ELMWOOD PARK PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

SCIENCE

Grade 4

ABSTRACT

The goal of this full-year *Science* course is for students to apply their problem-solving, communication, and reasoning skills in an increasingly diverse set of situations as they develop a better understanding of the connections between science and other disciplines and the real world. In Grade 4, instructional time will be divided among topics in four main sciences: (1) life science, including molecules to organisms and structures of organisms; (2) physical science, including force and motion, energy, waves, and applications; (3) Earth and space science, including Earth's place in the universe, fossils, weathering, and climate; (4) engineering and technology science, including engineering and design. This hands-on course will include interdisciplinary activities that connect science to English literacy, math, music, art, technology, and careers necessary for the 21st century.

The following crosscutting concepts serve as organizing concepts for the disciplinary core ideas above: patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world. Students will develop proficiency in each of the following scientific practices: asking questions; developing and using models; planning and carrying out investigations; analyzing and interpreting data; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information.

UNIT #: *Unit Title* Number of Days	**Unit 1:** *Earth Systems:* *Weathering and Erosion* 13 days	**Unit 2:** *History of Planet Earth and Earth Processes:* *Rocks, Earthquakes, and Volcanoes* *14 days*	**Unit 3:** *Transfer of Energy:* *Force and Motion* 15 days
STAGE 1: DESIRED RESULTS ***What will students understand as a result of the unit? What are the BIG ideas?***			
ESTABLISHED GOALS: *(NJSLS-Science)*	**Earth and Space Science** 4-ESS1-1 4-ESS2-1 **Engineering** 3-5-ETS1-1 3-5-ETS1-2 **Computer Science and Design Thinking** 8.1.5.NI.2 8.1.5.IC.2 8.2.5.ED.3 **Career Readiness, Life Literacies, and Key Skills** 9.1.5.EG.1 9.1.5.EG.2 9.1.5.EG.3 9.1.5.EG.4 9.1.5.EG.5 9.1.5.PB.1 9.1.5.PB.2 9.2.5.CAP.1 9.2.5.CAP.8	**Earth and Space Science** 4-ESS2-2 4-ESS3-2 **Engineering** 3-5-ETS1-2 3-5-ETS1-3 **Computer Science and Design Thinking** 8.1.5.NI.2 8.1.5.IC.2 8.2.5.ED.3 **Career Readiness, Life Literacies, and Key Skills** 9.1.5.CR.1 9.1.5.EG.1 9.1.5.EG.2 9.1.5.EG.3 9.1.5.EG.4 9.1.5.RMI.1 9.1.5.RMI.2 9.1.5.PB.1 9.1.5.PB.2	**Physical Science** 4-PS3-1 4-PS3-2 4-PS3-3 4-PS3-4 **Earth and Space Science** 4-ESS3-1 **Engineering** 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3 **Computer Science and Design Thinking** 8.1.5.NI.2 8.1.5.IC.2 8.2.5.ED.3 **Career Readiness, Life Literacies, and Key Skills** 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CT.1

	9.2.5.CAP.9 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CI.1 9.4.5.CI.2 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CT.1 9.4.5.CT.2 9.4.5.CT.3 9.4.5.CT.4 9.4.5.DC.1 9.4.5.DC.2 9.4.5.DC.3 9.4.5.DC.4 9.4.5.DC.5 9.4.5.DC.6 9.4.5.DC.7 9.4.5.DC.8 9.4.5.IML.1 9.4.5.IML.2 9.4.5.IML.3 9.4.5.IML.4 9.4.5.IML.5 9.4.5.IML.6 9.4.5.IML.7 9.4.5.TL.1 9.4.5.TL.2 9.4.5.TL.3	9.2.5.CAP.1 9.2.5.CAP.2 9.2.5.CAP.3 9.2.5.CAP.4 9.2.5.CAP.5 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CT.1 9.4.5.CT.2 9.4.5.CT.3 9.4.5.CT.4 9.4.5.DC.1 9.4.5.DC.2 9.4.5.DC.3 9.4.5.DC.4 9.4.5.DC.5 9.4.5.DC.6 9.4.5.DC.7 9.4.5.TL.4 9.4.5.TL.5 9.4.5.IML.1 9.4.5.IML.2 9.4.5.IML.3 9.4.5.IML.4 9.4.5.IML.5 9.4.5.IML.6 9.4.5.IML.7	9.4.5.CT.2 9.4.5.CT.3 9.4.5.CT.4 9.4.5.DC.1 9.4.5.DC.2 9.4.5.DC.3 9.4.5.DC.4 9.4.5.DC.5 9.4.5.DC.6 9.4.5.DC.7 9.4.5.IML.1 9.4.5.IML.2 9.4.5.IML.3 9.4.5.IML.4 9.4.5.IML.5 9.4.5.IML.6 9.4.5.IML.7
ENDURING UNDERSTANDINGS: *(Students will understand that . . .)*	• Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. • Living things affect the physical characteristics of their regions.	• Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. • The locations of mountain ranges,	• The faster a given object is moving, the more energy it possesses. • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. • Energy is present whenever there

		deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth.	are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. ● Light also transfers energy from place to place. ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the electrical energy. ● When objects collide, the contact forces transfer energy so as to change the object's motions.
ESSENTIAL QUESTIONS: *(What provocative questions will foster inquiry, understanding, and transfer of learning?)*	● What is mechanical and chemical weathering and how does it affect the environment? ● What is erosion and how does it affect the environment? ● How do living things affect their environments? ● How does rainfall affect the environment?	● What can rock formations teach about the history of Earth? ● How can fossils help determine the age of rocks and rock layers? ● What are tectonic plates? ● What causes many of Earth's surface features and where do these features tend to exist?	● What is energy? ● What is the difference between kinetic and potential energy? ● When do objects have more or less energy? ● What are the various forms of energy? ● How does energy shift between kinetic and potential? ● How does energy transfer among the various forms of energy? ● How does a collision transfer energy or force? ● What is the law of conservation of energy? ● What is force and how does it relate to energy? ● What is direct and indirect force?

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?)*	• Students will make sense of problems and persevere in solving them. • Students will attend to precision. • Students will look for and make use of structure. • Students will construct viable arguments and critique the reasoning of others. • Students will use appropriate tools strategically. • Students will create a model of ice weathering a rock and relate it to weathering in nature. • Students will create a model of water weathering a rock and relate it to weathering in nature. • Students will create a model of erosion and relate it to erosion in nature. • Students will create a model of weathering and erosion and relate it to weathering and erosion in nature. • Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root	• Students will make sense of problems and persevere in solving them. • Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others. • Students will attend to precision. • Students will look for and make use of structure. • Students will construct viable arguments and critique the reasoning of others. • Students will use appropriate tools strategically. • Students will identify rock layers in a sedimentary rock model and use this information to determine the step-by-step process of rock formation. • Students will determine what the youngest and oldest layer of a rock	• Students will make sense of problems and persevere in solving them. • Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others. • Students will attend to precision. • Students will look for and make use of structure. • Students will construct viable arguments and critique the reasoning of others. • Students will use appropriate tools strategically. • Students will observe how energy can be transferred among its various forms and explain what is happening using scientific vocabulary. • Students will develop a model to

	cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.	is based on the Law of Superposition.	represent the flow of energy.
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?)*	• Laboratory Activities • Classwork • Learning Centers • Class Discussions • Group Discussions • Presentations • Student Participation • Teacher Observation (formal/informal) • Exploratory Activities • Quizzes • Homework • Tests • Web-based Assessments • Peer and Self Evaluation • Projects • Rubrics • Laboratory Reports	• Laboratory Activities • Classwork • Learning Centers • Class Discussions • Group Discussions • Presentations • Student Participation • Teacher Observation (formal/informal) • Exploratory Activities • Quizzes • Homework • Tests • Web-based Assessments • Peer and Self Evaluation • Projects • Rubrics • Laboratory Reports • Benchmark Assessment	• Laboratory Activities • Classwork • Learning Centers • Class Discussions • Group Discussions • Presentations • Student Participation • Teacher Observation (formal/informal) • Exploratory Activities • Quizzes • Homework • Tests • Web-based Assessments • Peer and Self Evaluation • Projects • Rubrics • Laboratory Reports
RESOURCES:	• Teacher-made Materials • Student Workbook • Digital Textbook • Support Videos • Digital Personal Trainer(s) • Assessment Resources for Text Series • Tiered Worksheets • Web Based Resources: • Generation Genius • EdPuzzle • BrainPOP Jr. • Learner.org	• Teacher-made Materials • Student Workbook • Digital Textbook • Support Videos • Digital Personal Trainer(s) • Assessment Resources for Text Series • Tiered Worksheets • Web Based Resources: • Generation Genius • EdPuzzle • BrainPOP Jr. • Learner.org	• Teacher-made Materials • Student Workbook • Digital Textbook • Support Videos • Digital Personal Trainer(s) • Assessment Resources for Text Series • Tiered Worksheets • Web Based Resources: • Generation Genius • EdPuzzle • BrainPOP Jr. • Learner.org

