ELMWOOD PARK PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

SCIENCE

Grade 7

5 credits

ABSTRACT

The goal of science education curriculum is to produce students who have gained sufficient knowledge of the practices, crosscutting concepts, and core ideas of science and engineering to engage in public discussions on science-related issues, to be critical consumers of scientific information related to their everyday lives, and to continue to learn about science throughout their lives. They should come to appreciate that science and the current scientific understanding of the world are the result of many hundreds of years of creative human endeavor. It is especially important to note that the above goals are for all students, not just those who pursue careers in science, engineering, or technology or those who continue on to higher education. Units of study in *Science 7* include the following: the structure and properties of matter; interactions of matter; chemical reactions; structure and function; body systems; inheritance and variation of traits; organization of matter and energy flow in organisms; and Earth systems.

UNIT #: *Unit Title* Number of Days	**Unit 1:** *Structure and Property* 25 days	**Unit 2:** *Interactions of Matter* 30 days	**Unit 3:** *Chemical Reactions* 25 days
STAGE 1: DESIRED RESULTS **What will students understand as a result of the unit? What are the BIG ideas?**			
ESTABLISHED GOALS: *(NJSLS-Science)*	**Physical Science** MS-PS1-2 MS-PS1-3 MS-PS1-5 MS-PS1-6 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1 **Career Readiness, Life Literacies, and Key Skills:** 9.2.8.CAP.10 9.2.8.CAP.11 9.2.8.CAP.12 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2	**Physical Science** MS-PS3-2 MS-PS3-3 MS-PS3-4 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1 **Career Readiness, Life Literacies, and Key Skills:** 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7	**Physical Science** MS-PS1-1 MS-PS1-3 MS-PS1-4 MS-PS1-5 MS-PS1-6 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1 **Career Readiness, Life Literacies, and Key Skills:** 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7

	9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7		
ENDURING UNDERSTANDINGS: (Students will understand that . . .)	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) 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),(MS-PS1-3) Gasses and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) Solids may be formed from molecules, or they may be extended structures with	Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. (MS-PS3-3),(MS-PS3-4) The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4) Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)	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),(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) The term “heat” as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. (secondary

	repeating subunits (e.g., crystals). (MS-PS1-1) The changes of state that occur with variations in temperature or pressure can be described and predicted using these models. (MS-PS1-4)	http://www.nextgenscience.org/msps3-energy	to MS-PS1-4) The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecules (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) 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) 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) 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) http://www.nextgenscience.org/msps1-matter-interactions
ESSENTIAL QUESTIONS: (What provocative questions will foster inquiry, understanding, and transfer of learning?)	1. What is matter and how do we measure it? 2. What is an atom and how is it structured? 3. How is the Periodic Table of Elements arranged and what does an element's placement tell you about the substance? 4. What is the difference between a physical and a chemical property and what are some examples of each? 5. What are the states of matter and what role does thermal energy play in changing matter's state?	1. How is temperature related to kinetic energy? 2. What are three scales commonly used to measure temperature and how do they relate to another? 3. Why do things feel hot or cold? 4. What is the definition of thermal energy and how does it relate to heat? 5. How do conductors and insulators differ? 6. What are the 1st and 2nd laws of thermodynamics? 7. What do heat engines do?	1. What happens when substances react chemically? 2. What happens to atoms of the original substances when a reaction occurs? 3. Will the properties of the substance that is produced as part of a reaction be the same as those of the original substances? 4. What happens to the total mass of all atoms as a reaction takes place? 5. How does the amount of stored energy change during a chemical reaction? 6. How does the everyday definition of "heat" differ from the scientific definition? 7. When does heat transfer between two objects? 8. How are temperature and energy related?
STAGE 2: ASSESSMENT EVIDENCE **What evidence will be collected to determine whether or not the understandings have been developed, the knowledge and skills attained, and the state standards met? [Anchor the work in performance tasks that involve application, supplemented as needed by prompted work, quizzes, observations, etc.]**			
PERFORMANCE TASKS:	Assessments of each learning activity Students who understand the concepts are able to:	Students who understand the concepts are able to:	Students who understand the concepts are able to:

(Through what authentic performance tasks will students demonstrate the desired understandings?) (By what criteria will performances of understanding be judged?)	• 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 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.	• 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. • 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. • Students understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment.	• 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. • 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.

		They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.	
OTHER EVIDENCE: (Through what other evidence (e.g. quizzes, tests, academic prompts, observations, homework, journals) will students demonstrate achievement of the desired results?) (How will students self-assess their learning?)	• Lab 1 – Measuring Matter • Lab 2 – Build an Atom • Quiz 1 – Matter and Periodic Table Quiz • Lab 3 – Build a Molecule • Quiz 2 – Physical Properties of Matter / Molecules • Lab 4 – Determining Density • Quiz 3 – Density • Quiz 4 – States of Matter / Changes of Matter • Unit Test	• Lab 1: Temperature and KE Lab • Quiz 1: Temperature and Kinetic Energy Quiz • Lab 2: Thermal Energy Transfer • Lab 3: Conductors and Insulators • Quiz 2: Thermal Energy Transfer Part I • Lab 4: Thermal Energy Transfer II • Quiz 3: Thermal Energy Transfer Part II • Lab 5: Thermodynamics • Quiz 4: Thermodynamics • Unit Test: Thermal Energy	• Lab 1 Classifying Reactions • Quiz 1 Physical and Chemical Changes • Lab 2 Atomic Rearrangement • Quiz 2 Conservation of Mass • Quiz 3 Types of Energy and Energy Changes • Lab 3 Temperature and Thermal Energy • Lab 4 Energy Transfer • Quiz 4: Thermal Energy and Temperature
RESOURCES:	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Middle school Chemistry, Chapter 1: Solids, Liquids, and Gases (http://www.middleschoolchemistry.com/) Students are introduced to the idea that matter is composed of	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Molecular View of a Gas: (https://concord.org/stem-resources/molecular-view-gas) Explore the structure of a gas at the molecular level. Molecules are always in	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Middle School Chemistry, Chapter 5: The Water Molecule and Dissolving: (http://www.middleschoolchemistry.com/) Students investigate the polarity of the water molecule and design tests to

