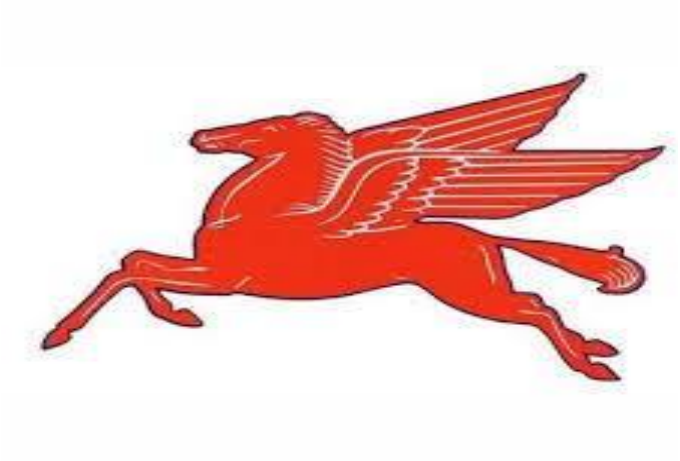
Curriculum Management System

PAULSBORO PUBLIC SCHOOLS



Science Curriculum- Seventh Grade

UPDATED JUNE 2016

For adoption by all regular education programs as specified and for adoption or adaptation by all Special Education Programs in accordance with Board of Education Policy.

Board Approved: September 2016

Table of Contents

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Paulsboro Public Schools

Mission Statement

The mission of the Paulsboro School District is to provide each student the educational opportunities to assist in attaining their full potential in a democratic society. Our instructional programs will take place in a responsive, community based school system that fosters respect among all people. Our expectation is that all students will achieve the New Jersey Core Curriculum Content Standards (NJCCCS) at every grade level.

New Jersey State Department of Education 21st Century College and Career Readiness Standards

The 12 Career Ready Practices

These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills.

CRP3. Attend to personal health and financial well-being.

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

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

CRP9. Model integrity, ethical leadership and effective management.

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

9.1 Personal Financial Literacy -This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, and Preparation- This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements. http://www.state.nj.us/education/cccs/2014/career/

SCIENCE UNIT	NJCCS LANGUAGE ARTS STANDARDS	NJCCS MATHEMATICS STANDARDS
Structures and Properties of Matter	RST.6-8.1, RST.6-8.7	MP.4, 6.RP.A.3, 8.EE.A.3, 6.SP.B.4, 6.SP.B.5
Interactions of Matter	RST.6-8.1, RST.6-8.7, WHST.6-8.8	6.NS.C.5
Chemical Reactions	RST.6-8.1, RST.6-8.3, RST.6-8.7, RST.6-8.9, WHST.6-8.7, 6.RP.A.3	MP.2, MP.4, 7.EE.3
Structure & Function	WHST.6-8.7, SL.8.5	6.EE.C.9
Body Systems	RST.6-8.1, RI.6.8, WHST.6-8.1, WHST.6-8.8	N/A
Inheritance and Variation of Traits	RST.6-8.7, SL.8.5	N/A
Organization for Matter and Energy Flow in Organisms	RST.6-8.1, RST.6-8.2, WHST.6-8.2, WHST.6-8.9	6.EE.C.9
Earth Systems	RST.6-8.1, WHST.6-8.2 , RST.6-8.7, RST.6-8.9, SL.8.5	7.EE.B.4, 6.EE.B.6, 7.EE.B.6, MP.2

MODIFICATIONS

Special Education:

Students Hands on activity, cooperative learning, peer tutoring, extended time, reteach in utilizing various methods. Utilize remediation resources which include assessment and intervention, in planning and instruction.

English Language Learners:

Provide hands-on activities and explanations. Use reduced text, so that print is not so dense. Assess comprehension through demonstration or other alternative means (gestures, drawings). Give instructions/directions in writing and orally. Use of translation dictionaries to locate words in the native language.

Use English Learners resources such as study guides, assessments and a visual glossary.

At-Risk Students:

Hands on activities cooperative learning, reteach using various methods. Make use of remediation lessons and quizzes when appropriate.

Gifted and Talented Students:

Utilize Pre-AP Resources such as the pacing, assignment and best practices guide.

Scope and Sequence

Quarter 1 – Grade 7

Big Idea: UNIT 1: Structures and Properties of Matter

How is it that everything is made of stardust?

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2)

PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2)

Big Idea: UNIT 2: Interactions of Matter

How can we trace synthetic materials back to natural ingredients?

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3)
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)

PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3)

PS3.A: Definitions of Energy

	• The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4) • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)

Scope and Sequence

Quarter 2 – Grade 7

Big Idea: Unit 3 - Chemical Reactions

How do substances combine or change (react) to make new substances?

Disciplinary Core Ideas

PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-5)
- The total number of each type of atom is conserved, and thus the mass does not change. (MS-PS1-5)
- Some chemical reactions release energy, others store energy. (MS-PS1-6)

ETS1.B: Developing Possible Solutions

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (*secondary to MS-PS1-6*)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)

ETS1.C: Optimizing the Design Solution

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. (*secondary to MS-PS1-6*)

Big Idea: Unit 4 - Structure & Function

How do cells contribute to the functioning of an organism?

