Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

**Grade 8 Science
Unit 4 Range Performance Level Descriptors
Providing Solutions to Problems Using Simple Wave Properties
September 2023**

Grade 8 Unit 4 Assessment Performance Expectations

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. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [*Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.*]

MS-PS4-2- Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [*Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.*]

MS-ETS-1-1. 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.

SIPS Unit 4 Range Performance Level Descriptors

SIPS tasks require students to apply and transfer their science learning through engagement with science and engineering practices (SEPs) and application of the crosscutting concepts (CCCs) to demonstrate their understanding of disciplinary core ideas (DCIs) to make sense of and explain phenomena and/or to design solutions to phenomena-rooted engineering problems.

Level 1	Level 2	Level 3 (Target)	Level 4
A student performing at this level produces evidence of three-dimensional science learning by their ability to:	A student performing at this level produces evidence of three-dimensional science learning by their ability to:	A student performing at this level produces evidence of three-dimensional science learning by their ability to:	A student performing at this level produces evidence of three-dimensional science learning by their ability to:
• use some data to describe the mathematical relationship between amplitude and energy.	• use data or graphical displays to develop incomplete conclusions related to the relationships between frequency, wavelength, wave speed, amplitude, and/or energy transmitted by a wave.	• interpret data and develop accurate and complete graphical displays to identify repeating patterns to develop accurate and complete conclusions with evidence related to relationships between frequency, wavelength, wave speed, amplitude, and energy transmitted by a wave in a given time.	• analyze and interpret data and develop accurate and complete graphical displays to identify repeating patterns to develop scientifically accurate and complete conclusions with evidence related to relationships between frequency, wavelength, wave speed, amplitude, and energy transmitted by a wave in a given time.
• use a model to develop an explanation of wave properties related to reflection, absorption, or refraction when waves interact with materials.	• construct an incomplete model to develop an explanation of a change to some wave properties after experiencing a change in medium.	• develop and use accurate and complete models to create accurate and complete explanations of a wave passing from an original medium to a second medium involving reflection, absorption, or refraction which results in a change to some wave properties (e.g., wavelength, frequency, amplitude, and color, etc.).	• develop and use accurate and complete models to create scientifically accurate and complete explanations of a wave passing from an original medium to a second medium involving reflection, absorption, or refraction which results in a change to some wave properties (e.g., wavelength, frequency, amplitude, and color, etc.).
• use a model to develop a description of light visible to humans as compared to light waves perceived by other species.	• develop and use mathematical models to create an incomplete explanation of the frequencies and wavelengths of light visible to humans as compared to light	• develop and use accurate and complete mathematical models to create accurate and complete explanations of the frequencies and wavelengths of light	• develop and use accurate and complete mathematical models to create scientifically accurate and complete explanations of the frequencies and

	waves that some species can perceive that humans cannot.	visible to humans and relate those properties of the mathematical wave model that correspond to the properties of light that some species can perceive that humans cannot.	wavelengths of light visible to humans and relate those properties of the mathematical wave model that correspond to the properties of light that some species can perceive that humans cannot.
• identify a solution to a problem related to sound waves.	• identify a design problem related to waves to generate and compare solutions based on some criteria and constraints of the design problem and describe how the solution functions.	• define a design problem related to waves to generate and compare solutions based on criteria and constraints of the design problem and describe a procedure to use to evaluate how well the solution functions.	• define a design problem related to waves to generate and compare solutions based on criteria and constraints of the design problem and generate a procedure to evaluate how well the solution functions based on using materials with certain properties that are well-suited for specific functions (e.g., lenses, mirrors, sound barriers).