	atoms and molecules that are attracted to each other and in constant motion. Students explore the attractions and motion of atoms and molecules as they experiment with and observe the heating and cooling of a solid, liquid, and gas. • Middle school Chemistry, Chapter 2: Changes of State (http://www.middleschoolchemistry.com/) Students help design experiments to test whether the temperature of water affects the rate of evaporation and whether the temperature of water vapor affects the rate of condensation. Students also look in more detail at the water molecule to help explain the state changes of water. (all activities/lessons) • States of Matter: (https://concord.org/stem-resources/states-matter) Use interactive computer models to trace an atom's trajectory at a certain physical stage, and investigate how molecular behavior is responsible for the substance's state. • Molecular View of a Solid: (https://concord.org/stem-resources/molecular-view-solid) Explore the structure of a solid at the molecular level. Molecules are always in motion, though molecules in a solid move slowly. All molecules are attracted to each other. Molecules can be weakly or	motion. Molecules in a gas move quickly. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts. • Molecular View of a Liquid: (https://concord.org/stem-resources/molecular-view-liquid) Explore the structure of a liquid at the molecular level. Molecules are always in motion. Molecules in a liquid move moderately. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts. • Molecular View of a Solid: (https://concord.org/stem-resources/molecular-view-solid) Explore the structure of a solid at the molecular level. Molecules are always in motion, though molecules in a solid move slowly. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct	compare water to less polar liquids for evaporation rate, surface tension, and ability to dissolve certain substances. Students also discover that dissolving applies to solids, liquids, and gasses. • Middle School Chemistry, Chapter 6: Chemical Change: (http://www.middleschoolchemistry.com/) Students explore the concept that chemical reactions involve the breaking of certain bonds between atoms in the reactants, and the rearrangement and rebonding of these atoms to make the products. Students also design tests to investigate how the amount of products and the rate of the reaction can be changed. Students will also explore endothermic and exothermic reactions. Students are using models to match what happens during a chemical change and mass is conserved. • Gumdrop Models: Students will design a model to explain the structure of an atom. This activity will allow for fast pacing for the gifted and talented students. Students will be given Data Cards to develop and modify models of molecules. Content will be differentiated Data Cards will begin with the construction of an atom. As students finish construction, they will draw the atom/molecule as a summative assessment. • Middle School Chemistry, Chapter 4: Periodic Table and Bonding:

	strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts. • Molecular View of a Liquid: (https://concord.org/stem-resources/molecular-view-liquid) Explore the structure of a liquid at the molecular level. Molecules are always in motion. Molecules in a liquid move moderately. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts. • Molecular View of a Gas: (https://concord.org/stem-resources/molecular-view-gas) Explore the structure of a gas at the molecular level. Molecules are always in motion. Molecules in a gas move quickly. All molecules are attracted to each other. Molecules can be weakly or strongly attracted to each other. The way that large molecules interact in physical, chemical and biological applications is a direct consequence of the many tiny attractions of the smaller parts. • https://phet.colorado.edu/: used to do simulations for building an atom	consequence of the many tiny attractions of the smaller parts.	(http://www.middleschoolchemistry.com/) (Lesson 1 and 2 only) Students look deeply into the structure of the atom and play a game to better understand the relationship between protons, neutrons, electrons, and energy levels in atoms and their location in the periodic table. Predict how elements will react to each other based on their location in the periodic table. Lesson 1: Students are constructing an explanation of why charges attract or repel.

	and building a molecule. Students used the site along with a webquest.		

STAGE 3: LEARNING PLAN

What learning experiences and instruction will enable students to achieve the desired results? Utilize the WHERETO* acronym to consider key design elements.

SKILLS AND TOPICS: (What specific activities will students do and what skills will students know as a result of the unit?)	By the end of this unit, students will be able to: ● Describe the basic structures of atoms and molecules ● Demonstrate how both mass and volume are measured and then use this information to calculate for density. ● Distinguish between weight and mass. ● Describe the difference between physical and chemical properties and give examples of each. ● Display the ability to read the Periodic Table of Elements and describe elements based on their location in the chart. ● Distinguish between solids, liquids and gasses based on distinct characteristics	By the end of this unit, students will be able to: ● Relate the motion and spacing of a substance's particles to the substance's temperature. ● Describe why object's expand or contract in terms of the temperature change of the object as well as the motion of the object's particles. ● Measure a substance's temperature using a standard thermometer and convert between Kelvin, Celsius and Fahrenheit. ● Relate thermal expansion/contraction to how thermometers work. ● Identify when substances can have the same temperature but possess different amounts of thermal energy. ● Differentiate between examples of convection, conduction and radiation. ● Use their knowledge of conductors and insulators to maximize and minimize thermal energy transfer.	By the end of this unit, students will be able to: ● Describe observable cues that a chemical reaction has occurred. ● Distinguish between chemical substances based on observable properties. ● Develop an atomic level model to explain how atoms rearrange to form new substances during a chemical reaction. ● Distinguish between reactions that absorb energy and reactions that release energy ● Explain when heat will transfer between two objects and in which direction the heat will flow.

		• Determine temperature changes between two objects that exchange thermal energy. • Be able to describe what happens to usable energy in a system. • Describe the relationship between energy transferred, type/amount of matter, and temperature. • Use the thermal energy/specific heat equation to calculate: temperature change, heat added or lost, mass of objects, and specific heats. • Determine qualitatively the relative temperature of objects given a heat input and the specific heat capacity of each object.. • Describe examples of the 1st law of thermodynamics • Identify examples of heat engines, specifically an internal combustion engine.	
CROSS-CURRICULAR / DIFFERENTIATION: *(What cross-curricular (e.g. writing, literacy, math, science, history, career readiness, life literacies, key skills, technology) learning activities are included in this unit that will help achieve the desired results?)*	**Cross-Curricular:** **English Language Arts** (RST.6-8.1-10,WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) • Cite specific textual evidence to support analysis of science and technical texts on the characteristic properties of pure substances. Attend precise details of explanations or descriptions about	**Cross-Curricular:** **English Language Arts** (RST.6-8.1-10,, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) • Cite specific text to support the analysis of evidence that synthetic materials formed from natural resources affect society. Attend the	**Cross-Curricular:** **English Language Arts** (RST.6-8.1-10, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.8.5) • Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks related to chemical

(What type of differentiated instruction will be used for Sp.Ed./504, ELL, G&T, At-Risk students?)	the properties of substances before and after they undergo a chemical process. ● Integrate qualitative 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. **Mathematics** (MP.2, MP.4, 6.RP.A.3, 6.SP.B.4, 6.SP.B.5) ● 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. ● Reason quantitatively (with amounts, numbers, sizes) and abstractly (with variables). ● Develop a mathematical model to describe the atomic composition of simple molecules and extended structures.	precise details of explanations or descriptions. ● 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. **Mathematics** (MP.2, MP.4, 6.NS.C.5) ● 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. ● 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.	reactions that release energy and some that store energy. ● 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. ● 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 ● 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. ● Draw evidence from informational texts to support analysis, reflection, and research on the design and modification of a device that controls the transfer of

