http://calacademy.org/educators/lesson-plans/what contains-carbon http://calacademy.org/educators/lesson-plans/carbon-cycle role-play http://calacademy.org/educators/lesson-plans/carbon-cycle poster	**Key Vocabulary:** Photosynthesis, Chloroplasts, Chlorophyll, Glucose, Food Chain, Food Web, Ecosystem

Food is Fuel-VIDEO-English and Spanish NSTA Plant Growth and Gas Exchange NSTA Plants and Energy (Respiration and Photosynthesis) NSTA Investigating Photosynthesis NSTA Interactive Interdependence NSTA No More Plants NSTA Chesapeake Bay Food Web NSTA Modeling Marine Food Webs and Human Impact NSTA Lab11. Food Webs and Ecosystems: Which Member of an Ecosystem Would Affect the Food Web the Most If Removed? NSTA Habitable Planet Population Simulator NSTA Lionfish-VIDEO-Ocean Bully NSTA Dueling Mandates: Debating Issues Affecting Yellowstone National Park NSTA Teacher Resource - Flow of Matter and Energy in Ecosystems NSTA Exploring the "Systems" in Ecosystems NSTA Florida Everglades: The River of Grass http://www.calacademy.org/educators/lesson plans/stomata-printing-microscope-investigation http://www.calacademy.org/educators/lesson-plans/how stable-is-your-food-web http://www.calacademy.org/educators/lesson-plans/carbon cycle-poster http://www.calacademy.org/educators/lesson plans/photosynthesis-seen-from-space http://www.calacademy.org/educators/lesson plans/sensational-seaweed California Academy of Sciences -VIDEO-Take a Virtual Dive in a Kelp Forest California Academy of Sciences-VIDEO-What Is the Environmental Impact of Feeding the World California Academy of Sciences-VIDEO-How Do Trees Transport Water from Roots to Leaves California Academy of Sciences-VIDEO-Waterwise Farms	

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete Entire Unit: 15 Days**

Scientific Explanation on the Role of Photosynthesis on Cycling Matter and Role of Energy	- Students use clues to piece together their own understanding of how a plant gets energy	- Plant Growth and Gas Exchange - Respiration and Photosynthesis - Investigating Photosynthesis	6 Days

Research Project	-Students research a question posed by observing scientific data and looking to explain patterns of when and where photosynthesis occurs on Earth	- No More plants - Chesapeake Bay food web - Modeling marine food webs - Food webs and ecosystems	9 Days

Teacher Notes:

Additional Resources:

http://www.state.nj.us/education/modelcurriculum/sci/7u2.shtml

NSTA Translating the NGSS for Classroom Instruction

Students with Disabilities	**English Language Learners**	**Gifted and Talented Students**	**Students at Risk**	**510Students**

· Consult with Guidance Counselors and follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary and appropriate	·Assign a buddy, same language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions ·Accept participation at any level, even one word	·Provide extension activities ·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	·Provide extended time to complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	·Allow errors ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participation on any level, even one word ·Consult with Case Managers and follow

				IEP accommodations/modifications

Content Area: Science

Unit Title: Earth Systems

Grade Level: 7th

Core Ideas: Earth Systems, Geologic Processes, Geologic Time, Rock Cycle, Plate Tectonics

Students examine geoscience data in order to understand processes and events in Earth's history. Important crosscutting concepts in this unit are scale, proportion, and quantity, stability and change, and patterns in relation to the different ways geologic processes operate over geologic time. An important aspect of the history of Earth is that geologic events and conditions have affected the evolution of life, but different life forms have also played important roles in altering Earth's systems. Students understand how Earth's geosystems operate by modeling the flow of energy and the cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Students are expected to demonstrate proficiency in analyzing and interpreting data and constructing explanations. They are also expected to use these practices to demonstrate an understanding of the core ideas.

