4 Waves Properties

Content Area: **Science**
Course(s): **Applied Physical Science**
Time Period: **January**
Length: **20 days**
Status: **Published**

Unit Overview:

In this unit of study, students apply their understanding of how wave properties can be used to transfer information across long distances, store information, and investigate nature on many scales. The crosscutting concept of cause and effect is highlighted as an organizing concept for these disciplinary core ideas. Students are expected to demonstrate proficiency in using mathematical thinking, and to use this practice to demonstrate understanding of the core idea.

Enduring Understandings:

- Beats and the Doppler Effect resultfrom the characteristic behavior of waves.
- E-M wavespeed depends on the media.
- Geometric optics and ray tracing illustrate reflection and lens behavior.
- Radiowaves, light andX-rays are different wave length bands in the spectrumof electromagnetic waves.
- Snell's Law provides an explanation for the operation of optical technology.
- Sound is a longitudinal wave whose speed depends on the transmission medium in which it propagates.
- Transverse and longitudinal waves exist in mechanical media, such as springs and ropes, and in the Earth as seismic waves.
- Transverse waves provide an explanation for the behavior of light.
- Wave reflection is mathematically predictable.
- Wavecharacteristics include interference, diffraction, refractionand polarization.
- Wavelength, frequency and wave speed are related.
- Waves carry energyfrom one place to another.

Essential Questions:

- How are wavelength and frequency related
- How do musical instruments work?
- How do wavelength and frequency affect waves
- How do you measure wavelength and amplitude
- How does amplitude affect waves
- What are waves, and what kinds of waves do we come in contact with in our lives?

- What is sound?
- What is the Doppler effect?

Standards/Indicators/Student Learning Objectives (SLOs):

- SWBAT discuss how wave properties affect different types of waves
- SWBAT discuss how waves can interact with each other
- SWBAT explain how sound is made and how wave properties determine how it sounds
- SWBAT explain the doppler effect and use the equation to predict
- SWBAT how frequency and wavelength are related

SCI.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.
SCI.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
SCI.HS-PS4-3	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.
SCI.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.
SCI.HS-PS4-2	Evaluate questions about the advantages of using a digital transmission and storage of information.

Lesson Titles:

- Doppler Effect
- Sound
- Wave properties
- Wave speed

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections:

LA.RH.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of primary and secondary sources, connecting insights gained from specific details to develop an understanding of the text as a whole.
LA.RH.11-12.2	Determine the theme, central ideas, information and/or perspective(s) presented in a primary or secondary source; provide an accurate summary of how key events, ideas and/or author's perspective(s) develop over the course of the text.
LA.RH.11-12.3	Evaluate various perspectives for actions or events; determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
LA.RH.11-12.4	Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
LA.RH.11-12.6	Evaluate authors' differing perspectives on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.
LA.RH.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, qualitatively, as well as in words) in order to address a question or solve a problem.
LA.RH.11-12.8	Evaluate an author's claims, reasoning, and evidence by corroborating or challenging them with other sources.
LA.RH.11-12.9	Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.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.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.WHST.11-12.5	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.
LA.WHST.11-12.6	Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information.
	The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, ð˜ˆ = ((ð˜£â‚+ð˜£â‚‚)/2)ð˜©, can be solved for ð˜© using the same deductive process.
	The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.
	Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, p + 0.05p is the sum of the simpler expressions p and 0.05p. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.
	An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Discovery of the Earth's Core
- Doppler Effect model
- Refraction through a glass
- Resonance online lab
- Resonance Tube
- Ripple Tank online lab
- Slinky lab
- Sound notes
- Sound online lab
- Wave Properties Notes
- Waves on a String online lab

Modifications

ELL Modifications:

- Focus on domain specific vocabulary and keywords
- Front load information
- Group students
- Provide ELL students with multiple literacy strategies
- Sheltered English Instruction
- Use real objects when possible

IEP & 504 Modifications:

- less none of the above, all of the above, which of the following apply, or which do not apply type questions (again it is testing for understanding of the question not the content)
- providing students with content vocabulary prior to teaching a lesson including that vocabulary (pre-teaching)
- providing study guides that don’t lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides

- scaffolded notes
- teaching the main ideas/concepts (limiting not needed details)to be taught and repeating them in several different ways over several different days (goal is 7 different ways same concept for students with learning disabilities)

G&T Modifications:

- Determine where students' interests lie and capitalize on their inquisitiveness. (Is there a specific career they are interested in? How would this apply to their interest?)
- Employ differentiated curriculum to keep interest high.
- Encourage students to explore concepts in depth and encourage independent studies or investigations.
- Invite students to explore different points of view on a topic of study and compare the two.
- Provide additional rigorous challenge problems for advanced students
- Student led/directed discussions

At Risk Modifications

- guided notes
- hands-on Instruction
- modeling and showing lots of examples
- non-verbal redirection of behaviors
- outlines & graphic organizers
- scaffolded notes
- slower pacing of materials
- study guides

Alternative assessments:

Alternative assessments:

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Benchmark Assessments:

Benchmark Assessments:

Skills-based assessment

Reading response

Writing prompt

Lab practical

Formative Assessment:

- Anticipatory Set
- Closure
- Doppler Effect
- Properties quiz
- Sound quiz
- Warm-Up

Summative Assessment:

- Alternate Assessment
- Marking Period Assessment
- Personalized learning project
- Waves unit test

Resources & Materials:

- Lab equipment
- Notes
- practice
- study guides

Technology:

- Analyze the capabilities and limitations of current and emerging technology resources and assess their potential to address personal, social, lifelong learning, and career needs. 8.1.12.D.5
- Apply previous content knowledge by creating and piloting a digital learning game or tutorial. 8.1.12.B.2
- chromebook
- Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community. 8.1.12.C.1
- https://phet.colorado.edu/en/simulation/sound
- https://phet.colorado.edu/sims/html/wave-on-a-string/latest/wave-on-a-string_en.html
- https://sites.google.com/site/mantonphysicalscience/
- internet
- Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers. 8.1.12.E.2

TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.D.1	Demonstrate appropriate application of copyright, fair use and/or Creative Commons to an original work.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.F.CS1	Identify and define authentic problems and significant questions for investigation.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.