	● Use ratio and rate reasoning to describe the atomic composition of simple molecules and extended structures. ● Reason quantitatively with amounts, numbers, and sizes for properties like density, melting point, boiling point, solubility, flammability, and odor, and reason abstractly by assigning labels or symbols. ● Use ratio and rate reasoning to determine whether a chemical reaction has occurred. ● Display numerical data for properties such as density, melting point, solubility, flammability, and order in plots on a number line, including dot plots, histograms, and box plots. ● Summarize numerical data sets on the properties of substances before and after the substances interact to determine whether a chemical reaction has occurred. The summary of the numerical data sets must be in relation to their context. **Career Readiness, Life Literacies, and Key Skills Introduction :** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution	**Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● Develop a proposal for a solution to a real-world problem that includes a	energy to the environment using factors such as type and concentration of a substance. ● 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. **Mathematics** (MP.2, MP.4, 6.RP.A.3, 7.EE.B.3) ● 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. ● Reason quantitatively and abstractly during communication about melting or boiling points. ● Use mathematics to model the law of conservation of matter. ● 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. ● Reason quantitatively and abstractly: Reason quantitatively using numbers to represent the criteria (amount, time, and

	elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential. **Differentiation** ● Structure lessons around questions that are authentic, relate to	model (e.g.,physical prototype, graphical/technical sketch). **Differentiation:** ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices	temperature of substance) when testing a device that either releases or absorbs thermal energy by chemical processes; reason abstractly by assigning labels or symbols. ● Collect and analyze numerical data from tests of a device that either releases or absorbs thermal energy by chemical processes. 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. Pose problems with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate the numerical data with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computations and estimation strategies. ● Develop a probability model and use it as part of an iterative process for testing to find the probability that a promising design solution will lead to an optimal solution. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy in order to ultimately develop an optimal design.

	students' interests, social/family background and knowledge of their community. ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. ● Use project-based science learning to connect science with observable phenomena.	to provide students with multiple entry points and multiple ways to demonstrate their understanding. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Provide ELL students with multiple literacy strategies. ● Collaborate with after-school programs or clubs to extend learning opportunities. ● Restructure lesson using UDL principles **English Language Learners:** ● Construct a poster on chemical reactions. ● Students may use a bilingual dictionary (or online translation tool). ● Read aloud written instructions ● Provide modified assessments when necessary. ● Make home/culture connections ● Place student next to same-language speaker, if possible ● Provide text to speech ● Provide graphic organizers ● Thesaurus/ word bank	**Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. **Differentiation:** ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ● Provide students with multiple choices for how they can represent

	● Structure the learning around explaining or solving a social or community-based issue. ● Provide ELL students with multiple literacy strategies. ● Collaborate with after-school programs or clubs to extend learning opportunities. ● Restructure lesson using UDL principles **English Language Learners:** ● Create a digital infographic about atomic structure. ● Students may use a bilingual dictionary (or online translation tool). ● Read aloud written instructions ● Provide modified assessments when necessary. ● Make home/culture connections ● Place student next to same-language speaker, if possible ● Provide text to speech ● Provide graphic organizers ● Thesaurus/ word bank **Special Education/504**: ● Generate an anchor chart on atomic structure.	**Special Education/504**: ● Design a coloring book on the types and evidence of reactions. ● Students: Modifications in accordance with individual students' 504 plans and IEPs ● Students may be provided with note organizers / study guides to reinforce key topics ● Extended time on assessments when needed ● Preferred seating to be determined by student and teacher ● Provide modified assessments when necessary ● Establish a non-verbal cue to redirect student when not on task ● Maintain strong teacher / parent communication ● Guided reading ● Flexible grouping ● Applicable career options are discussed as they arise throughout the science program. ● Peer tutoring ● Collaborative learning ● Teacher modeling academic tasks and behaviors ● Thesaurus/ word bank	their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Provide ELL students with multiple literacy strategies. ● Collaborate with after-school programs or clubs to extend learning opportunities.

	• Students: Modifications in accordance with individual students' 504 plans and IEPs • Students may be provided with note organizers / study guides to reinforce key topics • Extended time on assessments when needed • Preferred seating to be determined by student and teacher • Provide modified assessments when necessary • Establish a non-verbal cue to redirect student when not on task • Maintain strong teacher / parent communication • Guided reading • Flexible grouping • Applicable career options are discussed as they arise throughout the science program. • Peer tutoring • Collaborative learning • Teacher modeling academic tasks and behaviors • Thesaurus/ word bank **Gifted and Talented Students:** • Create learning centers about elements and atoms. • Students will be afforded the opportunity to locate current events, beyond the scope	**Gifted and Talented Students:** • Demonstrate to class classified reactions(endo-/exothermic, chemical and physical changes) • Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits • Use higher level questioning techniques in class and on applicable assessment pieces • fast pacing • level of challenge (including differentiation of content) • opportunities for self-direction • strategic grouping **At Risk:** • Create a board game about chemical reactions. • Materials that allow a different mode of input • Materials that allow a different mode of output • Materials that reduce the level of abstraction of information • Use of school support systems including role models and	• Restructure lesson using UDL principles **English Language Learners:** • Build a 3D atom. • Students may use a bilingual dictionary (or online translation tool). • Read aloud written instructions • Provide modified assessments when necessary. • Make home/culture connections • Place student next to same-language speaker, if possible • Provide text to speech • Provide graphic organizers • Thesaurus/ word bank **Special Education/504**: • Use atomic model kits to construct atoms. • Students: Modifications in accordance with individual students' 504 plans and IEPs • Students may be provided with note organizers / study guides to reinforce key topics • Extended time on assessments when needed • Preferred seating to be determined by student and teacher • Provide modified assessments when necessary • Establish a non-verbal cue to redirect student when not on task

	discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits ● Use higher level questioning techniques in class and on applicable assessment pieces ● fast pacing ● level of challenge (including differentiation of content) ● opportunities for self-direction ● strategic grouping **At Risk:** ● Create an Atomic Bulletin Board. ● Materials that allow a different mode of input ● Materials that allow a different mode of output ● Materials that reduce the level of abstraction of information ● Use of school support systems including role models and mentors of similar racial or ethnic backgrounds ● Using project-based science learning as a form of connected science ● Community involvement and social activism	mentors of similar racial or ethnic backgrounds ● Using project-based science learning as a form of connected science ● Community involvement and social activism ● Multiple representation and multimodal experiences ● Tiered interventions following RtI framework ● Rtl Intervention Bank ● Use additional practice ● Structured after-school opportunities ● Family outreach ● Life skills training ● Safe learning environment ● Individualized academic support	● Maintain strong teacher / parent communication ● Guided reading ● Flexible grouping ● Applicable career options are discussed as they arise throughout the science program. ● Peer tutoring ● Collaborative learning ● Teacher modeling academic tasks and behaviors ● Thesaurus/ word bank **Gifted and Talented Students:** ● Design and construct model building kits to construct molecules, atoms and elements. ● Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits ● Use higher level questioning techniques in class and on applicable assessment pieces ● fast pacing ● level of challenge (including differentiation of content) ● opportunities for self-direction ● strategic grouping

