Grade 8
Module L Dimensions
Waves

New Jersey Student Learning Standards

Established	2016-2017
Revised	2017-2018
Revised	2018-2019
Revised	2019-2020
Revised	2020-2021
Revised	2022-2023

Marking Period	Unit Title	Recommended Instructional Days
4	**Waves and Their Applications**	**40 Days**

NJSLS - Science: *Title*	NJSLS - Science: *Performance Expectations*	Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-S within Unit
Waves and Their Applications in Technologies for Information Transfer	**MS-PS4-1.** Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. **MS-PS4-2.** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. **MS-PS4-3.** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and	**Essential Question/s:** 1. What are the characteristic properties of waves and how can they be used to transfer energy and information? 2. How is the amplitude of a wave related to the energy in a wave? 3. What type of mathematical relationship exists between wavelength, frequency, and energy? 4. How do waves carry energy through matter? 5. How does energy move through space? 6. How is light energy transmitted, reflected, refracted, or absorbed? 7. What are the advantages of using digitized signals (electromagnetic waves) for communication over analog signals? 8. Why are electromagnetic waves a more reliable method for transmitting information? 9. How does digital communication of information affect society?

	transmit information than analog signals. **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	**Activity Description:** ❖ Unit Phenomenon: Can you Explain it? ❖ Hands on Lab: Model two types of waves ❖ Hands on Lab: Investigate waves ❖ Hands on Lab: Generate mechanical waves ❖ Hands on Lab: Model specific wave properties ❖ Hands on Lab: Make a penny disappear ❖ Hands on Lab: light up a maze ❖ Hands on Lab: Encode a Message ❖ Hands on Lab: Transmit and record a signal ❖ Virtual Lab: What are waves and how do they behave? ❖ Virtual Lab: Sound waves and hearing ❖ Virtual Lab: How do sound waves interact with matter? ❖ Virtual Lab: Sound Technology **Lab and engineering activities will incorporate these skills:** ● Planning and Organization ● Critical Thinking ● Communication in a group ● Decision Making ● Reflection on activity and participation

	MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	**Spotlight on scientists and their accomplishments** Ex. Alan Turing - Computer Scientist/Cryptographer Lynn Conway - Computer Scientist/Engineer James West - Research Scientist Human Impacts on Earth Demonstrate how thermal energy changes water currents and creates conditions for superstorms which carry more energy that impacts the environment. (Electromagnetic Waves - UV rays) HMH: Book L Unit 1 Lesson 3 - Light Waves **<u>Interdisciplinary Connection: Content: (NJSLS#)</u>** **<u>Connections to Math</u>:** ● Reason abstractly and quantitatively **(MP.2)** ● Model with mathematics **(MP.4)** ● Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **(6.RP.A.1)** ● Recognize and represent proportional relationships between quantities. **(7.RP.A.2)** ● Interpret the equation y=mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **(8.F.A.3)** ● Understand the concept of a unit rate *a/b* associated
FOUNDATION **Disciplinary:** ***Core Idea***	**FOUNDATION** **Disciplinary:** ***Statement***	
PS4.A: Wave properties **PS4.B: Electromagnetic Radiation**	A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) A sound wave needs a medium through which it is transmitted. (MS-PS4-2) When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and frequency (color) of the light. (MS-PS4-2) The path that light travels can be traced as straight lines, except	

PS4.C: Information Technologies and Instrumentation **ETS1.B: Developing Possible Solutions**	at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends, (MS-PS4-2) A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2) However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) There are systematic processes for evaluating solutions with respect to how well they meet the	with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. **(6.RP.A.2)** ● Know and apply the properties of integer exponents to generate equivalent numerical expressions. **(8.EE.A.1)** ● Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that ✓2 is irrational. **(8.EE.A.2)** ● Summarize numerical data sets in relation to their context. **(6.SP.B.5)** ● Use ratios and proportional relationships and functions. ● Measure with non-standard units **<u>Connections to Language Arts</u>:** ● Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence and add interest **(SL.8.5)** ● Cite specific textual evidence to support analysis of science and technical tests. **(RST.6-8.1)** ● Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct

	criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) Models of all kinds are important or testing solutions. (MS-ETS1-4)	from prior knowledge or opinions. **(RST.6-8.2)** ● Compare and contrast information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. **(RST.6-8.9)** ● Draw evidence from informational texts to support analysis, reflection, and research. **(WHST.6-8.9)**
FOUNDATION **Science and Engineering Practices:** ***Core Idea***	**FOUNDATION** **Science and Engineering Practices:** ***Statement***	
Developing and Using Models **Using Mathematics andComputational Thinking**	Modeling in 6-8 builds on K-5 and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Mathematical and computational thinking at the 6-8 builds on K-5 and progresses to identifying patterns in large data	

	sets and using mathematical concepts to support explanations and arguments.	
FOUNDATION **Crosscutting Concepts:** ***Core Idea***	**FOUNDATION** **Crosscutting Concepts:** ***Statement***	
Patterns	Graphs and charts can be used to identify patterns in data. (MS-PS4-1)	
Structure and Function	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2) Structures can be designed to serve particular functions. (MS-PS4-3)	
Connections to Engineering, Technology**, *and Applications of Science***		
Influence of Science, Engineering, and Technology on Society and the Natural	Technologies extend the measurement, exploration, modeling, and computational	