	http://www.njctl.org http://www.nextgenscience.org http://www.standmaps.nsdl.org http://www.pals.sri.com http://www.sciencenetlinks.com http://www.livescience.com http://www.HowStuffWorks.com http://wwww.discovery.com http://www.ScientificAmerican.com https://www.readworks.org	http://www.njctl.org http://www.standmaps.nsdl.org http://www.pals.sri.com http://www.sciencenetlinks.com http://www.livescience.com http://www.HowStuffWorks.com http://wwww.discovery.com http://www.ScientificAmerican.com https://www.readworks.org	http://www.njctl.org http://www.standmaps.nsdl.org http://www.pals.sri.com http://www.sciencenetlinks.com http://www.livescience.com http://www.HowStuffWorks.com http://wwww.discovery.com http://www.ScientificAmerican.com https://www.readworks.org
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?)*	• Identify chemical versus mechanical weathering. • Distinguish weathering and erosion. • Identify the impact of weathering and erosion in the environment around the school.	• Create a model of sedimentary rock for formation. • Create a model of fossils in sedimentary rock layers. • Collaborate to build a model of one type of plate boundary. • Map earthquakes and plate boundary locations and determine the connections between their locations.	• Predict how changes in speed affect an object's energy. • Predict changes in energy that will occur as a result of objects colliding. • Test and refine devices that convert energy from one form to another.
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** (RI.4.1 , RI.4.3, RI.4.4, W.4.4, W.4.7, W.4.8, W.4.9, W.4.10, SL.4.1, SL.4.2, SL.4.4, L.4.1, L.4.2, L.4.3, L.4.6) -To support integration of the ELA standards in this unit, students can read content-specific texts to deepen their understanding of the cause-and-effect relationships within earth systems. As they	**Cross-Curricular:** **English Language Arts** (RI.4.1 , RI.4.3, RI.4.4, W.4.4, W.4.7, W.4.8, W.4.9, W.4.10, SL.4.1, SL.4.2, SL.4.4, L.4.1, L.4.2, L.4.3, L.4.6) To support integration of the ELA standards in this unit, students should have access to multiple sources of information about Earth's features and earth processes. Students should have opportunities to read, analyze, and	**Cross-Curricular:** **English Language Arts** (RI.4.1 , RI.4.3, RI.4.4, RI.4.9, W.4.2, W.4.4, W.4.7, W.4.8, W.4.9, W.4.10, SL.4.1, SL.4.2, SL.4.4, L.4.1, L.4.2, L.4.3, L.4.6) To support integration of the ELA standards in this unit, students will conduct research to build their understanding of energy, transfer of energy, and natural

(What type of differentiated instruction will be used for Sp.Ed./504, ELL, G&T, At-Risk students?)	read, students should take notes, which can be used to help them understand and explain how earth processes affect the world around them. They should ask questions, such as: - What types of soil erode faster? - Why do some rocks weather more easily or more quickly than others? - What patterns of change can be observed using models? As they attempt to answer these questions, students can cite evidence from observations and from texts to support their thinking. **Mathematics** (MP.2, MP.4, MP.5, 4.MD.A.1, 4.MD.A.2) To support integration of the Mathematics standards into this unit, students are expected to use mathematics when analyzing quantitative data to identify patterns, explain cause-and-effect relationships, and make predictions. Students need opportunities to measure earth materials using tools, such as balances and graduated cylinders, and to measure distances and heights using rulers or tape measures. Students should also be required to solve problems involving measurement and data. Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. **<u>Differentiation</u>:** ● Allow students to choose which way to present their findings to the class (poster, written report, slide	interpret information from nonfiction text, charts, graphs, diagrams, timelines, and interactive elements on the Internet. Students use this information, along with data they collect during investigations, to help explain, both orally and in writing, the patterns they observe in the features of the Earth and in the natural hazards that occur on the Earth. **Mathematics** (MP.2, MP.4, MP.5, 4.MD.A.1, 4.MD.A.2, 4.OA.A.1) To support integration of the Mathematics standards into this unit, students should: - Use measurements to determine how far earthquakes and volcanoes tend to occur from continental boundaries. -Analyze data to determine patterns of change that occur in areas where volcanoes erupt, earthquakes occur, and in flood zones. -Reason abstractly and quantitatively to draw diagrams to build scale models. -Analyze timelines, charts, and graphs to determine patterns in Earth's features and patterns of change caused by earth processes. -Reason abstractly and quantitatively when discussing the effects of an earth process on humans. For example, on average, 3,000 lives are lost every year due to tsunamis. When early warning systems are in place, fewer than 1,000 lives are lost annually. -Analyze constraints on materials, time, or cost in order to determine criteria for design solutions. **<u>Differentiation</u>:** ● Provide various levels of informational texts to students ● Centers based upon student level and guidance needed	sources of energy. Students will recall relevant information from in-class investigations and experiences and gather relevant information from print and digital sources. They should take notes and categorize information and provide a list of sources. Students also draw evidence from literary and informational texts in order to analyze and reflect on their findings. **Mathematics** (MP.2, MP.4, MP.5, 4.OA.A.1, 4.OA.A.3) To support the integration of the Mathematics standards into this unit, students will reason abstractly and quantitatively as they gather and analyze data during investigations and while conducting research about transfer of energy and energy sources. Students model with mathematics as they represent and/or solve word problems. As students research the environmental effects of obtaining fossil fuels, they might be asked to represent a verbal statement of multiplicative comparison as a multiplication equation. For example, students might find information about a spill that was 5 million gallons of oil and was 40 times larger than a previous oil spill in the same location. They can be asked to represent this mathematically using an equation to determine the number of gallons of oils that were spilled in the previous event. **<u>Differentiation</u>:** ● Have research notes printed for students to utilize ● Centers based upon student level