	• Multiple representation and multimodal experiences • Tiered interventions following RtI framework • Rtl Intervention Bank • Use additional practice • Structured after-school opportunities • Family outreach • Life skills training • Safe learning environment • Individualized academic support		**At Risk:** • Complete Molecular structure webquest. • Materials that allow a different mode of input • Materials that allow a different mode of output • Materials that reduce the level of abstraction of information • Use of school support systems including role models and mentors of similar racial or ethnic backgrounds • Using project-based science learning as a form of connected science • Community involvement and social activism • Multiple representation and multimodal experiences • Tiered interventions following RtI framework • Rtl Intervention Bank • Use additional practice • Structured after-school opportunities • Family outreach • Life skills training • Safe learning environment • Individualized academic support

***WHERETO**

W = Help the students know **<u>WHERE</u>** the unit is going and **<u>WHAT</u>** is expected. Help the teacher know **<u>WHERE</u>** the students are coming from

(prior knowledge, interests).
H = **HOOK** all students and **HOLD** their interest.
E = **EQUIP** students, help them **EXPERIENCE** the key ideas and **EXPLORE** the issue.
R = Provide opportunities to **RETHINK** and **REVISE** their understanding and work.
E *= Allow students to* ***EVALUATE*** *their work and its implications.*
T *=* ***TAILORED*** *to the different needs, interests, and abilities of learners.*
O *=* ***ORGANIZE*** *to maximize initial and sustained engagement as well as effective learning.*

UNIT #: *Unit Title* Number of Days	**Unit 4** *Structure and Function* 15 days	**Unit 5** *Body Systems* 15 days	**Unit 6** *Inheritance and Variation of Traits* 20 days
STAGE 1: DESIRED RESULTS **What will students understand as a result of the unit? What are the BIG ideas?**			
ESTABLISHED GOALS: *(NJSLS-Science)*	**Life Science** MS-LS1-1 MS-LS1-2 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1	**Life Science** MS-LS1-3 MS-LS1-8 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1	**Life Science** MS-LS1-1 MS-LS1-2 MS-LS3-1 MS-LS3-2 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology**

	Career Readiness, Life Literacies, and Key Skills: 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7	**Career Readiness, Life Literacies, and Key Skills** 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7	8.1.8.D.5 8.1.8.E.1 8.2.8.E.1 **Career Readiness, Life Literacies, and Key Skills** 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7 9.4.8.IML.9 9.4.8.IML.10 9.4.8.IML.11
ENDURING UNDERSTANDINGS: (Students will understand that . . .)	All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)	In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) 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)	Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS- LS3-2) 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) 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) In *artificial* selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.
ESSENTIAL QUESTIONS: (What provocative questions will foster inquiry, understanding, and transfer of learning?)	1. What are the building blocks of life? 2. How does each part of a cell function?	1. How is the body a system of interacting subsystems composed of groups of cells? 2. What are fundamental differences between animal and plant cells pertaining to cell reproduction?	1. How do children get traits from their parents? 2. Why do some people look more like their dad and some look more like their mom?

		3. How do our sensory receptors send information to our brain?	3. What is a Punnett Square and how does it help us predict the traits of offspring? 4. Why do some children show traits that neither of their parents display? 5. Why are some people born with birth defects or diseases?
STAGE 2: ASSESSMENT EVIDENCE **What evidence will be collected to determine whether or not the understandings have been developed, the knowledge and skills attained, and the state standards met? [Anchor the work in performance tasks that involve application, supplemented as needed by prompted work, quizzes, observations, etc.]**			
PERFORMANCE TASKS: (Through what authentic performance tasks will students demonstrate the desired understandings?) (By what criteria will performances of understanding be judged?)	• 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 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.	• 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. • Describe how publications and methods used are supported or not supported by evidence.	• 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. • Use models such as Punnett squares, diagrams, and simulations to describe the cause-and effect-relationship of gene transmission from parent(s) to

	• Develop and use models to describe the relationship between the structure and function of the cell wall and cell membrane.		offspring and resulting genetic variation.
OTHER EVIDENCE: (Through what other evidence (e.g. quizzes, tests, academic prompts, observations, homework, journals) will students demonstrate achievement of the desired results?) (How will students self-assess their learning?)	• Lab 1: Investigating Cells • Quiz 1: Cell Structure and Function • Project: Cell City • Build an Organ Activity • Lab 2: Dissecting a Chicken Wing • Organ Systems Activity • Quiz 2: Tissues, Organs & Organ Systems • Lab 3: Can You Trust Your Senses? • Quiz 3: Information Processing • Unit Test	• Build an Organ Activity • Lab 2: Dissecting a Chicken Wing • Organ Systems Activity • Quiz 2: Tissues, Organs & Organ Systems • Lab 3: Can You Trust Your Senses? • Quiz 3: Information Processing • Unit Test	• Webquest – Mendel's Peas • Activity – Dragon Crossing (Punnett Squares) • Activity – Jane and John (Using Punnett Squares) • Quiz 1 – Mendelian Genetics and Punnett Squares • Project – Genetic Mutations (see rubric) • Unit Test
RESOURCES:	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Let's Talk Science: Seeding Argumentation About Cells and Growth: This is a sequence of lessons that have been developed to help middle school students	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • NOVA body + brain: This link will take you to NOVA's homepage for journal articles, videos, and interactives that can be used to teach the body.	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Meiosis: How Does the Process of Meiosis Reduce the Number of Chromosomes in Reproductive Cells? This lab activity introduces students to the process of meiosis at the chromosomal level. The guiding

	learn and argue about the core concept of how a plant root grows at the cellular level. The first part of the sequence begins with a corn seed germination activity and the initial phase of teaching the students argumentation. The second part of the sequence consists of a microscope investigation to provide data upon which students will base their arguments explaining growth at the cellular level. In the third part of the sequence, students use their data to publicly make a claim, and provide evidence and reasoning to support their claims. This sequence unfolds over the course of three weeks. • Movement of Molecules Into or Out of Cells: Movement of Molecules Into and Out of Cells is one of a series of activities from "Scientific Argumentation in Biology: 30 Classroom Activities. Movement of Molecules engages students in planning and carrying out investigations, modeling, engaging in argument from evidence, and communication. After observing a figure of magnified red blood cells, and a figure of magnified red blood cells with sugar water added,	• Animal Communications: All animal species have some capacity for communication but communication abilities range from very simple to extremely complex, depending upon the species. Communication is influenced by a species' genetic makeup, its environment, and the numerous ways by which animals and humans respond to and adapt to their surroundings.	question for the investigation is: How does the process of meiosis reduce the number of chromosomes in reproductive cells? Students develop an explanatory model based on their knowledge of mitosis and how cells divide. Students are provided with pictures showing various stages of meiosis. Students sequence the pictures and provide a description of what they think may be going on during each stage. The book provides a link (www.nsta.org/publications/press/extras/argument.aspx) to download images of meiosis (sequencing activity). Students use pop bead chromosomes (provided by the teacher) to create a valid model that explains : what happens to the chromosomes inside a cell as it goes through meiosis, why reproductive cells have half the number of chromosomes of the individuals who produce them, and why there are no pairs of chromosomes in reproductive cells. When students have finished the model, and after they have collected and analyzed the data, they develop an initial argument. They prepare a whiteboard presentation that includes the guiding question, claim, evidence, and justification of evidence and present it to the whole-class using a round-robin format. After collecting feedback, students return to their original small groups for editing and revising before writing a final report. Each lab ends with a list of checkout