Standards (Content and Technology)**:**

CPI#:	**Statement:**
Performance Expectations (NJSLS)	
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.
MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
Science & Engineering Practices	-Analyze and interpret data to provide evidence for phenomena. -Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Disciplinary Core Ideas ESS1.C	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.
Disciplinary Core Ideas ESS2.A	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.
Disciplinary Core Ideas ESS2.B	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.
Disciplinary Core Ideas ESS2.C	Water's movements–both on the land and underground–cause weathering and erosion, which change the land's surface features and create underground formations.
Crosscutting Concepts	-Patterns in rates of change and other numerical relationships can provide information about natural systems. -Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
Career Readiness, Life Literacies, and Key Skills	
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal
Computer Science and Design Thinking	
8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

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 (e.g., annotated sketches).
Intercultural Statements (Amistad, Holocaust, LGBT, etc...)	
ELD Standard 4	English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science

ELD-SC 6-8 Explain Interpretive	Defining investigable questions or design problems based on observations, information, and/or data about a phenomenon ● Determining central ideas in complex evidence and information to help explain how or why a phenomenon occurs ● Evaluating scientific reasoning that shows why data or evidence adequately supports conclusions
ELD-SC 6-8 Explain Expressive	Describe valid and reliable evidence from sources about a phenomenon ● Establish neutral or objective stance in how results are communicated ● Develop reasoning to show relationships among independent and dependent variables in models and simple systems ● Summarize patterns in evidence, making trade-offs, revising, and retesting
ELD-SC 6-8 Argue Interpretive	Identifying convincing evidence from data, models, and/or information from investigations of phenomena or design solutions ● Comparing reasoning and claims based on evidence from two arguments on the same topic ● Evaluating whether they emphasize similar or different evidence and/or interpretations of facts
ELD-SC 6-8 Argue Expressive	Introduce and contextualize topic/ phenomenon in issues related to the natural and designed world(s) ● Support or refute a claim based on data and evidence ● Establish and maintain a neutral or objective stance ● Signal logical relationships among reasoning, evidence, data, and/or a model when making or defending a claim or counterclaim
Interdisciplinary Connection	
NJSLSA.R1	Cite specific textual evidence based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history to support analysis of science and technical texts.
NJSLSA.W2	Write informative/explanatory texts to examine evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
NJSLSA.W.9	Use informative/explanatory texts to examine evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
NJSLSA.R7	Include multimedia components and visual displays in presentations about evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales to clarify claims and findings and emphasize salient points.
NJSLSA.R9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources showing evidence of past plate motion with that gained from reading a text on the same topic.
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 any prior knowledge or opinions.
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).
RST.6-8.9	Compare and contrast the information gained from experiments, simulation, video, or multimedia sources with that gained from reading a text on the same topic
Math	Use variables to represent numbers and write expressions when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6- billion-year-old history; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specific set.
Math	Use variables to represent quantities in a real-world or mathematical problem when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
Math	Reason abstractly and quantitatively when analyzing evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Unit Essential Question(s):	**Unit Enduring Understandings:**
● If no one was there, how do we know the Earth's history? ● What provides the forces that drive Earth's systems? ● How do we know that the Earth is approximately 4.6- billion-years-old? ● What drives the cycling of Earth's materials? ● Do all of the changes to Earth systems occur in similar time scales? ● How is it possible for the same kind of fossils to be found in New Jersey and in Africa?	● The geologic time scale is used to organize Earth's 4.6-billion-year-old history. ● Rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. ● 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. ● Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. ● Energy drives the process that results in the cycling of Earth's materials. ● The processes of melting, crystallization, weathering, deformation, and sedimentation act together to form minerals and rocks through the cycling of Earth's materials. ● All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. ● Energy flowing and matter cycling within and among

	the planet's systems derive from the sun and Earth's hot interior. ● Energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. ● Explanations of stability and change in Earth's natural systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. ● Geoscience processes have changed Earth's surface at varying time and spatial scales. ● Processes change Earth's surface at time and spatial scales that can be large or small; many geoscience processes usually behave gradually but are punctuated by catastrophic events. ● Geoscience processes shape local geographic features. ● 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. ● Interactions among Earth's systems have shaped Earth's history and will determine its future. ● Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. ● Time, space, and energy phenomena within Earth's systems can be observed at various scales using models to study systems that are too large or too small. ● Tectonic processes continually generate new sea floor at ridges and destroy old sea floor at trenches. ● 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. ● Patterns in rates of change and other numerical relationships can provide information about past plate motions. ● The distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions. ● Similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) provide evidence of past plate motions.

Formative Assessments:

• Construct a scientific explanation based on valid and reliable evidence from rock strata obtained from sources (including the students' own experiments).

•Construct a scientific explanation based on rock strata 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.

•Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

•Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on valid and reliable evidence obtained from sources (including the students' own experiments).

•Construct a scientific explanation for how geoscience processes have changed Earth's surface at varying time and spatial scales based on 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.

•Collect evidence about processes that change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges).

•Collect evidence about processes that change Earth's surface at time and spatial scales that can be small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events.

Summative/Benchmark Assessment(s):

• Analyze and interpret data such as distributions of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.

•Analyze how science findings have been revised and/or reinterpreted based on new evidence about past plate motions.

•Choose from the menu 1 project to complete and present.

Alternative Assessments:

• Interpret data such as distributions of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.

•Explain how science findings have been revised and/or reinterpreted based on new evidence about past plate motions •Choose from the menu 1 project to complete.

Resources/Materials: http://scienceworld.scholastic.com/ Rock Cycle Journey NSTA Interactives Dynamic Earth NSTA Crayon Rock Cycle NSTA Continental Drift Activity NSTA Dig This! Erosion Investigation NSTA Musical Plates-A Study of Earthquakes and Plate Tectonics NSTA Activity: A Plate Tectonics Puzzle NSTA: Investigating Erosion NSTA Virtual Lab-Fossil Data California Academy of Sciences - Rock Cycle Roundabout California Academy of Sciences - Teacher Guide: Earthquakes Cal Academy of Sciences VIDEO-Plate Boundaries Divergent-Convergent-Transform Cal Academy of Sciences VIDEO-Plate Tectonics-Shaping the Continents Cal Academy of Sciences VIDEO-The Great San Francisco Earthquake of 1906 60 Minutes-Historic Film: San Francisco Days Before the 1906 Earthquake Cal Academy of Sciences VIDEO-Plate Tectonics and Ancient Civilizations https://www.calacademy.org/educators/lesson plans/earthquakes-and-tectonic-plates USGS - Earthquakes for Kids http://www.3dprinterworld.com/article/virtual-3d-printable fossil-collection	**Key Vocabulary:** Uniformitarianism, Catastrophism, Plate Tectonics, Rock Cycle, Igneous, Metamorphic, Sedimentary, Mantle, Continental Drift

Lesson Name/Topic	**Student Learning Objective(s)**	**Suggested Tasks/Activities:**	**Day(s) to Complete Entire Unit: 25 days**

Geologic Time Scale	- fossil age by superposition is used to construct a timeline of the Earth's 4.6 billion year history	- Superposition and the age of the Earth - Catastrophism Vs. Uniformitarianism	5 Days
Cycling of the Earth's Materials	- to develop a model of the rock cycle including the energy that drives the cycle	- Rock cycle intro, diagram, lab	5 Days

Geoscience Processes and the Changing of the Earth's surfaces	- to construct an explanation based on evidence for how the Earth's surface has been changed over time by geoscience processes	- Alfred Wegner and Continental Drift - Layers of the Earth - Plate Tectonics	7 Days
Plate Tectonics and the History of the Earth	- to write an argumentative essay in support of the idea that the Earth's plates have moved over time using fossil, rock, continental shape and seafloor structure evidence uncovered through class activities	- Fossil evidence - Rock evidence - Continental Shape evidence - Seafloor Spreading - Argumentative essay on how the Earth's plates have moved over time	8 Days

Teacher Notes:

Additional Resources:

http://www.state.nj.us/education/modelcurriculum/sci/7u8.shtml

NSTA Translating the NGSS for Classroom Instruction

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	511Students

· Consult with Guidance Counselors and follow plan procedures/action plans · Allow extended time to answer questions and permit drawing as an explanation · Accept participation on any level, when necessary	·Assign a buddy, same language or English speaking ·Allow errors in speaking ·Rephrase questions, directions, and explanations ·Allow extended time to	·Provide extension activities ·Build on students' intrinsic motivation ·Consult with parents to accommodate students' interests in completing tasks at their level of engagement	·Provide extended time to complete tasks ·Consult with other members of the 7th grade team for specific behavior interventions ·Provide rewards as necessary	·Allow errors ·Rephrase questions, directions, and explanations ·Allow extended time to answer questions and permit drawing as an explanation ·Accept participatio

and appropriate	answer questions ·Accept participation at any level, even one word			n on any level, even one word ·Consult with Case Managers and follow IEP accommodations/modifications