

PHYSICS

HS-PS4-1: Waves and their Applications in Technologies for Information Transfer

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

Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.

Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.

Evidence Statements: HS-PS4-1

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
<p>Using Mathematics and Computational Thinking</p> <p><u>Mathematical and computational thinking at the 9-12 level builds on K-8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.</u></p> <p><u>Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.</u></p>	<p>PS4.A: Wave Properties</p> <p><u>The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.</u></p>	<p>Cause and Effect</p> <p><u>Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.</u></p>

Connections to other DCIs in this grade-band: HS.ESS2.A

Articulation of DCIs across grade-bands: MS.PS4.A ; MS.PS4.B

NJSLS- ELA: RST.11-12.7

NJSLS- Math: MP.2, MP.4, HSA-SSE.A.1, HSA-SSE.B.3, HSA.CED.A.4

5E Model

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

Engage Anticipatory Set	<p>GCSE Science Revision - Types of Waves https://www.youtube.com/watch?v=w2s2fZr8sqQ</p> <p>Radio Waves & Electromagnetic Fields Students will investigate how radio broadcasting and radio receivers work. https://phet.colorado.edu/services/download-servlet?filename=%2Factivities%2F3084%2FHW11_SIM.pdf</p>
Exploration Student Inquiry	<p>Making Waves and Determining Mathematical Relationships Students make waves and find an important relationship between variables. http://betterlesson.com/lesson/639696/making-waves-and-determining-mathematical-relationships</p> <p>Wave Lab Stations Day 1 Students participate in lab stations about the wave phenomena.</p>

	<p>http://betterlesson.com/lesson/639703/wave-lab-stations-day-1</p> <p><u>Wave Lab Stations Day 2</u></p> <p>Students will be able to identify the wave phenomena occurring at each station in the lab.</p> <p>http://betterlesson.com/lesson/639704/wave-lab-stations-day-2</p>
Explanation Concepts and Practices	<p><u>In these lessons</u></p> <p>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.</p> <p>Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.</p> <p><u>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):</u></p> <p>PS4.A: Wave Properties</p> <p>The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.</p>
Elaboration Extension Activity	<p><u>Measuring the Speed of Sound</u></p> <p>What is the speed of sound in our classroom? Today, students find out!</p> <p>http://betterlesson.com/lesson/640789/measuring-the-speed-of-sound</p>
Evaluation Assessment Tasks	<p><u>Assessment Task A: Making Waves Activity</u></p> <p>Students will use mathematical relationships to support their claims regarding the relationships between frequency, speed and wavelength.</p> <p>Using the mathematical relationship, students assess claims about any of the three quantities when the other two quantities are known for waves traveling in various specified media.</p> <p>Students use the mathematical relationships to distinguish between cause and correlation with respect to the supported claims.</p>