	students are presented with a question (Why do the red blood cells appear smaller) and three possible explanations. Based on their chosen explanation and a set of available materials, they design an experiment to test their claim. After engaging in an "Argumentation Session", they write an essay to support their explanation. Teachers are encouraged to refer to the preface, introduction, assessment samples, and appendix provided in the full book for important background on the practice of argumentation and resources for classroom implementation. The standards addressed in the lesson are also included in the teacher's notes.		questions. The book includes an option to extend the lesson by asking students to complete a double-blind peer review of the argument using a rubric provided in the appendix. To provide additional support, four appendixes are included: standards alignment matrices, options for implementing argument-driven inquiry lab investigations, investigation proposal options, and peer-review guide and instructor scoring rubric. A detailed step-by-step guide that explains the argument-driven inquiry is included for teachers not familiar with the model. • Pedigrees and the Inheritance of Lactose Intolerance: In this activity students analyze a family's pedigrees to make a claim based on evidence about mode of inheritance of a lactose intolerance trait, determine the most likely inheritance pattern of a trait, and analyze variations in DNA to make a claim about which variants are associated with specific traits. This activity serves as a supplement to the film Got Lactose? The Co-evolution of Genes and Culture (http://www.hhmi.org/biointeractive/making-fittest-got-lactase-co-evolution-genes-and-culture). The film shows a scientist as he tracks down the genetic changes associated with the ability to digest lactose as adults. A detailed teacher's guide that includes curriculum connections, teaching tips, time requirements, answer key and a

			student guide can be downloaded at http://www.hhmi.org/biointeractive/pedigrees-and-inheritance-lactose-intolerance. Six supporting resources and two "click and learn" activities are also found on the link. • How do Siamese Cats Get Their Color? This resource is an article from the January 2016 issue of The Science Teacher. The unit focuses on an essential question: How do Siamese cats develop their coloration? Students develop explanations by making connections among genes, proteins, and traits. The unit is designed to be implemented over six or seven instructional days. However, each activity can be used as a stand-alone instructional strategy. During the instructional cycle, students develop an initial model to explain how Siamese cats get their coat coloration, learn about enzyme structure and function, use a computer model to see how proteins interact, experiment with Jell-O to see enzymes in action, learn about molecular motor proteins to see how structure relates to function, revise their model of coat coloration, and experiment with precursors of melanin to see how proteins can lead to observable traits. The unit is designed to help teachers extend the central dogma concept beyond the idea that proteins are the final products in the process. The unit provides opportunities for students to develop a

			conceptual understanding that proteins are important in cellular functions as well as trait-producing mechanisms. The article includes a teacher guide which describes how each activity is aligned to the Next Generation Science Standards. Unit handouts for students and the teacher guide are found on the NSTA website at www.nsta.org/highschool/connections.aspx.
STAGE 3: LEARNING PLAN **What learning experiences and instruction will enable students to achieve the desired results? Utilize the WHERETO* acronym to consider key design elements.**			
SKILLS AND TOPICS: (What specific activities will students do and what skills will students know as a result of the unit?)	• 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). • Within cells, special structures are responsible for particular functions, and the cell membrane forms the	• 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. • Cells form tissues, which form organs, which form systems • Sensory receptors send messages to our brain	• How to properly use a Punnett Square • Your traits are determined by the dominant and recessive alleles passed to you from your parents • The difference between genotype and phenotype and how phenotype depends on genotype • How to perform a test cross to determine the unknown genotype of an organism • Why a person may end up being born with a birth defect or disease

	boundary that controls what enters and leaves the cell.		
CROSS-CURRICULAR / DIFFERENTIATION: *(What cross-curricular (e.g. writing, literacy, math, science, history, career readiness, life literacies, key skills, technology) learning activities are included in this unit that will help achieve the desired results?)* *(What type of differentiated instruction will be used for Sp.Ed./504, ELL, G&T, At-Risk students?)*	**Cross-Curricular:** **English Language Arts** (RST.6-8.1-10, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) · 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 and generate additional related, focused questions that allow for multiple avenues of exploration. · Integrate multimedia and visual displays of cells and specific cell parts into presentations to clarify information, strengthen claims and evidence, and add interest. **Mathematics** (MP.2, MP.4, 6.EE.C.9) · Use variables to represent two quantities, such as the number of cells that make up an organism and units representing the size or type of the organism, and determine the relationship between these two variables. · Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the	**Cross-Curricular:** **English Language Arts** (RST.6-8.1-10, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) · 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. · 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. · Write arguments, supported by evidence, for how the body is a system of · interacting subsystems composed of groups of cells. · 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. Quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.	**Cross-Curricular:** **English Language Arts** (RST.6-8.1-10, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) · 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. · 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. · Write arguments, supported by evidence, for how the body is a system of · interacting subsystems composed of groups of cells. · 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. Quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

	independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. 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. **Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from	**Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● 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	**Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● Distinguish between ethical and unethical uses of information and media Differentiation ● Structure lessons around questions that are authentic, relate to students'

	a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. Differentiation ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.	trade-offs (e.g., annotated sketches) Differentiation ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding.	interests, social/family background and knowledge of their community. ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue.

	● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. ● Use project-based science learning to connect science with observable phenomena.	● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Provide ELL students with multiple literacy strategies. ● Collaborate with after-school programs or clubs to extend learning opportunities. ● Restructure lesson using UDL principles **English Language Learners:** ● Perform a chicken wing dissection. ● Students may use a bilingual dictionary (or online translation tool). ● Read aloud written instructions ● Provide modified assessments when necessary. ● Make home/culture connections ● Place student next to same-language speaker, if possible ● Provide text to speech ● Provide graphic organizers ● Thesaurus/ word bank	● Provide ELL students with multiple literacy strategies. ● Collaborate with after-school programs or clubs to extend learning opportunities. ● Restructure lesson using UDL principles **English Language Learners:** ● Format Punnett Squares-monohybrid cross. ● Students may use a bilingual dictionary (or online translation tool). ● Read aloud written instructions ● Provide modified assessments when necessary. ● Make home/culture connections ● Place student next to same-language speaker, if possible ● Provide text to speech ● Provide graphic organizers ● Thesaurus/ word bank **Special Education/504**: ● Janet and John activity (predicting probable genetic outcomes). ● Students: Modifications in accordance with individual students' 504 plans and IEPs