World	capacity of scientific investigations. (MS-PS4-3)	
Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***	
Responsible Decision-Making Relationship Skills Self-Management Social Awareness Self Awareness	● Develop, implement, and model effective problem-solving and critical thinking skills ● Utilize positive communication and social skills to interact effectively with others ● Recognize the skills needed to establish and and achieve personal and educational goals ● Demonstrate an understanding of the need for mutual respect when viewpoints differ. ● Demonstrate an awareness of the expectations for social interactions in a variety of ways. ● Recognize the importance of self-confidence in	

	handling daily tasks and challenges.	
Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***		**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
Formative Assessments: • Diagnostic tests used to modify teaching and learning activities to improve student attainment		**Benchmarks:** • District Assessment **Summative Assessments:** • End of unit/chapter tests/lesson quizzes

Differentiated Student Access to Content:
Teaching and Learning *Resources/Materials*

Core Resources	**Alternate Core Resources** *IEP/504/At-Risk/ESL*	**ELL Core Resources**	**Gifted & Talented Core Resources**
• **Interactive Worktext** • **Equipment Kits** • **Online Simulations** • **IXL Science** • **Evidence Notebook** • **BrainPop Science** • **Lab Safety Handbook** • **CK 12**	• Multilingual Glossary • Sciencesaurus • Online Science Tools (Scientific Calculator, Graphing) • BrainPopEspanol	• Multilingual Glossary • Sciencesaurus • Online Science Tools (Scientific Calculator, Graphing) • Brain Pop ELL	• Online Simulations • CK 12 • Virtual Labs • Webquests • PHET • Video-Based Projects • Take It Further • You Solve It ! • Unit Performance Tasks

			• Unit Projects • Online Science Tools (Scientific Calculator, Graphing) • IXL Science • BrainPop Science

Supplemental Resources

Technology:

- **8.1.8.A.1, 8.1.8.A. 2, 8.1.8.A.3, 8.1.8.A. 4, 8.1.8.A. 5**

Other: Career Education

- CRP4 Communicate clearly and effectively and with reason.
- CRP6 Demonstrate creativity and innovation
- CRP7 Employ valid and reliable research strategies
- CRP11 Use technology to enhance productivity

Differentiated Student Access to Content:
Recommended Strategies & Techniques

Core Resources	**Alternate Core Resources** *IEP/504/At-Risk/ESL*	**ELL Core Resources**	**Gifted & Talented Core Resources**
• **Large group instruction** • **Small group instruction** • **Think Pair Share** • **Peer editing**	• Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the	• Extend time requirements, preferred seating, positive reinforcement, check	• Create an enhanced set of introductory activities, integrate active teaching/learning

• **Cooperative group work** • **Multimedia presentations** • **Choice Boards/Learning Menus** • **Manipulatives**	method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.	often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.	opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related talent development opportunities.

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept: 1.Career Awareness and Planning, 2.Creativity and Innovation, 3.Critical Thinking and Problem Solving, 4.Global and Cultural Awareness 5. Digital Citizenship 6. Information and Media Literacy 7. Technology Literacy**	
	Core Ideas:	**1. There are a variety of resources available to help navigate the career planning process.** **2. Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.** **3. Multiple solutions often exist to solve a problem.** **4. Awareness of and appreciation for cultural differences is critical to avoid barriers to productive and positive interaction.** **5. Detailed examples exist to illustrate crediting others when**

		incorporating their digital artifacts in one's own work. 6. Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated. 7. Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others
	Performance Expectation/s:	1. 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential. 2. 9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 3. 9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2). 4. 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal. 5. 9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 5. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 6. 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 7. 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 7. 9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4,

		6.1.8.EconET.1, 6.1.8.CivicsPR.4).
	Career Readiness, Life Literacies, & Key Skills Practices	
	• **Act as a responsible and contributing community member and employee.** • **Demonstrate creativity and innovation.** • **Utilize critical thinking to make sense of problems and persevere in solving them.** • **Consider the environmental, social and economic impacts of decisions.** • **Use technology to enhance productivity, increase collaboration and communicate effectively.** • **Work productively in teams while using cultural/global competence.**	

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
X	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*	X	LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*	X	Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*	X	Standards in Action: *Climate Change*