

**COSMOS Experiment-Properties of Waves**

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| **Grade 9-12** | |  | |
| **Topic:**  **Wave’s properties** | | **Materials:**   * Laptops * Pluto * COSMOS Toolkit | |
| **Science & Engineering Practices (SEPs)**  Communicate technical information or ideas in multiple formats.    Asking questions and defining problems given the COSMOS kit. | **Disciplinary Core Ideas (DCIs)**  Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PS4-5) | **Crosscutting Concepts (CCs)**  Empirical evidence is required to  differentiate between cause and  correlation and make claims about  specific causes and effects.  Systems can be designed to cause a  desired effect. (HS-PS4-5)  Models (e.g., physical, mathematical,  computer models) can be used to  simulate systems and interactions—  including energy, matter, and  information flows—within and between  systems at different scales. (HS-PS4-3) |  |
| **New York State P-12 Science Learning Standards**  **HS-PS4-1.** Use mathematical representations to support a claim regarding relationships among the period, frequency, wavelength, and speed of waves traveling and transferring energy (amplitude, frequency) in various media.  [Clarification Statement: Examples of data could include descriptions of waves classified as transverse, longitudinal, mechanical, or standing, electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, seismic waves traveling through Earth, and direction of waves due to reflection and refraction.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.] | | | |
| **Essential Question:**  What are the frequency and amplitude of the wave? | | | |
| **Learning Target** | I can determine frequency of a wave from a time graph of a wave. | | |
| **Engage** | Students give examples of waves.  Students draw waves. | | |
| **Explore** | One group of students sends a radio wave from a laptop to a laptop of another group of students. The second group of students will identify the properties of the received wave. The first group of students will give feedback to the second group. | | |
| **Explain** | Students will explain how they get their answers. The amplitude is determined from the height of the wave measured from the equilibrium line. Frequency is determined from the reciprocal of the period of a wave. | | |
| **Extend** | Students give three real-life examples of amplitude and frequency of waves. | | |
| **Evaluate** | Students draw two different waves with different frequency and amplitude. Students determine the properties of the waves and compare the properties of the two waves. | | |
| **Differentiation** | Students who demonstrated mastery of the skills will write an example of determining a wave’s properties with detailed explanation.  Students who have troubles with the skill will continue to be involved in the whole-class sharing of how to determine the properties of a wave. | | |