	show, etc.). ● Centers based upon student level and guidance needed ● Peer tutoring ● Leveled worksheets such as Enrichment and Reteach Sheets ● Time accommodation ● Modified exams and assignments ● Collaboration with Special Ed. staff ● Tiered reading and writing assignments **<u>Special Education/504</u>:** ● Provide students with Weathering and Erosion Foldable to assist with note taking and understanding. ● Individual Instructional Plans ● Modifications ● Extended Time ● Teach in Smaller Concepts ● Frequent Breaks ● Shortened Assignment ● Preferential Seating ● Hands-On Tasks ● Increase One-to-One Time ● Oral Directions ● Oral Responses ● Heterogeneous Groups ● Use of Manipulatives **<u>ELL</u>:** ● Use of informational texts to explain weathering and erosion at the level of the ELL ● Picture flashcards with domain specific vocabulary words written in English (weathering, erosion, etc.) ● Use of technology to translate written responses from student's	● Peer tutoring ● Leveled worksheets such as Enrichment and Reteach Sheets ● Time accommodation ● Modified exams and assignments ● Collaboration with Special Ed. staff ● Tiered reading and writing assignments **<u>Special Education/504</u>:** ● Create a poster for each type of rock, explaining the qualities of each, and how it is formed. ● Individual Instructional Plans ● Modifications ● Extended Time ● Teach in Smaller Concepts ● Frequent Breaks ● Shortened Assignment ● Preferential Seating ● Hands-On Tasks ● Increase One-to-One Time ● Oral Directions ● Oral Responses ● Heterogeneous Groups ● Use of Manipulatives **<u>ELL</u>:** ● Use of informational texts to explain rocks, and fossils at the level of the ELL ● Picture flashcards with domain specific vocabulary words written in English (sedimentary rock, igneous rock, metamorphic rock, volcano, fossil, etc.) ● Use of technology to translate written responses from student's first language into the English Language ● ELL Activity Guide	and guidance needed ● Peer tutoring ● Leveled worksheets such as Enrichment and Reteach Sheets ● Time accommodation ● Modified exams and assignments ● Collaboration with Special Ed. staff ● Tiered reading and writing assignments **<u>Special Education/504</u>:** ● Use a video, in addition to other resources, to assist in teaching the difference between kinetic and potential energy (e.g. roller coaster video). ● Individual Instructional Plans ● Modifications ● Extended Time ● Teach in Smaller Concepts ● Frequent Breaks ● Shortened Assignment ● Preferential Seating ● Hands-On Tasks ● Increase One-to-One Time ● Oral Directions ● Oral Responses ● Heterogeneous Groups ● Use of Manipulatives **<u>ELL</u>:** ● Use of informational texts to explain energy at the level of the ELL ● Picture flashcards with domain specific vocabulary words written in English (energy, kinetic energy, potential energy, etc.) ● Use of technology to translate written responses from student's

	first language into the English Language • ELL Activity Guide • Strategy groups • Graphic organizers • Repeated directions • Teacher/Peer modeling and conferencing • Strategy groups • School/Home bilingual letter to introduce units on Weathering and Erosion. • Instruction will be based on language proficiency. **<u>Gifted & Talented</u>:** • Create a model (using sand, clay, water, etc.) showing the effects of weathering and erosion. • Advanced centers • Tutor Peers • Enrichment pages and workbook • Advanced Learner's Activity • Projects outside of school • Above Grade Level Problems • Think Smarter/Go Deeper questioning • Higher Order Thinking questioning • Web-Based assignments **<u>At Risk</u>:** • Reading and learning content on weathering and erosion at student's ability level • Extra Help • Remediation • Basic Skills • Tiered Lessons • ReTeach Packets • Multiplication Chart	• Strategy groups • Graphic organizers • Repeated directions • Teacher/Peer modeling and conferencing • Strategy groups • School/Home bilingual letter to introduce units on Types of Rocks, and Fossils. • Instruction will be based on language proficiency. **<u>Gifted & Talented</u>:** • Provide students with a dinosaur fossil and ask them to examine it closely. Then ask students to write a response to explain what they know about this dinosaur based on the fossil it has left behind. • Advanced centers • Tutor Peers • Enrichment pages and workbook • Advanced Learner's Activity • Projects outside of school • Above Grade Level Problems • Think Smarter/Go Deeper questioning • Higher Order Thinking questioning • Web-Based assignments **<u>At Risk</u>:** • Reading and learning content on types of rocks and fossils at student's ability level • Extra Help • Remediation • Basic Skills • Tiered Lessons • ReTeach Packets • Multiplication Chart • Manipulatives	first language into the English Language • ELL Activity Guide • Strategy groups • Graphic organizers • Repeated directions • Teacher/Peer modeling and conferencing • Strategy groups • School/Home bilingual letter to introduce unit on Energy • Instruction will be based on language proficiency. **<u>Gifted & Talented</u>:** • Build a model (e.g. ramp, rollercoaster) to show the differences between kinetic and potential energy. • Advanced centers • Tutor Peers • Enrichment pages and workbook • Advanced Learner's Activity • Projects outside of school • Above Grade Level Problems • Think Smarter/Go Deeper questioning • Higher Order Thinking questioning • Web-Based assignments **<u>At Risk</u>:** • Reading and learning content on energy at student's ability level • Extra Help • Remediation • Basic Skills • Tiered Lessons • ReTeach Packets • Multiplication Chart • Manipulatives

	• Manipulatives • Use of Hands-On Materials • Conferencing	• Use of Hands-On Materials • Conferencing	• Use of Hands-On Materials • Conferencing

***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.

- 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.
- Use project-based science learning to connect science with observable phenomena.

