



# Honors Physics - Unit 10 - Vibrations and Waves

## Unit Focus

Properties of waves are introduced as we explore the wave velocity equation by finding the frequency and wavelength of different types of waves. Simple harmonic motion is introduced with a discussion of spring force and spring potential energy, pendulums and other oscillatory motion and how that motion relates to waves. Throughout the unit. Students will apply the fundamentals of wave characteristics to different scenarios and problems. Students will integrate prior units (force, energy) and integrate this content into their analysis. This unit serves as a fundamental base for the student of sound and light.

## Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p><b>Next Generation Science</b>  <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> <li>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. <i>HS-PS4-5</i></li> </ul> <p><b>Next Generation Science Standards (DCI)</b>  <i>Science: 11</i></p> <ul style="list-style-type: none"> <li>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. <i>PS4.9.A1</i></li> <li>Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. <i>PS4.9.A3</i></li> </ul> <p><b>Madison Public Schools Profile of a Graduate</b>  <i>Critical Thinking</i></p> <ul style="list-style-type: none"> <li>Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)</li> </ul>	<p><b>T1</b> Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.  <b>T2</b> Use the scientific process to generate evidence that addresses the original questions.</p>	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p><b>U1</b> Two or more waves that occupy the same space at the same time may interfere constructively or destructively.  <b>U2</b> When waves encounter objects they can reflect, refract, diffract or absorb depending on the property of material.  <b>U3</b> Waves are used in scientific applications and everyday purposes.</p>	<p><b>Q1</b> How is the resonant frequency of an object related to its practical use?</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
<p><b>K1</b> Students will identify that the cause of every wave is a vibrating source.  <b>K2</b> Students will be able to define the word medium and be able to identify the mediums of common waves.  <b>K3</b> Students will be able to distinguish between a transverse and a longitudinal wave and give examples of each.  <b>K4</b> Students will be able to diagram a wave by identifying features (amplitude, wavelength, frequency etc.)  <b>K5</b> Students will not confuse frequency with the velocity of a wave.  <b>K6</b> Students will understand the relationship between velocity, frequency and wavelength.  <b>K7</b> Students will be able to explain resonance  <b>K8</b> Students will be able to define and give examples of Simple Harmonic Motion</p>	<p><b>S1</b> Students will understand the relationship between velocity, frequency and wavelength. Given any two variables, students should be able to determine the third.  <b>S2</b> Students will be able to define and identify examples of constructive and destructive interference. They will be able to sketch simple interference situations between two waves.  <b>S3</b> Students will be able to identify nodes and antinodes in a standing wave.  <b>S4</b> Students will be able to solve SHM problems in springs, penduluae and other objects</p>	