	• Structure the learning around explaining or solving a social or community-based issue. • Provide ELL students with multiple literacy strategies. • Collaborate with after-school programs or clubs to extend learning opportunities. • Restructure lesson using UDL principles **English Language Learners:** • Generate drawings from microscopic observations. • Students may use a bilingual dictionary (or online translation tool). • Read aloud written instructions • Provide modified assessments when necessary. • Make home/culture connections • Place student next to same-language speaker, if possible • Provide text to speech • Provide graphic organizers • Thesaurus/ word bank **Special Education/504** • Complete flip-book on cells and organelles.	**Special Education/504**: • Research organ functions. Create a visual representation of the research. • Students: Modifications in accordance with individual students' 504 plans and IEPs • Students may be provided with note organizers / study guides to reinforce key topics • Extended time on assessments when needed • Preferred seating to be determined by student and teacher • Provide modified assessments when necessary • Establish a non-verbal cue to redirect student when not on task • Maintain strong teacher / parent communication • Guided reading • Flexible grouping • Applicable career options are discussed as they arise throughout the science program. • Peer tutoring • Collaborative learning	• Students may be provided with note organizers / study guides to reinforce key topics • Extended time on assessments when needed • Preferred seating to be determined by student and teacher • Provide modified assessments when necessary • Establish a non-verbal cue to redirect student when not on task • Maintain strong teacher / parent communication • Guided reading • Flexible grouping • Applicable career options are discussed as they arise throughout the science program. • Peer tutoring • Collaborative learning • Teacher modeling academic tasks and behaviors • Thesaurus/ word bank **Gifted and Talented Students:** • Complete Baby Dragon activity and construct a 3-D model of baby dragon.

	• Students: Modifications in accordance with individual students' 504 plans and IEPs • Students may be provided with note organizers / study guides to reinforce key topics • Extended time on assessments when needed • Preferred seating to be determined by student and teacher • Provide modified assessments when necessary • Establish a non-verbal cue to redirect student when not on task • Maintain strong teacher / parent communication • Guided reading • Flexible grouping • Applicable career options are discussed as they arise throughout the science program. • Peer tutoring • Collaborative learning • Teacher modeling academic tasks and behaviors • Thesaurus/ word bank **Gifted and Talented Students:** • Design and create 3D models of plant and animal cells. Include labels and	• Teacher modeling academic tasks and behaviors • Thesaurus/ word bank **Gifted and Talented Students:** • Research and organize into a presentation on specified diseases of the organ system. • Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits • Use higher level questioning techniques in class and on applicable assessment pieces • fast pacing • level of challenge (including differentiation of content) • opportunities for self-direction • strategic grouping **At Risk:**	• Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits • Use higher level questioning techniques in class and on applicable assessment pieces • fast pacing • level of challenge (including differentiation of content) • opportunities for self-direction • strategic grouping **At Risk:** • Predicting genotype and phenotype probabilities activity. • Materials that allow a different mode of input • Materials that allow a different mode of output • Materials that reduce the level of abstraction of information • Use of school support systems including role models and mentors

	functions of organelles and structures. ● Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits ● Use higher level questioning techniques in class and on applicable assessment pieces ● fast pacing ● level of challenge (including differentiation of content) ● opportunities for self-direction ● strategic grouping **At Risk:** ● Color and label plant and animal cell pictures. ● Materials that allow a different mode of input ● Materials that allow a different mode of output ● Materials that reduce the level of abstraction of information ● Use of school support systems including role	● Draw and label organ systems and associated organs. ● Materials that allow a different mode of input ● Materials that allow a different mode of output ● Materials that reduce the level of abstraction of information ● Use of school support systems including role models and mentors of similar racial or ethnic backgrounds ● Using project-based science learning as a form of connected science ● Community involvement and social activism ● Multiple representation and multimodal experiences ● Tiered interventions following RtI framework ● Rtl Intervention Bank ● Use additional practice ● Structured after-school opportunities ● Family outreach ● Life skills training ● Safe learning environment ● Individualized academic support	of similar racial or ethnic backgrounds ● Using project-based science learning as a form of connected science ● Community involvement and social activism ● Multiple representation and multimodal experiences ● Tiered interventions following RtI framework ● Rtl Intervention Bank ● Use additional practice ● Structured after-school opportunities ● Family outreach ● Life skills training ● Safe learning environment ● Individualized academic support

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***WHERETO**

W = Help the students know **WHERE** the unit is going and **WHAT** is expected. Help the teacher know **WHERE** the students are coming from (prior knowledge, interests).

H = **HOOK** all students and **HOLD** their interest.

E = **EQUIP** students, help them **EXPERIENCE** the key ideas and **EXPLORE** the issue.

R = Provide opportunities to **RETHINK** and **REVISE** their understanding and work.

E *= Allow students to* ***EVALUATE*** *their work and its implications.*

T *=* ***TAILORED*** *to the different needs, interests, and abilities of learners.*

O *=* ***ORGANIZE*** *to maximize initial and sustained engagement as well as effective learning.*

UNIT #: *Unit Title* Number of Days	**Unit 7:** *Organization for Matter and Energy Flow in Organisms* 15 days	**Unit 8:** *Earth Systems* 30 days	
STAGE 1: DESIRED RESULTS **What will students understand as a result of the unit? What are the BIG ideas?**			
ESTABLISHED GOALS: *(NJSLS-Science)*	**Life Science** MS-LS1-6 MS-LS1-7 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1 **Career Readiness, Life Literacies, and Key Skills** 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4	**Earth and Space Science** MS-ESS1-4 MS-ESS2-1 MS-ESS2-2 MS-ESS2-3 MS-ESS3-5 **Engineering** MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 **Technology** 8.1.8.D.5 8.1.8.E.1 8.2.8.E.1 **Career Readiness, Life Literacies, and Key Skills**	

	9.4.8.IML.7 9.4.8.IML.9	9.4.8.CI.1 9.4.8.CI.4 9.4.8.DC.2 9.4.8.GCA.1 9.4.8.GCA.2 9.4.8.IML.3 9.4.8.IML.4 9.4.8.IML.7 9.4.8.IML.8	
ENDURING UNDERSTANDINGS: (Students will understand that . . .)	Plants, algae (including phytoplankton), and many microorganisms use 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) The chemical reactions by which plants produce complex food molecules (sugars) requires energy input (i.e., from sunlight) to occur. In this reaction carbon dioxide and water combine to form carbon-based	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) 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)	