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**: *Waves, Light, and Information* 14 days	**Unit 5**: *Natural Resources* 14 days	**Unit 6**: *Structures and Functions: Molecules to Organisms* 15 days

STAGE 1: DESIRED RESULTS

What will students understand as a result of the unit? What are the BIG ideas?

ESTABLISHED GOALS:	**Physical Science**	**Earth and Space Science**	**Life Science**

(NJSLS-Science)	4-PS4-1 4-PS4-2 4-PS4-3 **Engineering** 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3 **Computer Science and Design Thinking** 8.1.5.NI.2 8.1.5.IC.2 8.2.5.ED.3 **Career Readiness, Life Literacies, and Key Skills** 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CT.1 9.4.5.CT.2 9.4.5.CT.3 9.4.5.CT.4 9.4.5.DC.1 9.4.5.DC.2 9.4.5.DC.3 9.4.5.DC.4 9.4.5.DC.5 9.4.5.DC.6 9.4.5.DC.7 9.4.5.IML.1 9.4.5.IML.2 9.4.5.IML.3 9.4.5.IML.4 9.4.5.IML.5 9.4.5.IML.6 9.4.5.IML.7	4-ESS3-1 4-ESS3-2 **Engineering** 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3 **Computer Science and Design Thinking** 8.1.5.NI.2 8.1.5.IC.2 8.2.5.ED.3 **Career Readiness, Life Literacies, and Key Skills** 9.1.5.CR.1 9.1.5.CP.1 9.1.5.EG.1 9.1.5.EG.2 9.1.5.EG.3 9.1.5.EG.4 9.1.5.FI.1 9.1.5.FP.1 9.1.5.FP.2 9.1.5.FP.3 9.1.5.FP.4 9.1.5.FP.5 9.4.5.CI.1 9.4.5.CI.2 9.2.5.CAP.6 9.2.5.CAP.7 9.2.5.CAP.8 9.2.5.CAP.9 9.4.5.CI.1 9.4.5.CI.2 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CT.1 9.4.5.CT.2 9.4.5.CT.3	4-LS1-1 4-LS1-2 **Computer Science and Design Thinking** 8.1.5.NI.2 8.1.5.IC.2 8.2.5.ED.3 **Career Readiness, Life Literacies, and Key Skills** 9.2.5.CAP.1 9.2.5.CAP.2 9.2.5.CAP.3 9.2.5.CAP.4 9.2.5.CAP.5 9.4.5.CI.1 9.4.5.CI.2 9.4.5.CI.3 9.4.5.CI.4 9.4.5.CT.1 9.4.5.CT.2 9.4.5.CT.3 9.4.5.CT.4 9.4.5.DC.1 9.4.5.DC.2 9.4.5.DC.3 9.4.5.DC.4 9.4.5.DC.5 9.4.5.DC.6 9.4.5.DC.7 9.4.5.DC.8 9.4.5.GCA.1 9.4.5.IML.1 9.4.5.IML.2 9.4.5.IML.3 9.4.5.IML.4 9.4.5.IML.5 9.4.5.IML.6 9.4.5.IML.7

		9.4.5.CT.4 9.4.5.DC.1 9.4.5.DC.2 9.4.5.DC.3 9.4.5.DC.4 9.4.5.DC.5 9.4.5.DC.6 9.4.5.DC.7 9.4.5.DC.8 9.4.5.GCA.1 9.4.5.IML.1 9.4.5.IML.2 9.4.5.IML.3 9.4.5.IML.4 9.4.5.IML.5 9.4.5.IML.6 9.4.5.IML.7	
ENDURING UNDERSTANDINGS: *(Students will understand that . . .)*	• Waves are regular patterns of motion caused by a disturbance. • In longitudinal waves, particles move in the same or opposite direction of the wave. • In transverse waves, particles move up or down as the wave moves right or left. • In order for us to see, light must reflect off of objects. • We see colors when they are reflected and other colors are absorbed. When we see white, we are seeing all the colors reflected. When we see black, all the colors are absorbed. • A plane mirror reflects light at the same angle it hits it and reflects an object the same distance away as it is from the mirror. • Light bends as it passes from one material to another. • Computers communicate using	• Humans use energy and fuels derived from natural sources. • Producing energy refers to converting energy from one form to another so that it can be used for practical purposes. • Devices must be designed, tested, and refined in order to convert energy. • Renewable energy is energy that comes from a source that replenishes quickly and will not be used up before more is created. • Non-renewable energy is energy that comes from a source that is very slow to replenish and can be used up. • Human energy use has many impacts on the environment.	• The core 4 functions of organisms: growth, survival, behavior and reproduction. • Examples of how plant and animal structures, both internally and externally, function to fulfill life processes. • The difference between instincts and behavior with examples. • How senses benefit animals in respect to how they respond to their environment.

