Wall Township Public Schools	Board Approval Date: 5-21-24

POR Integrated Science

POR Integrated Science includes an overview of topics in Biology, Chemistry, Physics, and Earth Science. This course will expose students to real-life applications of scientific issues and explore how concepts from different sciences overlap and interact. Students will develop problem solving and analysis skills, utilize technology, discuss current issues in science, apply their knowledge and effectively communicate ideas and findings while writing in the content area.

New Jersey Student Learning Standards - Science (Click here to skip below to a description about the Standards)

Course Sequence & Pacing

Unit Title	Estimated Number of Instructional Periods
Unit 1: Introduction to Science - Skills and Practices	September
Unit 2: Atomic Structure / Periodic Table	October
Unit 3: Nutrition Science	November
Unit 4: Geophysics / Natural Disasters	December
Unit 5: Motion and Forces	January/February
Unit 6: Astronomy	February/March
Unit 7: Energy	April/May
Unit 8: Waves / Electromagnetic Spectrum	May

Unit 1: Introduction to Science - Skills and Practices

Stage 1: Desired Results

Unit 1: Introduction to Science - Skills and Practices

Unit Summary: Students will be exposed to basic science practices. Students will build a foundation of science application skills and methods. Students will investigate the scientific method, laboratory equipment and techniques, as well as focus on developing skills of measurement, graphing, numeric conversion, precision / accuracy and lab safety. Students will build a foundation for the class and the future content material.

Unit 1: Learning Standards / Targets

NJSLS Science (PE):

- **SEP #3 (Planning and carrying out investigations):** Plan and carry out an investigation in the field or laboratory, working collaboratively as well as individually. Investigations are systematic and require clarifying what counts as data and identifying variables or parameters.
- **SEP #4 (Analyzing and Interpreting Data):** Data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, tools—including tabulation, graphical interpretation, visualization, and statistical analysis are used to identify the significant features and patterns in the data. When applicable, sources of error are identified and calculation of the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.
- **SEP # 7 (Engaging in Argument from Evidence):** Argumentation is the process by which explanations and solutions are reached. Use appropriate and sufficient evidence with scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

Unit Enduring Understandings:	**Unit Essential Questions:**
• The scientific process is important in conducting investigations, exploring phenomena, and collecting data. • Define science based on knowledge and experiences. • Develop a scientific process. • Design an experiment in an attempt to answer a scientific question. • Model a process by manipulating lab materials. • Realize that society depends on quality and quantity of accurate and precise data. • Calculate quantities by working in both US and metric systems. • Recognize that graphing is a useful tool. • Understand the importance of lab safety	• What is science? • How does the scientific process work? • How are experiments created? • What is the importance of a model? • What is the difference between quantity and quality? • What is the difference between precision and accuracy? • How does conversion work for metric and US systems? • What is the importance of using graphs? • Why is lab safety important?

Vocabulary: scientific process, investigate, investigation, phenomena, explanation, theory, hypothesis, independent variable, dependent variable, control group, experimental group, precision, accuracy, quantitative, qualitative data, claim, evidence, reasoning, metric system, density

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.

9.2.12.CAP.5: Assess and modify a personal plan to support current interests and postsecondary plans.

9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas.

9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice.

Computer Science & Design Thinking *(CS & DT)*:

8.1.2.CS.1: Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.

8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.

8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

NJSLS Companion Standards - ELA: writing, reading comprehension, analysis

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Connections to NJSLS - Mathematics : calculations, dimensional analysis converting units, graphing, metrics

MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.

Unit 1: Stage 2 - Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class participation
- Do Now

- Communicator Check-ins
- Laboratory Activities/Lab Reports
- Claim, evidence & reasoning assessments

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- Density of Mystery Objects Lab or Measurement Lab
- Unit 1 Test : Nature of Science

Performance Tasks / Alternate Assessments

- Penny Water Drop Lab
- Edpuzzles
- Metric Conversions (metrics to US and US to metrics) Activity
- Graphing Activity (measurement lab follow up)
- Measurement Lab or Mystery Objects Lab

***Common Benchmark Assessment**

Unit 1: Stage 3 - Learning Plan

Potential Unit Launches

- SWBAT determine do scientists investigate a problem?

Potential Supporting Lessons

- SWBAT convert units from US system to metric system and metric system to US system.
- SWBAT complete metrics review.
- SWBAT utilize dimensional analysis to convert between systems and units.
- SWBAT complete a controlled experiment.
- SWBAT participate in a mini lesson on graphing.
- SWBAT develop an appropriate graph based on a data-set.
- SWBAT analyze data to determine the independent variable's effect on the dependent variable through a minilab or activity.

