

<b>Key Physics Concepts</b>	
<b>Section Summaries</b>	<b>Physics Principles</b>
<p><b>Section 1 Sounds in Vibrating Strings</b></p> <p>To connect vibrations and (eventually) waves to sound, students observe the vibration of a plucked string and compare how pitch varies when the length of the vibrating string is changed. They then explore the affect on vibrations and pitch when the tension of the string changes.</p>	<p>Sound and vibration Vibrations on strings Tension, string length, and pitch and frequency</p>
<p><b>Section 2 Making Waves</b></p> <p>By making waves with coiled springs, students observe transverse and longitudinal waves, wave pulses and periodic and standing waves. Students investigate the relationship between wave speed and amplitude, the effect of medium on wave speed, and wave addition when waves meet (the principle of superposition). Using standing waves, students develop the relationship between wave speed, frequency and velocity.</p>	<p>Wave Medium Crest, trough, and amplitude Node and antinode Longitudinal waves Transverse waves Standing waves Periodic waves</p>
<p><b>Section 3 Sounds in Strings Revisited</b></p> <p>Students return to vibrating strings, interpreting what they observed in <i>Section 1</i> in terms of standing wave patterns, wavelength, and frequency.</p>	<p>Wavelength Frequency Wave speed Tension Direct relationship Inverse relationship</p>
<p><b>Section 4 Sounds from Vibrating Air</b></p> <p>Drinking straws and test tubes filled with water are used to model musical instruments that use columns of vibrating air to produce sounds. The relationship of pitch to length of the column of air provides another look at frequency and wavelength, helping students understand how sound is produced by standing compressional (longitudinal) waves.</p>	<p>Pitch Wavelength Diffraction Wave speed</p>
<p><b>Section 5 Shadows</b></p> <p>In this section, students begin looking at how light can be incorporated into the <i>Chapter Challenge</i>. Students begin their study of light with observations that indicate that light rays travel in straight lines. That idea is exploited to understand how shadows are formed.</p>	<p>Light travels in straight lines Shadow formation</p>
<p><b>Section 6 Reflected Light</b></p> <p>Students explore how light rays are reflected by flat mirrors. They explore the effect of changing the angle at which light rays hit a mirror and learn to predict and control where images will be visible.</p>	<p>Law of reflection Angle of incidence Angle reflection Normal</p>
<p><b>Section 7 Curved Mirrors</b></p> <p>Shining a light beam on concave and convex mirrors increases student understanding of the variables that are involved in creating an image. They apply what they have learned to predict the path of a light beam reflected off a mirror.</p>	<p>Focal point Focal length Real image Virtual image</p>

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<p><b>Section 8 Refraction of Light</b></p> <p>In this section, sending rays of light through a block of acrylic allows students to explore what happens when light goes from air into another substance. They observe and measure the angle of incidence and the angle of refraction as they learn about Snell's law and how to predict where the beam of light can be observed. The <i>Active Physics Plus</i> uses trigonometric sine functions to express Snell's law.</p>	<p>Refraction Snell's law Critical angle Total internal reflection</p>
<p><b>Section 9 Effect of Lenses on Light</b></p> <p>Shining a light through convex lenses with different focal lengths enables students to observe how the size of the image changes as the light source moves closer to, then farther away from a lens. They then consider how the variables in image formation with lenses can enhance their sound and light show for the <i>Chapter Challenge</i>. The <i>Active Physics Plus</i> introduces students to the lens equation.</p>	<p>Focal point Focal length Refraction</p>
<p><b>Section 10 Color</b></p> <p>This final section adds to the study of light with observations of colored shadows. By carefully tracing the light rays from different colored lights sources, they explore color addition and colored shadows.</p>	<p>Subtractive color mixing Additive color addition</p>

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