	Binary, converting information into a list of 1's and 0's that relay information.		
ESSENTIAL QUESTIONS: *(What provocative questions will foster inquiry, understanding, and transfer of learning?)*	• What are waves and what are they caused by? • What words do scientists use to describe waves? • What are longitudinal waves and what causes them? • What are transverse waves and what causes them? • How are longitudinal and transverse waves different? • How does light allow us to see? • Why do we see colors? • How do plane mirrors reflect light and objects? • How is light refracted? • How do modern ways of communication utilize patterns to transfer information?	• Where do humans derive energy from? • What does it mean to produce energy? • How can energy be converted from one form to another? • What is renewable energy? • What is non-renewable energy? • How does human energy use impact the environment? • What are some examples of renewable energy sources/technologies that could reduce human impact on the climate? How would each reduce climate change impacts?	• How does an organism's structure fit its function? • How do internal and external structures function to support the survival of plants and animals? • How are instincts and learned behaviors beneficial to organisms? • How do senses function to help an animal's survival? • How are signals sent from receptors to the brain?
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?)*	• Students will make sense of problems and persevere in solving them. • Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They	• Students will make sense of problems and persevere in solving them. • Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.	• Students will make sense of problems and persevere in solving them. • Students readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem.

	are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others. ● Students will attend to precision. ● Students will look for and make use of structure. ● Students will construct viable arguments and critique the reasoning of others. ● Students will use appropriate tools strategically. ● Students will create a simple device to transfer sound waves and explain why it can do so. ● Students will relate amplitude and wavelength to volume and pitch. ● Students will model changes in amplitude and wavelength on a one-string guitar.	They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others. ● Students will attend to precision. ● Students will look for and make use of structure. ● Students will construct viable arguments and critique the reasoning of others. ● Students will use appropriate tools strategically. ● Students will design and build a simple device that converts energy from one form to another. ● Students will define a simple engineering problem related to constraints due to materials, cost, or time.	They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others. ● Students will attend to precision. ● Students will look for and make use of structure. ● Students will construct viable arguments and critique the reasoning of others. ● Students will use appropriate tools strategically. ● Students will use a model to describe how animals receive different types of information through their senses, process the information in their brains, and respond to the information in different ways.
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*	● Laboratory Activities ● Classwork ● Learning Centers ● Class Discussions ● Group Discussions ● Presentations ● Student Participation ● Teacher Observation (formal/informal)	● Laboratory Activities ● Classwork ● Learning Centers ● Class Discussions ● Group Discussions ● Presentations ● Student Participation ● Teacher Observation (formal/informal)	● Laboratory Activities ● Classwork ● Learning Centers ● Class Discussions ● Group Discussions ● Presentations ● Student Participation ● Teacher Observation (formal/informal)

learning?)	• Exploratory Activities • Quizzes • Homework • Tests • Web-based Assessments • Peer and Self Evaluation • Projects • Rubrics • Laboratory Reports • Benchmark Assessment	• Exploratory Activities • Quizzes • Homework • Tests • Web-based Assessments • Peer and Self Evaluation • Projects • Rubrics • Laboratory Reports	• Exploratory Activities • Quizzes • Homework • Tests • Web-based Assessments • Peer and Self Evaluation • Projects • Rubrics • Laboratory Reports • Benchmark Assessment
RESOURCES:	• Teacher-made Materials • Student Workbook • Digital Textbook • Support Videos • Digital Personal Trainer(s) • Assessment Resources for Text Series • Tiered Worksheets • Web Based Resources: • Generation Genius • EdPuzzle • BrainPOP Jr. • Learner.org http://www.njctl.org http://www.nextgenscience.org http://www.standmaps.nsdl.org http://www.pals.sri.com http://www.sciencenetlinks.com http://www.livescience.com http://www.HowStuffWorks.com http://wwww.discovery.com http://www.ScientificAmerican.com https://www.readworks.org	• Teacher-made Materials • Student Workbook • Digital Textbook • Support Videos • Digital Personal Trainer(s) • Assessment Resources for Text Series • Tiered Worksheets • Web Based Resources: • Generation Genius • EdPuzzle • BrainPOP Jr. • Learner.org http://www.njctl.org http://www.nextgenscience.org http://www.learner.org http://www.standmaps.nsdl.org http://www.pals.sri.com http://www.sciencenetlinks.com http://www.livescience.com http://www.HowStuffWorks.com http://wwww.discovery.com http://www.ScientificAmerican.com https://www.readworks.org	• Teacher-made Materials • Student Workbook • Digital Textbook • Support Videos • Digital Personal Trainer(s) • Assessment Resources for Text Series • Tiered Worksheets • Web Based Resources: • Generation Genius • EdPuzzle • BrainPOP Jr. • Learner.org http://www.njctl.org http://www.nextgenscience.org http://www.learner.org http://www.standmaps.nsdl.org http://www.pals.sri.com http://www.sciencenetlinks.com http://www.livescience.com http://www.HowStuffWorks.com http://wwww.discovery.com http://www.ScientificAmerican.com https://www.readworks.org