Core Instructional & Supplemental Materials

Texts, Readings, Online Platforms & Other Resources:

- Teacher Created Materials (google slides and docs)
- Laboratory activities and equipment
- Google Apps for Education
- Chromebooks
- EdPuzzle
- Kahoot
- Gimkit
- Blooket
- Youtube
- Quizlet

Science Website(s):

- https://www.physicsclassroom.com/
- https://phet.colorado.edu/
- https://thewonderofscience.com/
- https://www.openscied.org/why-openscied/about-us/

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback

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English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share - Cooperative learning groups

Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice

Students with 504 Plans

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

Unit 2 : Atomic Structure and the Periodic Table

Stage 1: Desired Results

Unit 2: Atomic Structure and the Periodic Table

Unit Summary: Students will explore basic atomic structure and historic discoveries of subatomic particles. Students will study the organization of the periodic table, properties of elements and mathematical concepts applied to the periodic table.

Unit 2: Learning Standards / Targets

NJSLS Science

HS-PS1-1: Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-2: Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-5: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs

HS-PS1-7:Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

HS-PS1-8: Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

SEP #4 (Analyzing and Interpreting Data): Data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, tools—including tabulation, graphical interpretation, visualization, and statistical analysis are used to identify the significant features and patterns in the data. When applicable, sources of error are identified and calculation of the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.

Unit Enduring Understandings:	**Unit Essential Questions:**
• Chemistry is a central science. • Chemistry is studied using the scientific method. • The periodic table is an organized chart of elements. • The periodic table is organized based on periodic properties of the elements. • The symbols on the periodic table represent the subatomic particles. • The atomic mass of an element is the weighted average atomic mass of the various isotopes. All atoms have an atomic structure that individually defines their identity and chemical reactivity. • Lab safety is an important practice designed to keep people safe in the lab	• Why learn Chemistry? • What is an atom? • What are subatomic particles? • How were the subatomic particles discovered? • How is the periodic table used to determine the placement of elements? • What are the groups or families of the periodic table? • What is an isotope? • What is the weighted average atomic mass? • How is weighted average atomic mass calculated?
Vocabulary: periodic table, protons, neutrons, electrons, isotopes, ions, elements, chemical reactions, reaction rates, atom, bond, energy, atomic mass, conservation of mass, fission, fusion, nuclear decay	
Interdisciplinary Connections	
Career Readiness, Life Literacies, & Key Skills *(CLKS)*: CRP7 – Employ valid and reliable research strategies. CRP8 – Utilize critical thinking to make sense of problems and persevere in solving them. CRP12 – Work productively in teams while using cultural global competence.	
Computer Science & Design Thinking ***(****CS & DT****)*****:** 8.1.2.CS.1: Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. **8.2.5.ED.3:** Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.	

NJSLS Companion Standards - ELA: writing, reading comprehension, analysis

RST.11-12.1, Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

WHST.9-12.2, Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.9-12.5, Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.9-12.7, Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.11-12.8, Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

WHST.9-12.9, Draw evidence from informational texts to support analysis, reflection, and research.

SL.11-12.5, Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Connections to NJSLS -

MP.2 Reason abstractly and quantitatively.

MP.4 Model with mathematics.

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

Unit 2: Stage 2 - Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class participation
- Do Now
- Communicator Check-ins
- Laboratory Activities/Lab Reports
- Claim, evidence & reasoning assessments

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- Lab - Atoms / Periodic Table
- Lab - Chemical Reactions / Reaction Rates
- Unit 2 Assessment : Atomic Structure and the Periodic Table

Performance Tasks / Alternate Assessments

- Lab - Chemical Reactions
- Lab - Reaction Rates
- Project (from one of the unit launches listed below)
- Edpuzzles
- Graphing Activity (half life or periodic trends)
- Periodic Table Models (student created to identify trends and properties)

***Common Benchmark Assessment**

Unit 2 : Atomic Structure and Periodic Table Stage 3 - Learning Plan

Potential Unit Launches

- **Element Superhero Creation**: Students can create "element superheroes" where each element represents a unique character with special powers based on its properties (e.g., reactivity, conductivity, appearance). Students present their creations and explain the scientific basis behind each superhero's powers.

- **Interactive Periodic Table Exploration**: Students use online tools or physical models to identify trends in atomic properties across periods and groups.
- **Atomic Model Building**: Hands-on activity where students construct models of atoms using materials representing protons, neutrons, and electrons.
- **Research and Presentation**: Assign students to research a specific element and present its atomic structure, properties, and uses to the class.

