

P20 Unit D: Reflection & Interference Online Lab

Name: _____

Date: _____

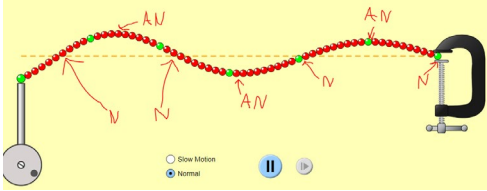
To access the animation for the lab, go to https://phet.colorado.edu/sims/html/wave-on-a-string/latest/wave-on-a-string_en.html or Google “phet wave on a string”.

Part A: Reflection

Instruction	Question
1. Make sure the animation is set to “Manual” on the upper left hand corner box and “Fixed End” in the upper right hand corner box. Turn the <i>Damping</i> down to “none”. Click on the wrench and wiggle it to make a wave.	1. What type of wave is produced in the string? Transverse wave (particle movement is perpendicular to the direction of propagation).
2. Click on the wrench again and make a crest.	2. When the crest pulse hits the fixed end C-clamp, it reflects. What happens during this reflection? The crest inverts to a trough and changes direction back towards the wrench.
3. Change the string from “fixed end” to “loose end”. Create another crest pulse in the string.	3. When the crest pulse hits the loose end C-clamp, it reflects. What happens during this reflection? The crest does not invert, but stays as a crest and changes direction back towards the wrench.
4. Change the tension in the string.	4. What does changing the tension in the string do to the wave? Decreasing tension decreases wave speed. Tension is directly proportional to wave speed in a string.

Part B: Reflection and Interference in a Standing Wave

5. Reset the animation by clicking the orange circular arrow button. Click on the “Pulse” and “Fixed End buttons. Turn the Damping down to “None”. Click on the “Slow Motion” button. Click the green button with a pointy wave pulse on it to generate a crest pulse. As the pulse is moving down the string, click the	5. What happens when the crest pulse is incident (runs into) the reflected trough pulse? The two waves overlap (interfere) and cancel out briefly. This is called <u>destructive interference</u>.
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green button again to make a second crest pulse.	
6. Repeat the steps above, this time using the “Loose End”.	<p>6. What happens when the crest pulse is incident on the reflected crest pulse?</p> <p>The two waves overlap (interfere) and become one larger amplitude wave. This is called <u>constructive interference</u>.</p>
7. Reset the animation again. Click on “Oscillate”. Turn the Damping to one tick more than “None”. The resulting wave is called a standing wave.	<p>7. Draw a diagram of your standing wave below. Label the nodes and antinodes.</p>  <p>The nodes appear where the string does not move much. The antinode appear where maximum string displacement occurs (tops and bottoms of pulses).</p>

Part C: Determining the speed of a wave.

<p>8. Restart the animation. Click on “Oscillate”, “No End” and set the Damping to “None”. Click on the ruler. Set the Frequency to 1.50 Hz. Pause the animation.</p>	<p>Using the measurement from the ruler and the universal wave equation, determine the speed of the wave when the tension is high, medium and low.</p> <p>High: when $f = 1.50 \text{ Hz}$, $\lambda = 4.1 \text{ cm}$ $v = f\lambda \rightarrow v = (1.50 \text{ Hz})(0.041 \text{ m}) = \underline{0.062 \text{ m/s}}$</p> <p>Medium: $v = 0.038 \text{ m/s}$ Low: $v = 0.012 \text{ m/s}$</p>
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