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?)*	• Create a wave and explain how to manipulate various characteristics of the wave (like amplitude or wavelength) • Explain how mirrors reflect objects and light. • Use patterns to create a code to transfer information. • Decode a set of digitized information.	• Build a device that converts energy from one form to another by following instructions. • Explain one energy type in depth, including where the energy is found, what it is used for, and how it impacts the environment. • Analyze a combination of information they have collected about one type of energy.	• Analyze a plant or animal, and explain how the internal and external features support their survival. • Model how senses are used in respect to the brain in order to respond to their environment effectively.
CROSS-CURRICULAR / DIFFERENTIATION: *(What cross-curricular (e.g. writing, literacy, math, science, history, career readiness, life literacies, key skills, and 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** (RI.4.1 , RI.4.3, RI.4.4, W.4.4, W.4.7, W.4.8, W.4.9, W.4.10, SL.4.1, SL.4.2, SL.4.4, SL.4.5, L.4.1, L.4.2, L.4.3, L.4.6) To support integration of ELA standards into this unit, students conduct short research projects, using both print and digital sources, to build their understanding of wave properties and of the use of waves to communicate over a distance. Students should take notes, categorize information collected, and document a list of the sources used. **Visual Arts** (1.5.5.Cr1a) Using the information they collect during research, as well as information from their experiences with waves, sound, and light, students integrate the information and use	**<u>Cross-Curricular</u>** **English Language Arts** (RI.4.1 , RI.4.3, RI.4.4, W.4.4, W.4.7, W.4.8, W.4.9, W.4.10, SL.4.1, SL.4.2, SL.4.4, L.4.1, L.4.2, L.4.3, L.4.6) To support integration of ELA standards into this unit, students conduct short research projects, using both print and digital sources, to build their understanding of natural resources and the human impact. Students should take notes, categorize information collected, and document a list of the sources used. Using the information they collect during research, as well as information from their experiences with natural resources and effects on the environment, students integrate the information and use it to design a device that creates energy without destroying our natural resources. As students create presentations that detail how their design solutions can be used to solve	**<u>Cross-Curricular</u>** **English Language Arts** (RI.4.1 , RI.4.3, RI.4.4, W.4.4, W.4.7, W.4.8, W.4.9, W.4.10, SL.4.1, SL.4.2, SL.4.4, L.4.1, L.4.2, L.4.3, L.4.6) To support integration of ELA standards into this unit, students should choose a plant or animal, and write about its four core functions: survival, reproduction, growth, and behavior, explaining what structure carries out each core function, and why it's necessary. Also, students can conduct short research projects, using both print and digital sources, to build their understanding of plants or animals. Students should take notes, categorize information collected, and document a list of the sources used. **Mathematics**

	it to design a device or process that can be used to create a code to communicate using patterns. As students create presentations that detail how their design solutions can be used to communicate, they should use details and examples from both their research and experiences to explain how patterns are used in their design to communicate. **Mathematics** (MP.2, MP.4, MP.5, 4.OA.A.1, 4.G.A.1) To support the integration of the mathematics standards into this unit of study, students should have opportunities to measure the crests and troughs of the waves. Students should draw points, lines, line segments, rays, angles, and perpendicular and parallel lines, and identify these in two-dimensional drawings as they identify rays and angles in drawings of the ways in which waves move. Students should also have opportunities to use the four operations to solve problems. As students create models of waves and engage in engineering design, they have opportunities to use tools strategically while measuring, drawing, and building. **<u>Differentiation</u>:** ● Labeled worksheets, highlighted to show the troughs and crests of the waves ● Centers based upon student level and guidance needed ● Peer tutoring ● Leveled worksheets such as Enrichment and Reteach Sheets ● Time accommodation	environmental problems, they should use details and examples from both their research and experiences to explain their solution. **Visual Arts** (1.5.5.Cr2c) Students can create a model or diagram to represent the various types of natural resources, showing how the energy is transferred along the way. **Mathematics** (MP.2, MP.4, MP.5, 4.MD.A.1, 4.MD.A.2) To support the integration of the mathematics standards into this unit of study, students should have opportunities to measure energy. Students should also have opportunities to use the four operations to solve problems such as the amount of natural resources being used each year, and how to preserve them. Students can analyze constraints on materials, time, or cost to draw implications for design solutions. For example, if a design calls for 20 screws and screws are sold in boxes of 150, how many copies of the design could be made? As students represent and solve word problems, such as these, they reason abstractly and quantitatively and model with mathematics. **<u>Differentiation</u>:** ● Leveled word problems ● Have research notes printed for	(MP.2, MP.5, 4.G.A.3) To support the integration of the mathematics standards into this unit of study, using data and prior knowledge, students will use math to explain their observations, measurements, and understandings of various plants' external parts, and how they help the plant survive in its environment. Students can create graphs and charts to show their results. **<u>Differentiation</u>:** ● Provide various levels of informational books for students to utilize ● Allow students to choose which way to present their findings to the class (poster, written report, slide show, etc.). ● Centers based upon student level and guidance needed ● Peer tutoring ● Leveled worksheets such as Enrichment and Reteach Sheets ● Time accommodation ● Modified exams and assignments ● Collaboration with Special Ed. staff ● Tiered reading and writing assignments **<u>Special Education/504</u>:** ● Provide a foldable for a plant and an animal, and then label the parts (structures) of each one. Assist students in