Potential Supporting Lessons

- SWBAT describe the basic structure of an atom, including the roles of protons, neutrons, and electrons.
- SWBAT explain how atomic number and mass number are determined and their significance.
- SWBAT define and differentiate between protons, neutrons, and electrons in terms of their mass, charge, and location within the atom.
- SWABT discuss the historical development of the atomic model from Dalton to the modern model.
- SWABT identify key features of the periodic table, such as periods, groups, elements, atomic symbols, and atomic numbers.
- SWBAT classify elements based on their position in the periodic table, including metals, nonmetals, and metalloids.
- SWBAT calculate the number of protons, neutrons, and electrons in an atom based on its atomic number and mass number.
- SWBAT practice converting between atomic mass units (amu) and grams.
- SWBAT calculate the number of protons, neutrons, and electrons in an atom based on its atomic number and mass number.
- SWBAT analyze and interpret periodic trends, such as atomic radius, ionization energy, and electronegativity, using the periodic table.
- SWBAT apply knowledge of atomic structure to explain phenomena such as isotopes, nuclear stability, and radioactive decay.
- SWBAT relate atomic structure concepts to practical applications in fields such as medicine (e.g., nuclear medicine), energy (e.g., nuclear reactors), and materials science (e.g., alloys).
- SWBAT demonstrate knowledge of Atomic Mass during notes.
- SWBAT demonstrate knowledge of Notes/Lecture - Atoms, Subatomic particles and the nuclear model of the atom

- SWBAT demonstrate knowledge of elements and periodic table notes
- Identifying an Element as Metal, Nonmetal, or Metalloid by its Position on the Periodic (student generated graphics and models)
- SWBAT carry out experiment and investigate: LAB Reaction Rates (graphing)

Potential Summative Assessments

- Element Superhero Project
- Unit 2 Summative Assessment

Core Instructional & Supplemental Materials

Texts, Readings, Online Platforms & Other Resources:

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- Laboratory activities and equipment
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- Chromebooks
- EdPuzzle
- Kahoot
- Gimkit
- Blooket
- Youtube
- Quizlet

Science Website(s):

- https://www.physicsclassroom.com/ (chemistry section)
- edpuzzle
- https://phet.colorado.edu/
- https://www.openscied.org/why-openscied/about-us/
- https://thewonderofscience.com/

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Specific Strategies and Practices that Support Gifted & Talented Students

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Unit 3: Nutrition Science

Stage 1 Desired Results

Unit 3: Nutrition Science

Unit Summary: Students will develop an understanding of the essential nutrients required for human health, the functions of these nutrients, and the importance of these nutrients. This unit will cover how we need nutrition to maintain health and the impact of nutrition on our overall being. Students will learn to analyze various dietary habits and make informed food choices.

Unit 3: Nutrition Science - Learning Standards / Targets

NJSLS Science

- **HS-LS1-2:** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- **HS-LS1-3:** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- **HS-LS1-6:** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- **HS-LS1-7:** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- **HS-LS2-3:** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

Unit Enduring Understandings:	**Unit Essential Questions:**
• Students will understand nutrition and its importance.	• What are the nutrients required for human health? • What are macronutrients and micronutrients? • What are the primary functions of the body?

• Students will learn an overview of essential nutrients: carbohydrates, proteins, fats, vitamins, minerals, and water. • Students will have an understanding of the digestive system and nutrient absorption. • Students will analyze dietary habits and the importance of a balanced diet.	• What are the processes involved in digestion and absorption of nutrients? • How does nutrition impact our overall health? • How can we assess and improve our dietary habits?
Vocabulary: claim, evidence, reasoning, cellular respiration, nutrition, digestion, nutrients, diet, macronutrients, micronutrients, molecules, carbon, hydrogen, oxygen, sugar, amino acids, carbohydrates, proteins, fats, minerals energy, matter, anaerobic, aerobic, homeostasis, organisms	
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Connections to NJSLS - Mathematics

HSF-IF.C.7 : Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

HSF-BF.A.1 : Write a function that describes a relationship between two quantities.

Unit 3 - Nutrition Science - Stage 2 Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class participation

- Do Now
- Communicator Check-ins
- Laboratory Activities/Lab Reports
- Claim, evidence & reasoning assessments

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- Nutrition Identification Lab
- Balanced Meal Planning
- Dietary Habits reflection
- Unit 3 Assessment: Nutrition Science

Performance Tasks / Alternate Assessments

- Lab simulation Activities
- Nutrition and Health Research Project
- Edpuzzle

***Common Benchmark Assessment**

Unit 3 - Nutrition Science Stage 3 Learning Plan

Potential Unit Launches

Health and Nutrition Investigation: Students will investigate a nutritional question or health-related issue. They might analyze food labels, conduct surveys on eating habits, design experiments related to nutrition, and present recommendations based on their findings.

Nutrient Investigation: Students research a specific nutrient (e.g., vitamin D) and present its importance, sources, deficiency symptoms, and recommended intake.

Meal Planning Challenge: Teams create a week-long meal plan that meets the nutritional needs of a hypothetical client (e.g., pregnant woman, teenage athlete).

Healthy Eating Campaign: Develop a campaign targeting peers to promote healthy eating habits, supported by evidence from their research.