	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. (MS-LS1-7)	· Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) · The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5) · Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) · Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) · Water's movements—both on the land and underground—cause weathering and erosion, which change the	

		land's surface features and create underground formations. (MS-ESS2-2)	
ESSENTIAL QUESTIONS: (What provocative questions will foster inquiry, understanding, and transfer of learning?)	• What is photosynthesis? • Why is photosynthesis important to all living things? • Where is the energy needed to perform photosynthesis created? • In what organisms does photosynthesis occur? In what cell structures does photosynthesis occur? • What is cellular respiration? • What materials are needed to perform photosynthesis? Cellular Respiration? • What materials are produced by photosynthesis? Cellular Respiration? • In what organisms does respiration occur? In what cell structures does respiration occur? • What is the relationship between Photosynthesis and Cellular Respiration?	• What materials make up our Earth? • How can rocks and fossils help us make a chronology of Earth's history? • What is the water cycle? • How is water recycled? • What effect does sunlight and gravity have on the water cycle? • What causes the ocean currents and tides? • How does water contribute to weathering and erosion? • Have the Earth's continents always looked the way they do today? • What causes Earth's continents to move? • In what ways do Earth's plates interact? What happens at these plate boundaries? • What causes earthquakes, tsunamis and volcanoes? • If climate has changed throughout the earth's history, why is there so much	

		concern about climate change today? ● What factors are responsible for climate change? ● Why do most scientists think that Earth's climate is changing as the result of human activity?	
STAGE 2: ASSESSMENT EVIDENCE **What evidence will be collected to determine whether or not the understandings have been developed, the knowledge and skills attained, and the state standards met? [Anchor the work in performance tasks that involve application, supplemented as needed by prompted work, quizzes, observations, etc.]**			
PERFORMANCE TASKS: (Through what authentic performance tasks will students demonstrate the desired understandings?) (By what criteria will performances of understanding be judged?)	● 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 ● Develop and use a model to describe how food is	● 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	

	rearranged through chemical reactions.	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.	
OTHER EVIDENCE: (Through what other evidence (e.g. quizzes, tests, academic prompts, observations, homework, journals) will students demonstrate achievement of the desired results?) (How will students self-assess their learning?)	• Quiz 1: Photosynthesis • Lab 1: Investigating Photosynthesis Inquiry Lab • Lab 2: Set Sail for the Island of Photosynthesis • Activity 1: Cellular Respiration Molecular Model Activity • Project 1: Photosynthesis and Cellular Respiration Project • Quiz 2: Cellular Respiration • Unit Test	• Quiz 1: Layers of the Earth/Rock Cycle • Lab 1: Fossil Layers Activity • Lab 2: Cookie Excavation • Lab 3: Vertebrate Fossil Webquest • Lab 4: Radiometric Dating Webquest • Unit Test • Activity 1: Changing Water • Quiz 1: Water Cycle • Activity 2: It's All Connected – Global Circulation • Quiz 2: Forces of the Water Cycle / Global Currents • Activity 3: Erosion and Weathering • Quiz 4: Weathering and Erosion • Unit Test • Quiz 1 : Pangaea – Energy Flow • Lab: Plate Tectonics • Activity: Tabletop	

		Earthquake ● Activity: Tabletop Tsunami ● Activity: Tabletop Volcano ● Unit Test	
RESOURCES:	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Plant Growth and Gas Exchange Unit: This model unit from Michigan State University includes 11 lessons that guide students through the process of collecting evidence and developing explanations of where the dry matter of plants comes from and of the roles of photosynthesis and respiration in the carbon cycle. Along with the focus on building explanations of these core ideas, the unit explicitly integrates the crosscutting concepts of matter and energy and scale, proportion, and quantity. This unit is built around the question of how small seeds grow into large plants, and the core activities of the unit guide students in tracing the mass changes that occur as seeds germinate and grow. These core activities are supported through a carefully planned sequence of	• STEMscopes • Generation Genius • Mosa Mack • Chromebooks • Rock Cycle Journey: This is an activity out of one of the DLESE Teaching boxes. The Teaching Box is titled Mountain Building. This activity is from Lesson 4 Activity #2 called Rock Cycle Journey. Stations are set up to represent different parts of the rock cycle. There is a die at each station. Students begin at one point and roll the die. The students record on their data sheet what happens to them (the rock). The student may end up staying where they are at or going to another station. Students continue individually through a set number of rolls of the dice. Students then look at their data and answer some questions. At the very end they share their information with others. • Interactives-Dynamic Earth: Dynamic Earth is an interactive website where students can learn	

	learning and assessment activities that follow a research-based learning progression to support the development of student understanding.	about the structure of the Earth, the movements of its tectonic plates, as well as the forces that create mountains, valleys, volcanoes and earthquakes. This site consists of four sections with both embedded assessments to check progress and a final summative assessment. Each section explores one aspect of the earth's structure and the movement of its tectonic plates. The instructions are simple and are located on each screen. Students will view animations, read explanations, and use their mouse to drag and drop the earth's continents into the correct places, highlight features on a map and cause earth's tectonic plates to move. At various points, students will check their knowledge by taking a quick quiz or playing a game to see how much they have learned about the Dynamic Earth. This website does have teacher information tabs located as related resources.	

STAGE 3: LEARNING PLAN

What learning experiences and instruction will enable students to achieve the desired results? Utilize the WHERETO* acronym to consider key design elements.

SKILLS AND TOPICS: (What specific activities will students do and what skills will students know as a result of the unit?)	By the end of this unit, students will know: ● Photosynthesis uses carbon dioxide and water to store the energy of water in plants. It creates glucose and releases oxygen as a waste product. ● Photosynthesis gets its energy from the sun and occurs in the chloroplast of plants. ● Cellular respiration is the opposite of Photosynthesis. It releases the energy stored in glucose by combining it with oxygen to give off energy and releases carbon dioxide and water as waste products. This occurs in the mitochondria. ● These two cycles are a system that helps keep many organisms on Earth alive.	● The layers of the Earth ● The 3 types of rocks ● The job of paleontologists ● How we can determine the age of objects found within the Earth ● Stages of the water cycle, including relevant vocabulary. ● What causes global movement of water. ● How differences in temperature and salinity form a global pattern of currents. ● How weathering and erosion caused by water's movement change the land's features. ● Earth's continents were once all connected in one supercontinent ● Earth's plates continue to move still today as a result of convection currents in the mantle ● Earth's plates meet at convergent, divergent and transform boundaries ● Convergent boundaries create mountain ranges ● Divergent boundaries cause seafloor spreading ● Transform boundaries can result in earthquakes ● Tsunamis are caused by underwater earthquakes	

		• Volcanoes can form at both convergent and divergent plate boundaries	
CROSS-CURRICULAR / DIFFERENTIATION: *(What cross-curricular (e.g. writing, literacy, math, science, history, career readiness, life literacies, key skills, technology) learning activities are included in this unit that will help achieve the desired results?)* *(What type of differentiated instruction will be used for Sp.Ed./504, ELL, G&T, At-Risk students?)*	**<u>Cross-Curricular:</u>** **English Language Arts** (RST.6-8.1-10, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) • 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. • 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 opinion. • 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. • 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.	**<u>Cross-Curricular:</u>** **English Language Arts** (RST.6-8.1-10, WHST.6-8.7, WHST.6-8.8, WHST.6-8.9, SL.7.5) • 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. • 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. • Cite specific textual evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales to support analysis of science and technical texts. • 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	