	• Modified exams and assignments • Collaboration with Special Ed. staff • Tiered reading and writing assignments **<u>Special Education/504</u>:** • Provide a diagram of a wave and label each part (trough, crest, equilibrium, amplitude, wavelength, etc.) with the students. • Individual Instructional Plans • Modifications • Extended Time • Teach in Smaller Concepts • Frequent Breaks • Shortened Assignment • Preferential Seating • Hands-On Tasks • Increase One-to-One Time • Oral Directions • Oral Responses • Heterogeneous Groups • Use of Manipulatives **<u>ELL</u>:** • Use of technology to translate written responses from student's first language into the English language • Picture flashcards with domain specific vocabulary words written in English (wave, wavelength, trough, crest, etc.) • Use of informational texts to explain waves at the level of the ELL • ELL Activity Guide • Strategy groups • Graphic organizers	students to utilize • Centers based upon student level and guidance needed • Peer tutoring • Leveled worksheets such as Enrichment and Reteach Sheets • Time accommodation • Modified exams and assignments • Collaboration with Special Ed. staff • Tiered reading and writing assignments **<u>Special Education/504</u>:** • Create a graphic organizer to list the differences between renewable and non-renewable resources. • Individual Instructional Plans • Modifications • Extended Time • Teach in Smaller Concepts • Frequent Breaks • Shortened Assignment • Preferential Seating • Hands-On Tasks • Increase One-to-One Time • Oral Directions • Oral Responses • Heterogeneous Groups • Use of Manipulatives **<u>ELL</u>:** • Use of informational texts to explain natural resources at the level of the ELL • Picture flashcards with domain specific vocabulary words written in English (natural resources, oil, coal, etc.)	identifying the function of each part (e.g. A flower has roots to survive and grow, seeds to reproduce, and colorful petals to attract pollinators). • Individual Instructional Plans • Modifications • Extended Time • Teach in Smaller Concepts • Frequent Breaks • Shortened Assignment • Preferential Seating • Hands-On Tasks • Increase One-to-One Time • Oral Directions • Oral Responses • Heterogeneous Groups • Use of Manipulatives **<u>ELL</u>:** • Picture flashcards with domain specific vocabulary words written in English (structure, function, 4 core functions, etc.) • Use of informational texts to explain structure and function at the level of the ELL • Use of technology to translate written responses from student's first language into the English language • ELL Activity Guide • Strategy groups • Graphic organizers • Repeated directions • Teacher/Peer modeling and conferencing • Strategy groups • School/Home bilingual letter

	• Repeated directions • Teacher/Peer modeling and conferencing • Strategy groups • School/Home bilingual letter to introduce a unit on Waves. • Instruction will be based on language proficiency. **<u>Gifted & Talented</u>:** • Students should work collaboratively in a group to design and build a device, or design a process for communicating information over a distance (e.g. Using a flashlight to convey information using a pattern of on and off, drums sending information through sound waves, building an instrument with a box and rubber bands of varying sizes that can be plucked in a pattern to communicate information, etc.). After the group builds their design and presents it to the class, their design should be tested to see how well it performs under a range of likely conditions (e.g., increase in distance, environmental noise or light, etc.). Students should use these findings to determine a way to alter their design, so that it best communicates the desired pattern. • Advanced centers • Tutor Peers • Enrichment pages and workbook • Advanced Learner's Activity • Projects outside of school • Above Grade Level Problems	• Use of technology to translate written responses from student's first language into the English Language • ELL Activity Guide • Strategy groups • Graphic organizers • Repeated directions • Teacher/Peer modeling and conferencing • Strategy groups • School/Home bilingual letter to introduce unit on Natural Resources • Instruction will be based on language proficiency. **<u>Gifted & Talented</u>:** • Build a Solar Collector to explore renewable energy from the sun (explore heating and cooking foods). • Advanced centers • Tutor Peers • Enrichment pages and workbook • Advanced Learner's Activity • Projects outside of school • Above Grade Level Problems • Think Smarter/Go Deeper questioning • Higher Order Thinking questioning • Web-Based assignments **<u>At Risk</u>:** • Reading and learning content on natural resources at student's ability level • Extra Help • Remediation	to introduce unit on Plant and Animal Structures and Functions • Instruction will be based on language proficiency. **<u>Gifted & Talented</u>:** • Students will choose and observe a living thing outside of school (plant, animal, or insect) and must be able to identify the structures of that living thing. Students must compose an essay to explain the core functions of each structure, and the importance it has to the living thing. • Advanced centers • Tutor Peers • Enrichment pages and workbook • Advanced Learner's Activity • Projects outside of school • Above Grade Level Problems • Think Smarter/Go Deeper questioning • Higher Order Thinking questioning • Web-Based assignments **<u>At Risk</u>:** • Reading and learning content on plant and animal structures and functions at student's ability level • Extra Help • Remediation • Basic Skills • Tiered Lessons • Reteach Packets • Multiplication Chart

	• Think Smarter/Go Deeper questioning • Higher Order Thinking questioning • Web-Based assignments **<u>At Risk</u>:** • Reading and learning content on waves at student's ability level • Extra Help • Remediation • Basic Skills • Tiered Lessons • Reteach Packets • Multiplication Chart • Manipulatives • Use of Hands-On Materials • Conferencing	• Basic Skills • Tiered Lessons • Reteach Packets • Multiplication Chart • Manipulatives • Use of Hands-On Materials • Conferencing	• Manipulatives • Use of Hands-On Materials • Conferencing