Potential Supporting Lessons

- SWBAT identify and classify macronutrients and micronutrients.
- SWBAT use simulation exercises to explain the digestive process.
- SWBAT use simulation exercises to explain how food is broken down and nutrients are absorbed in the human body.
- SWBAT investigate the effects of hydration on physical and cognitive performance.
- SWBAT analyze their daily food choices.
- SWBAT research and present the relationship between nutrition and specific health conditions.
- SWBAT apply knowledge of nutrition to create a balanced meal plan that meets nutritional needs.

Potential Summative Assessments

- Research different nutrients and their roles in the body.
- Investigate dietary guidelines (national/international).
- Explore current trends or controversies in nutrition science.
- Unit 3 Assessment

Core Instructional & Supplemental Materials

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It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning

Unit 4 : Geophysics / Natural Disasters

Stage 1 Desired Results

Unit 4: Title: Geophysics / Natural Disasters as a result of climate change

Unit Summary: This unit explores the intersection of geophysics and climate change. The unit will focus on how global climate change influences natural disasters. Students will learn the fundamental principles of geophysics, the mechanics of various natural disasters, and how climate change exacerbates these events.

Unit 4: Geophysics / Natural Disasters - Learning Standards / Targets

NJSLS Science

HS-ESS1-5 : Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards and changes in climate have influenced human activity.
HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Unit Enduring Understandings:	**Unit Essential Questions:**
• Students will understand the principles of geophysics. • Students will develop an understanding of the fundamentals of climate change. • Students will understand global warming and its environmental impact. • Students will develop an understanding of the different types of natural disasters. • Students will understand the impact of climate change on natural disasters.	• What are the basic principles of geophysics? • What are the dynamics of the Earth's structure? • What are the causes of climate change? • What are greenhouse gasses and the greenhouse effect? • What are the different types of natural disasters? • What are the geophysical causes and characteristics of each natural disaster? • What are the potential links between climate change and increased geological activity?
Vocabulary: climate change, natural disasters, geophysics, climate models, natural resources, earthquakes, volcanos, hurricanes, tsunamis, fault lines, tornados, rocks, crust, sea level, floods, seismic waves	
Interdisciplinary Connections	
Career Readiness, Life Literacies, & Key Skills *(CLKS)*: **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas. **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition. **9.4.12.CT.1:** Identify problem-solving strategies used in the development of an innovative product or practice.	
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NJSLS Companion Standards - ELA

RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.8 : Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

WHST.9-12.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

RST.11-12.2 Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

SL.11-12.5 : Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Connections to NJSLS - Mathematics

MP.2 : Reason abstractly and quantitatively.

MP.4 Model with mathematics.

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Unit 4: Geophysics / Natural Disasters - Stage 2 Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class participation
- Do Now
- Communicator Check-ins
- Laboratory Activities/Lab Reports
- Claim, evidence & reasoning assessments

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- Case study on historical and recent examples of natural disasters influenced by climate change
- Analysis of different natural disasters and causes
- Geophysics Exploration Lab
- Unit 4 Assessment : Geophysics

Performance Tasks / Alternate Assessments

- Climate Change and Rising Sea Level Lab Simulation
- Hurricane Formation and Impact Lab
- Flood Simulation Lab
- Earthquake Simulation and Seismic Waves Lab

***Common Benchmark Assessment**

Unit 4: Geophysics / Natural Disasters - Stage 3 Learning Plan

Potential Unit Launches

Choose a specific type or category of natural disaster to focus on (e.g., hurricanes, earthquakes, wildfires, floods). Research the causes and mechanisms of the chosen natural disaster. Investigate historical events and case studies related to the chosen disaster. Explore the geographic distribution and frequency of occurrence.

Potential Supporting Lessons

- SWBAT identify the basic principles of geophysics.
- SWBAT explain the causes of climate change.
- SWBAT identify the types of natural disasters and their cause.
- SWBAT understand the impact of climate change on natural disasters.
- SWBAT analyze collected data to interpret geological structures or anomalies.
- SWBAT compare and contrast different data interpretation techniques.
- SWBAT to explore different types of natural disasters, their causes, impacts, and mitigation strategies.
- SWBAT understand the scientific principles behind natural disasters and their societal implications.
- SWBAT analyze the environmental, economic, and social impacts of the chosen natural disaster.

- SWBAT use maps, charts, and statistical data to illustrate the extent of damage and affected populations.
- SWBAT discuss short-term and long-term consequences on communities and infrastructure.

