

Educational Resources from *Phenomenon Science Education*
Student Proficiency Goals for Performance Expectation **HS-PS4-1**



Information about Performance Expectation HS-PS4-1

Performance Expectation 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 Limits.

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

Science and Engineering Practice (Using Mathematics and Computational Thinking)

- Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations.

Disciplinary Core Idea (PS4.A: Wave Properties)

- 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.

Crosscutting Concept (Cause and Effect)

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

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SEP (Using Mathematics and Computational Thinking):

- Students describe the relationships among the frequency, wavelength, and speed of waves traveling within different media.
- Students use the formula $v = f\lambda$ to show that regardless of the frequency or wavelength, the speed of a wave is constant within a specific medium.
- Students use the formula $v = f\lambda$ to explain the change in wavelength that occurs when a wave enters a new medium.
- Students use the formula $v = f\lambda$ to solve for one quantity when the other two quantities are known and distinguish between cause and correlation in variation of any of the three quantities.

DCI (PS4.A Wave Properties):

- Students infer that the wavelength and frequency of a wave are related by the speed of the wave.
- Students know that the speed of a wave depends on the type of wave and the medium through which it is passing.

CCC (Cause and Effect):

- Students consider how empirical evidence can support or refute claims of causation versus correlation regarding the behavior of waves traveling within different media.
- Students consider the effects of media on the speed of travel, and thus the wavelength and frequency, of waves.