	• 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. **Mathematics** (MP.2, MP.4, 6.EE.C.9) 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. **Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution elements when creating media products ● Awareness of and	selection, organization, and analysis of relevant content. • 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. • Cite specific textual evidence of past plate motion to support analysis of science texts. • Integrate quantitative or technical information about evidence of past plate motions expressed in words in a text with a version of that information expressed in a flowchart, diagram, model, graph, or table. • 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. **Mathematics** (MP.2, MP.4, 7.EE.B.4, 7.EE.B.6, 6.EE.B.6) • 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	

	appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● Distinguish between ethical and unethical uses of information and media **Differentiation** ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.	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. • Use variables to represent quantities in a real-world or mathematical problem when solving problems while constructing explanations 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. • Reason abstractly and quantitatively when analyzing evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. • Use variables to represent numbers and write expressions when solving a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set. • Use variables to represent quantities in a real-world or	

	● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue.	mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales, and construct simple equations and inequalities to solve problems by reasoning about the quantities. • Use numbers, symbols, and words while analyzing and interpreting data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions. • Use variables to represent numerical data and write expressions when solving problems involved in the analysis of data about past plate motions. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set. Use variables to represent quantities when analyzing data about past plate motions and construct simple equations and inequalities to solve problems by reasoning about the quantities. **Career Readiness, Life Literacies, and Key Skills:** ● Explore the role of creativity and innovation in career pathways and industries. ● Provide appropriate citation and attribution	

	● Provide ELL students with multiple literacy strategies. ● Collaborate with after-school programs or clubs to extend learning opportunities. ● Restructure lesson using UDL principles **English Language Learners:** ● Write equations for photosynthesis and cellular respiration. Include pictures or words to clarify. ● Students may use a bilingual dictionary (or online translation tool). ● Read aloud written instructions ● Provide modified assessments when necessary. ● Make home/culture connections ● Place student next to same-language speaker, if possible ● Provide text to speech ● Provide graphic organizers ● Thesaurus/ word bank **Special Education/504**: ● Students will create a visual representation of photosynthesis (poster, slideshow, video)	elements when creating media products ● Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction. ● Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose. ● Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping. ● Ask insightful questions to organize different types of data and create meaningful visualizations. ● Distinguish between ethical and unethical uses of information and media ● Ask questions to clarify evidence of factors that have caused climate change over the past century.	

	• Students: Modifications in accordance with individual students' 504 plans and IEPs • Students may be provided with note organizers / study guides to reinforce key topics • Extended time on assessments when needed • Preferred seating to be determined by student and teacher • Provide modified assessments when necessary • Establish a non-verbal cue to redirect student when not on task • Maintain strong teacher / parent communication • Guided reading • Flexible grouping • Applicable career options are discussed as they arise throughout the science program. • Peer tutoring • Collaborative learning • Teacher modeling academic tasks and behaviors • Thesaurus/ word bank **Gifted and Talented Students** • Design a demonstration that will exhibit both photosynthesis and cellular respiration.	• Sources of information are evaluated for accuracy and relevance when considering the use of information. **Differentiation** • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies). • Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).	

	• Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits • Use higher level questioning techniques in class and on applicable assessment pieces • fast pacing • level of challenge (including differentiation of content) • opportunities for self-direction • strategic grouping **At Risk:** • Generate flashcards of the photosynthetic process • Materials that allow a different mode of input • Materials that allow a different mode of output • Materials that reduce the level of abstraction of information • Use of school support systems including role models and mentors of	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. • Use project-based science learning to connect science with observable phenomena. • Structure the learning around explaining or solving a social or community-based issue. • Provide ELL students with multiple literacy strategies. • Collaborate with after-school programs or clubs to extend learning opportunities. • Restructure lesson using UDL principles **English Language Learners:** • Create a visual representation of the different strata of rock over a specified geological time period. • Students may use a bilingual dictionary (or online translation tool). • Read aloud written instructions • Provide modified assessments when necessary. • Make home/culture connections	

	similar racial or ethnic backgrounds ● Using project-based science learning as a form of connected science ● Community involvement and social activism ● Multiple representation and multimodal experiences ● Tiered interventions following RtI framework ● Rtl Intervention Bank ● Use additional practice ● Structured after-school opportunities ● Family outreach ● Life skills training ● Safe learning environment ● Individualized academic support	● Place student next to same-language speaker, if possible ● Provide text to speech ● Provide graphic organizers ● Thesaurus/ word bank **Special Education/504**: ● Generate flip-books for each of the three types of rocks, showing rock formation. ● Students: Modifications in accordance with individual students' 504 plans and IEPs ● Students may be provided with note organizers / study guides to reinforce key topics ● Extended time on assessments when needed ● Preferred seating to be determined by student and teacher ● Provide modified assessments when necessary ● Establish a non-verbal cue to redirect student when not on task ● Maintain strong teacher / parent communication ● Guided reading ● Flexible grouping ● Applicable career options are discussed as they arise throughout the science program. ● Peer tutoring	

		• Collaborative learning • Teacher modeling academic tasks and behaviors • Thesaurus/ word bank **Gifted and Talented Students:** • Construct a working model of the effects of earthquakes creating tsunamis. • Students will be afforded the opportunity to locate current events, beyond the scope discussed in class, that are relevant to the class lessons in order to peer teach and share. All students will be provided a choice of enrichment activities to expand upon the curriculum, where time permits • Use higher level questioning techniques in class and on applicable assessment pieces • fast pacing • level of challenge (including differentiation of content) • opportunities for self-direction • strategic grouping **At Risk:** • Diagram how geological plates were once connected	

		and outline their movements throughout time. ● Materials that allow a different mode of input ● Materials that allow a different mode of output ● Materials that reduce the level of abstraction of information ● Use of school support systems including role models and mentors of similar racial or ethnic backgrounds ● Using project-based science learning as a form of connected science ● Community involvement and social activism ● Multiple representation and multimodal experiences ● Tiered interventions following RtI framework ● Rtl Intervention Bank ● Use additional practice ● Structured after-school opportunities ● Family outreach ● Life skills training ● Safe learning environment ● Individualized academic support	

***WHERETO**

W = Help the students know **WHERE** the unit is going and **WHAT** is expected. Help the teacher know **WHERE** the students are coming from (prior knowledge, interests).

H = **HOOK** all students and **HOLD** their interest.

E = **EQUIP** students, help them **EXPERIENCE** the key ideas and **EXPLORE** the issue.

R = Provide opportunities to **RETHINK** and **REVISE** their understanding and work.

***E** = Allow students to **EVALUATE** their work and its implications.*

***T** = **TAILORED** to the different needs, interests, and abilities of learners.*

***O** = **ORGANIZE** to maximize initial and sustained engagement as well as effective learning.*