Potential Summative Assessments

- Case study on historical and recent examples of natural disasters influenced by climate change
- Analysis of different natural disasters and causes
- Geophysics Exploration Lab
- Unit 4 Assessment

Core Instructional & Supplemental Materials

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- Teacher Created Materials (google slides and docs)
- Laboratory activities and equipment
- Google Apps for Education
- Chromebooks
- EdPuzzle
- Kahoot
- Gimkit
- Blooket
- Youtube
- Quizlet

Science Website(s):

- https://www.physicsclassroom.com/
- edpuzzle
- https://phet.colorado.edu/
- https://thewonderofscience.com/

Accommodations and Modifications:
Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

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English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share - Cooperative learning groups

Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice

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Unit 5: Motion and Forces

Stage 1 Desired Results

Unit 5: Motion / Forces

Unit Summary: In this unit, students will explore the motion of objects under the influence of forces. They will explore the relationships between distance, time, and velocity in accelerated and non-accelerated systems and conduct experiments to observe those relationships. Students will also become familiar with Newton's Laws of Motion and their effect on motion.

Unit 5: Motion / Forces - Learning Standards / Targets

NJSLS Science

HS-PS2-1: Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2: Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-3: Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Unit Enduring Understandings:

- What is a time interval?
- What is speed, velocity, and acceleration?
- What are Newton's laws of motion and how do we apply these laws to our daily lives?
- How do gravity and air resistance affect the motion of a projectile?

Unit Essential Questions:

- How do we describe motion using graphs (position vs time, velocity vs time)?
- How does impulse and it's relation to momentum change and how do we calculate conservation of momentum in collisions?

• What are the factors affecting friction and air resistance on motion? • What is gravity? • Motion at a constant velocity causes distance to increase at a constant rate. • Motion at constant, non-zero acceleration causes distance to change at a non-constant rate but causes velocity to change at a constant rate. • Scalar quantities (like distance, time, and speed) include only magnitude, whereas vector quantities (like velocity, acceleration, and force) include both magnitude and direction • Objects in freefall are accelerating at -9.8 m/s2 at all times, whether rising or falling. • Unbalanced forces cause acceleration. • Relative motion describes movement in relation to an object established as a reference point.	• What do the slopes of distance-time and velocity-time graphs indicate? • What does accelerated motion look like on a distance-time graph? On a velocity-time graph? • What is the relationship between distance and time when moving at constant velocity? • What is the relationship between distance and time when moving with constant acceleration? • What is the acceleration of a freely falling object? • What are Newton's Three Laws of Motion? • What is an unbalanced force and how does it affect motion? • What is an action-reaction pair? • How does mass affect force and acceleration? • How does a free body diagram represent motion? • What are some common forces and how are they represented in a free body diagram?
Vocabulary: gravity, motion, forces, magnitude, direction, acceleration, free body diagrams, mass, free, Newton's Laws of Motion, distance, time, velocity, friction, air resistance	
Interdisciplinary Connections	
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RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

WHST.9-12.7: Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

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MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

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HSN-Q.A.1: Define appropriate quantities for the purpose of descriptive modeling.

Unit 5: Motion / Forces: Stage 2 Assessment Evidence

Formative Assessments:

- Observation
- Homework

- Class participation
- Do Now
- Communicator Check-ins
- Laboratory Activities/Lab Reports
- Claim, evidence & reasoning assessments

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- Unit 5 Assessment: Motion / Forces
- Car Lab (Speed / Velocity / Acceleration)
- Graphing Assessment (car lab data)
- Solve a complex equation based on a real world motion situation
- Create a narrative to describe one of Newton's Laws of Motion
- Graphing Motion
- Free body diagrams - Diagram a system under the influence of multiple forces and determine the motion of the object based on that diagram.
- Unit 5 Assessment - Forces / Motion (Kinematics / Dynamics)

***Common Benchmark Assessment**

Unit 5: Motion / Forces - Stage 3 Learning Plan

Potential Unit Launches

- Design a safety feature for a playground slide or investigate the physics of roller coasters.
- Design a Rube Goldberg Machine: Create a complex machine that demonstrates different types of forces and motion.
- Bridge Building Challenge: Build and test bridges to understand forces like tension and compression.

Potential Supporting Lessons

- SWBAT examine kinematics (speed, acceleration, freefall, free body diagrams).
- SWBAT examine Newton's Laws of Motion and apply laws to real life scenarios.

- SWBAT plan and conduct investigations, analyze data and using math to support claims, and apply scientific ideas to solve design problems students in order to develop an understanding of ideas related to why some objects keep moving and some objects fall to the ground.
- SWBAT develop an understanding that the total momentum of a system of objects is conserved when there is no net force on the system.

Potential Summative Assessments

- Solve a complex equation based on a real world motion situation
- Create a narrative to describe one of Newton's Laws of Motion
- Graphing Motion
- Free body diagrams - Diagram a system under the influence of multiple forces and determine the motion of the object based on that diagram.
- Unit 5 Assessment - Forces / Motion (Kinematics / Dynamics)

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Unit 6: Astronomy

Stage 1 Desired Results

Unit 6: Astronomy

Unit Summary: This unit explores the field of astronomy, covering fundamental concepts of celestial objects, their motions, and the universe's structure. Students will learn about the solar system, stars, and galaxies. Students will understand Earth's place in the universe starting with the Big Bang and the formation of the elements and moving to the formation of the Sun and the solar system, and finally examining Earth's history of space science and its effect on society and technology.