Disciplinary Core Ideas

LS1.A: Structure and Function

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)

● 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. (secondary to MS-PS1-6) ● Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)		

Scope and Sequence

Quarter 3 – Grade 7

Big Idea: Unit 5 - Body Systems

What are humans made of?

Disciplinary Core Ideas

LS1.A: Structure and Function

- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

LS1.D: Information Processing

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

Big Idea: Unit 6 - Inheritance and Variation of Traits

Why do kids look similar to their parents?

Disciplinary Core Ideas

LS1.B: Growth and Development of Organisms

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. *(secondary to MS-LS3-2)*

LS3.A: Inheritance of Traits

- 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. (MS-LS3-1)
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

LS3.B: Variation of Traits

- 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. (MS-LS3-2)
- 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. (MS-LS3-1)

Scope and Sequence

Quarter 4 – Grade 7

Big Idea: Unit 7 - Organization for Matter and Energy Flow in Organisms

How do some organisms turn electromagnetic radiation into matter and energy?

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms

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

PS3.D: Energy in Chemical Processes and Everyday Life

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

Big Idea: Unit 8 - Earth Systems

If no one was there, how do we know the Earth's history?

What provides the forces that drive Earth's systems?

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)

ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

QUARTER 1 – 20 DAYS

Big Idea: Structures and Properties of Matter

Standards: NGSS- Physical Science

MS-PS1-1

- Develop a model to predict and/or describe phenomena.
- 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
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small

MS-PS1-2

- Analyze and interpret data to determine similarities and differences in findings.
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.

GOAL

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 understanding of the core ideas.

Essential Questions	**Assessments**
1. How is it that everything is made of stardust? 2. If the universe is not made of Legos®, then what is it made of? 3. Is it possible to tell if two substances mixed or if they reacted with each other?	**Formative:** 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. Analyze and interpret data to determine similarities and differences from results of chemical reactions between substances before and after they

- Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
- Science knowledge is based upon logical and conceptual connections between evidence and explanations.

Career Ready Practices

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

	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. **Summative/Topic Assessments:** Interactive Science assessments, formal lab sheets**,** experiments
Enduring Understanding	**Resources**
Students will demonstrate grade appropriate proficiency in analyzing and interpreting data, using models,conducting investigations, and communicating information.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 1 - 20 DAYS

Big Idea: Interactions of Matter

Standards: NGSS Physical Science

MS-PS1-3

- 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.
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
- 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 led to the development of entire industries and engineered systems.

GOAL

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 understanding of the core ideas.

Essential Questions	**Assessments**
1 .How can we trace synthetic materials back to natural ingredients? *2.* How can you tell what the molecules are doing in a substance? *3.* How can we trace synthetic materials back to natural ingredients?	**Formative:** ● Develop a model that predicts and describes changes in particle motion that could include molecules or inert atoms or pure substances. ● 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.

● The uses of technologies and any limitation on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. **MS-PS1-4** ● Develop a model to predict and/or describe phenomena. ● 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 location ● The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. ● Cause and effect relationships may be used to predict phenomena in natural or designed systems. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity.		● 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. ● Describe how information about how synthetic materials formed from natural resources affect society is supported or not supported by evidence. **Summative/Topic Assessments:** Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students will demonstrate grade appropriate proficiency in asking questions, designing solutions, engaging in argument from evidence, developing and using models, and designing solutions.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

CRP12. Work productively in teams while using cultural global competence.		

QUARTER 2 – 25 DAYS
Big Idea: Chemical Reactions

Standards: NGSS Physical Science

MS-PS1-5

- Develop a model to describe unobservable mechanisms.
- 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.
- Matter is conserved because atoms are conserved in physical and chemical processes.

MS-PS1-6

- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- Some chemical reactions release energy, others store energy.
- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign

GOAL

Students provide molecular-level accounts of states of matters and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and 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 in *developing and using models, analyzing and interpreting data, designing solutions*, and *obtaining, evaluating, and communicating information*. Students are also expected to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Essential Questions

1. How do substances combine or change (react) to make new substances?
2. What happens to the atoms when I bake a cake?
3. How can a device be designed, constructed, tested, and modified that either releases or absorbs thermal energy by chemical processes?

Assessments

Formative:

- 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.
- 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.

process - that is, some of the characteristics may be incorporated into the new design.

- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.
- The transfer of energy can be tracked as energy flows through a designed or natural system.

Standards: NGSS Engineering Design

MS-ETS1-3

- Analyze and interpret data to determine similarities and differences in findings.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.
- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design.

Career Ready Practices

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP11. Use technology to enhance productivity.

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

Summative/Topic Assessments:

Interactive Science assessments, formal lab sheets**,** experiments

Enduring Understanding	**Resources**
Students will demonstrate proficiency in asking questions, planning and carrying out investigations, designing solutions, engaging in argument from evidence, developing and using models, and constructing explanations and designing solutions.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

CRP12. Work productively in teams while using cultural global competence.		