Unit 6: Astronomy - Learning Standards / Targets

NJSLS Science

HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.

HS-ESS1-4 : Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

Unit Enduring Understandings:	**Unit Essential Questions:**
• Students will understand astronomy and the history of astronomical theories. • Students will understand the structure and components of the solar system. • Students will understand the structure and composition of the sun. • Students will develop a basic understanding of galaxies and the universe.	• What is the history of astronomical theories? • What are the fundamental components of the solar system and how do they interact? • How do stars form, evolve, and die? • What are the different types of galaxies and how are they structured? • How do astronomers use tools and techniques to study celestial objects and phenomena?

• Students will learn an overview of astronomical tools and techniques. • The Big Bang Theory is the leading explanation for how the universe began. • Elements were created in the Big Bang. • Stars create elements through fusion. • Describe Kepler's laws of planetary motion.	• What is a galaxy? • What does Kepler's laws of planetary motion tell us?
Vocabulary: galaxy, universe, Kepler's Laws, stars, astronomer, solar system, planets, fusion, celestial, claim, evidence, reasoning	
Interdisciplinary Connections	
Career Readiness, Life Literacies, & Key Skills *(CLKS)***:** **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas. **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition. **9.4.12.CT.1:** Identify problem-solving strategies used in the development of an innovative product or practice.	
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WHST.9-12.2 : Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

SL.11-12.4 Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

Connections to NJSLS - Mathematics

MP.2 : Reason abstractly and quantitatively.

MP.4 : Model with mathematics.

HSN-Q.A.1 : Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2 : Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 : Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

HSA-SSE.A.1: Interpret expressions that represent a quantity in terms of its context.

HSA-CED.A.2 : Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

HSA-CED.A.4 : Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Unit 6: Astronomy - Stage 2 Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class Participation
- Do now
- Communicators / Check ins
- Laboratory Activities / Lab Reports

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- Structure and composition of the sun and stars lab activity
- Unit 6 Assessment

Performance Assessment / Alternate Assessment

- Solar System simulation lab
- Lab – Planetary Data Lab
- Edpuzzles
- Lab activity on celestial activity, their motions, and the universe's structure
- Identification of astronomical tools and techniques

***Common Benchmark Assessment**

Unit 6: Astronomy - Stage 3 Learning Plan

Potential Unit Launches

- **Space Exploration Simulation**: Create a simulated space mission where students act as scientists or engineers. They could design experiments to be conducted on a simulated spacecraft, analyze data received, and draw conclusions about the feasibility of their experiment.

Potential Supporting Lessons

- SWBAT understand and investigate the basic principles of astronomy and its importance in understanding the universe.
- SWBAT describe the structure the structure and composition of the sun.
- SWBAT identify and classify different types of galaxies.
- SWBAT trace the development of astronomical theories from ancient times to modern era.
- SWBAT review Big Bang theory notes, planets, stars, Kepler's Law and Planetary Data notes
- SWBAT identify the components of the solar system, including planets, moons, asteroids, and comets.
- SWBAT identify different types of telescopes and what they are used for.
- SWBAT explain the mechanisms behind solar and lunar eclipses and meteor showers.

Potential Summative Assessments

- Solar System simulation lab
- Lab – Planetary Data Lab
- Edpuzzles
- Lab activity on celestial activity, their motions, and the universe's structure
- Unit 6 Assessment : Astronomy

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Unit 7: Energy

Stage 1 Desired Results

Unit 7: Energy

Unit Summary: Students will gain an understanding of how energy is the ability to do work. They will explore different types of energy. Students will gain an understanding of waves, different types of waves, and wave properties. They will be able to calculate wavelength, frequency of waves, amplitude, and speed.

Unit 7 - Energy: Learning Standards / Targets

NJSLS Science:

HS-PS3-1 : Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2 : Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

Unit Enduring Understandings:	**Unit Essential Questions:**
• The total energy in a closed system remains constant. • Energy cannot be created or destroyed, only transferred or transformed from one form to another. • All energy transfers are defined by the law of conservation of energy. • Energy is converted in a system.	• What are the different forms of energy? • How is energy conserved in a closed system? • How do we transfer energy? • What are the mechanisms of energy transfer in waves? • How does energy change form, such as from potential to kinetic energy or chemical to thermal energy.

• Momentum is a characteristic of mass and velocity and is conserved in collisions. • Energy can change forms, but the total amount of energy in a closed system remains constant. • Some energy is always lost to the environment, usually as heat, due to inefficiencies. • Energy is never lost—just transformed.	• What constitutes energy, including, but not limited to kinetic, potential, thermal, chemical, and other types of energy.
Vocabulary: energy, force, acceleration, momentum, mass, elastic collision, inelastic collision, explosion, Law of Conservation of Energy, energy transfer, system, kinetic, potential, thermal, chemical, sound, light	
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HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Unit 7: Energy - Stage 2 Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class participation
- Do Now
- Communicator Check-ins
- Laboratory Activities/Lab Reports

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- energy conversion experiments
- Calculation of wave speed and frequency lab
- Unit 7 assessment: Energy

Performance Tasks / Alternate Assessments

- Lab simulation activities
- edpuzzle
- pendulum lab
- skate park lab
- Roller coaster Amusement Park / Energy Calculations
- K'nex Building and calculations

***Common Benchmark Assessment**

Unit 7 Energy - Stage 3 Learning Plan

Potential Unit Launches

- Design experiments or simulations to investigate energy transformations or efficiency. For example, conducting experiments on how different materials insulate heat or building simple machines to demonstrate mechanical energy.
- **Energy Audit**: Conduct an energy audit of a school building or home to identify areas for energy conservation.
- **Renewable Energy Design Challenge**: Design and build a model of a renewable energy system (e.g., solar oven, wind-powered vehicle).
- **Energy Policy Analysis**: Research and analyze energy policies at local or national levels, and propose recommendations for improving energy efficiency and sustainability.

Potential Supporting Lessons

- SWBAT calculate energy and their respective quantities using appropriate formulas.
- SWBAT apply energy concepts to solve real world problems.
- SWBAT recognize energy transfers.
- SWBAT recognize Law of Conservation of Energy.
- SWBAT draw conclusions and make inferences on how and why energy transfers occur.

Core Instructional & Supplemental Materials

Texts, Readings, Online Platforms & Other Resources:

- Teacher Created Materials (google slides and docs)
- Laboratory activities and equipment
- Google Apps for Education
- Chromebooks
- EdPuzzle
- Kahoot
- Gimkit
- Blooket
- Youtube
- Quizlet

Science Website(s):

- https://www.physicsclassroom.com/
- Edpuzzle
- https://phet.colorado.edu/

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

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English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

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Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice

Students with 504 Plans

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning

Unit 8 : Waves / Electromagnetic Spectrum

Stage 1 Desired Results

Unit 8: Waves / Electromagnetic Spectrum

Unit Summary: In this unit, students will gain an understanding of waves, different types of waves, and wave properties. They will be able to calculate wavelength, frequency of waves, amplitude, and speed. Students will gain an understanding of the electromagnetic spectrum and the range of all types of electromagnetic radiation. Students will be introduced to the parts of the EMS. This unit will cover lights boundaries and ray diagrams.

Unit 8 - Waves / Electromagnetic Spectrum Learning Standards / Targets

NJSLS Science:

HS-PS2-5: Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

HS-PS3-5: Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

HS-PS4-1: Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-PS3-3: Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

HS-PS4-4: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

HS-PS4-5: Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Unit Enduring Understandings:	**Unit Essential Questions:**
• Field forces are forces that exist in a region of space and do not require contact between objects to cause accelerations.	• What is a field force? • How are fields represented? • What causes a field?

• Charged particles cause fields. • Charged particles moving through fields will accelerate based on the strength of the field. • Multiple fields can overlap causing interference. • Fields can be represented by field lines. • Magnets cause magnetic fields. • The speed of light changes as it moves into different materials based on the density of the material. • A light ray will be bent towards the normal when traveling from a low density material to a high density material; it will be bent away in the opposite circumstance.	• What happens when fields interact? • What is a magnet? • How/why is Earth like a giant magnet? • What is the speed of light? • How does light act like a particle? In what way is light like a wave? • What is the Electromagnetic Spectrum? • How is the EMS arranged? • What happens to a light ray's speed as it enters a more dense material? • How does a light ray behave when it enters a more dense material? A less dense material?
Vocabulary: magnetism, electricity, electromagnetic spectrum, light waves, rays, particle, medium, constructive interference, destructive interference, force, fields	
Interdisciplinary Connections	
Career Readiness, Life Literacies, & Key Skills *(CLKS)*: **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas. **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition. **9.4.12.CT.1:** Identify problem-solving strategies used in the development of an innovative product or practice.	
Computer Science & Design Thinking *(CS & DT)*: **CRP7** – Employ valid and reliable research strategies. **CRP8** – Utilize critical thinking to make sense of problems and persevere in solving them. **CRP12** – Work productively in teams while using cultural global competence. **8.1.2.CS.1:** Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences. **8.2.5.ED.2:** Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.	

8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

NJSLS Companion Standards - ELA

WHST.9-12.7: Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation

RST.9-10.8: Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

RST.11-12.1: Write arguments focused on discipline-specific content.

RST.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Connections to NJSLS - Mathematics

MP.2: Reason abstractly and quantitatively.