QUARTER 2 - 15 DAYS
Big Idea: Structure and Function

Standards: NGSS Life Science

MS-LS1-1

- Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.
- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
- Phenomena that can be observed at one scale may not be observable at another scale.

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

MS-LS1-2

- Develop a model to describe phenomena.

- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
- Complex and microscopic structures and systems can be visualized, modeled, and used to

GOAL

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.

Essential Questions	**Assessments**
1. How do cells contribute to the functioning of an organism? 2. How will astrobiologists know if they have found life elsewhere in the solar system? 3. How do the functions of cells support an entire organism?	**Formative:** ● 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.

describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		● 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 the function of a cell as a whole. ○ ● 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/Topic Assessments:** Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**

	Students are expected to demonstrate proficiency in asking questions, planning and carrying out investigations, designing solutions, and engaging in argument.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 3 – 15 DAYS

Big Idea: Body Systems

Standards: NGSS Life Science

MS-LS1-3

- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.

MS-LS1-8

- 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.
- 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.

GOAL

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 for how organisms gather and use information from the environment. The cross cutting 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.

Essential Questions	**Assessments**
1. 1.What are humans made of? 2. What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells? 3. How do organisms receive and respond to information from their environment?	**Formative:** ● 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. ● Gather, read, and synthesize information from multiple appropriate sources about sensory receptors' response to stimuli. ● Assess the credibility, accuracy, and possible bias of each publication and methods used.

● Cause and effect relationships may be used to predict phenomena in natural systems. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		● Describe how publications and methods used are supported or not supported by evidence. **Summative/Topic Assessments:** Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students are expected to demonstrate proficiency in developing and using models and analyzing and interpreting data.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 3 – 20 DAYS
Big Idea: Inheritance and Variation of Traits

Standards: NGSS Life Science

MS-LS3-1

- Develop and use a model to describe phenomena.
- 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.
- 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.
- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.

MS-LS3-2

GOAL

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.

Essential Questions	**Assessments**
1. Why do kids look similar to their parents? 2. How do structural changes to genes (mutations) located on chromosomes affect proteins or affect the structure and function of an organism? 3. How do asexual reproduction and sexual reproduction affect the genetic variation of offspring?	**Formative:** ● 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. ● 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.

● Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. ● 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. ● Cause and effect relationships may be used to predict phenomena in natural systems. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		● 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/Topic Assessments:** Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students are expected to demonstrate proficiency in developing and using models, and planning and carrying out investigations.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 4 – 15 DAYS
Big Idea: Organization for Matter and Energy Flow in Organisms

Standards: NGSS Life Science

MS-LS1-6

- 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.
- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.
- 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.
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter.
- Science knowledge is based upon logical connections between evidence and explanations.

MS-LS1.7

GOAL

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 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.

Essential Questions	**Assessments**
1. How do some organisms turn electromagnetic radiation into matter and energy? 2. What is the role of photosynthesis in the cycling of matter and flow of energy into and out of an organism? 3. How is food rearranged through chemical reactions to form new molecules that support growth	**Formative:** ● 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

● Use a model based on evidence to illustrate the relationships between systems or between components of a system. ● 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. ● Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. ● Matter is conserved because atoms are conserved in physical and chemical processes. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.	and/or release energy as this matter moves through an organism? **Enduring Understanding** Students are expected to demonstrate proficiency in developing and using models, and planning and carrying out investigations.	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 and use a model to describe how food is rearranged through chemical reactions. **Summative/Topic Assessments:** Interactive Science assessments, formal lab sheets, experiments **Resources** - Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/

QUARTER 4 – 30 DAYS
Big Idea: Earth Systems

Standards: NGSS Earth Systems Science

MS-ESS1-4

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.
- 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.

MS-ESS2-1

- Develop and use a model to describe phenomena.
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.
- Explanations of stability and change in natural or designed systems can be constructed by

GOAL

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 geo-systems operate by modeling the flow of energy and 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 understanding of the core ideas.

Essential Questions

1. If no one was there, how do we know the Earth's history?
2. What provides the forces that drive Earth's systems?
3. How do we know that the Earth is approximately 4.6-billion-year-old history?
4. What drives the cycling of Earth's materials?
5. Do all of the changes to Earth systems occur in similar time scales?
6. How is it possible for the same kind of fossils to be found in New Jersey and in Africa?

Assessments

Formative:

- 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.

examining the changes over time and processes at different scales, including the atomic scale. **MS-ESS2-2** ● The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **MS-ESS2-3** ● Analyze and interpret data to provide evidence for phenomena. ● 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 natural systems. ● Science findings are frequently revised and/or reinterpreted based on new evidence. **Career Ready Practices** CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.		• 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. • 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. **Summative/Topic Assessments:** Interactive Science assessments, formal lab sheets**,** experiments
	Enduring Understanding	**Resources**
	Students are expected to demonstrate proficiency in developing and using models, and planning and carrying out investigations.	- Interactive Science Series - Trade Books/ Classroom Library - Manipulatives - NJDOE Model Curriculum - NGSS www.nextgenscience.org/ - NSTA www.nsta.org/