MP.4: Model with mathematics.

HSN-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

HSN-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Unit 8: Waves / Electromagnetic Spectrum - Stage 2 Assessment Evidence

Formative Assessments:

- Observation
- Homework
- Class participation
- Do Now
- Communicator Check-ins
- Laboratory Activities/Lab Reports

Summative Assessments: (includes alternative assessments were applicable)

- Quizzes
- energy conversion experiments
- Calculation of wave speed and frequency lab
- Research and presentation on electromagnetic waves
- wave interference and diffraction
- Unit 8 assessment: Waves / Electromagnetic Spectrum

Performance Tasks / Alternate Assessments

- Map an electromagnetic field.
- Develop a strategy to separate steel from aluminum for industrial recycling use electromagnets
- Waves (slinky) lab
- Interference, reflection, refraction, and diffraction.
- Lab- interference, reflection, refraction, and diffraction.
- Sound and light wave exploration

***Common Benchmark Assessment**

Unit 8 : Waves / Electromagnetic Spectrum - Stage 3 Learning Plan

Potential Unit Launches

- Design a communication system for a remote area or investigate how different frequencies affect signal transmission.
- Design experiments to explore wave properties such as interference, reflection, refraction, and diffraction.
- Design a product or solution that utilizes knowledge of waves or the EM spectrum. This could be a communication device, an antenna system, or a device that detects specific types of waves.
- Build a Simple Radio Transmitter: Understand how radio waves work by building a basic transmitter and receiver.

Potential Supporting Lessons

- SWBAT will be able to explain how changing the frequency affects the characteristics of a wave.
- SWBAT understand the properties of sound waves, including frequency, amplitude, and wavelength, and how they relate to the perception of sound.
- SWBAT explore how sound waves travel through different mediums.
- SWBAT comprehend the nature of light waves, including frequency, wavelength, and speed. They will explore how light interacts with matter through reflection., refraction, and dispersion
- SWBAT understand the components of the electromagnetic spectrum, including types of radiation, wavelengths, frequencies, and energy levels.
- SWBAT apply energy concepts to solve real world problems.
- SWBAT complete questions summarizing the understanding of wave characteristics.
- SWBAT create a poster and slideshow showcasing the properties and applications of waves, incorporating visual representation and explanations.
- SWBAT identify and describe the different types of electromagnetic radiation within the electromagnetic spectrum.

Potential Summative Assessments

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New Jersey Student Learning Standards - Science

Science

Scientific and technological advances have proliferated and now permeate most aspects of life in the 21st century. It is increasingly important that all members of our society develop an understanding of scientific and engineering concepts and processes. Learning how to construct scientific explanations and how to design evidence-based solutions provides students with tools to think critically about personal and societal issues and needs. Students can then contribute meaningfully to decision-making processes, such as discussions about climate change, new approaches to health care, and innovative solutions to local and global problems.

Three Dimensions of NJSLS Science

Performance Expectations (PE) are student learning standards devised with the three dimensions or components described below. For detailed information regarding the research and design behind the standards click here.

Disciplinary Core Ideas (DCI)

The fundamental ideas that are necessary for understanding a given science discipline. The core ideas all have broad importance within or across science or engineering disciplines, provide a key tool for understanding or investigating complex ideas and solving problems, relate to societal or personal concerns, and can be taught over multiple grade levels at progressive levels of depth and complexity.

- Disciplinary Core Ideas in Physical Science (PS)
- Disciplinary Core Ideas in Life Science (LS)
- Disciplinary Core Ideas in Earth and Space Science (ESS)
- Disciplinary Core Ideas in Engineering, Technology, and the Application of Science (ETS)

Science and Engineering Practices (SEP)

The practices are what students DO to make sense of phenomena. They are both a set of skills and a set of knowledge to be internalized. The SEPs reflect the major practices that scientists and engineers use to investigate the world and design and build systems.

Crosscutting Concepts (CCC)

These are concepts that hold true across the natural and engineered world. Students can use them to make connections across seemingly disparate disciplines or situations, connect new learning to prior experiences, and more deeply engage with material across the other dimensions. The NGSS requires that students explicitly use their understanding of the CCCs to make sense of phenomena or solve problems.

Science and Engineering Practices (SEP)	**Crosscutting Concepts (CCC)**
● Asking Questions and Defining Problems ● Planning and Carrying Out Investigations ● Analyzing and Interpreting Data ● Developing and Using Models ● Constructing Explanations and Designing Solutions ● Engaging in Argument from Evidence ● Using Mathematics and Computational Thinking ● Obtaining, Evaluating, and Communicating Information	● Patterns ● Cause and Effect: Mechanism and Explanation ● Scale, Proportion, and Quantity ● Systems and System Models ● Energy and Matter ● Structure and Function ● Stability and Change