

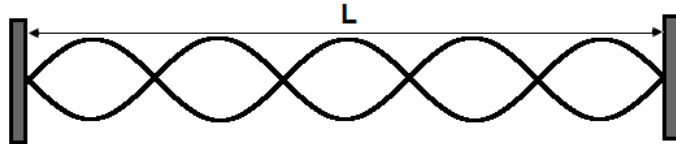
Name: _____

AP Physics 1: Waves
Doppler Effect and Harmonics of Strings HW

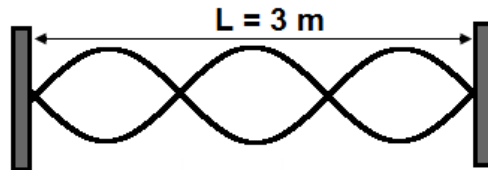
Conceptual Questions

1. When all the strings on a guitar are stretched to the same tension, will the velocity of a wave along the more massive bass strings be faster or slower than the velocity of a wave on the lighter strings?
2. To increase the velocity, and therefore the pitch of a stringed instrument, how should the player change the tension?

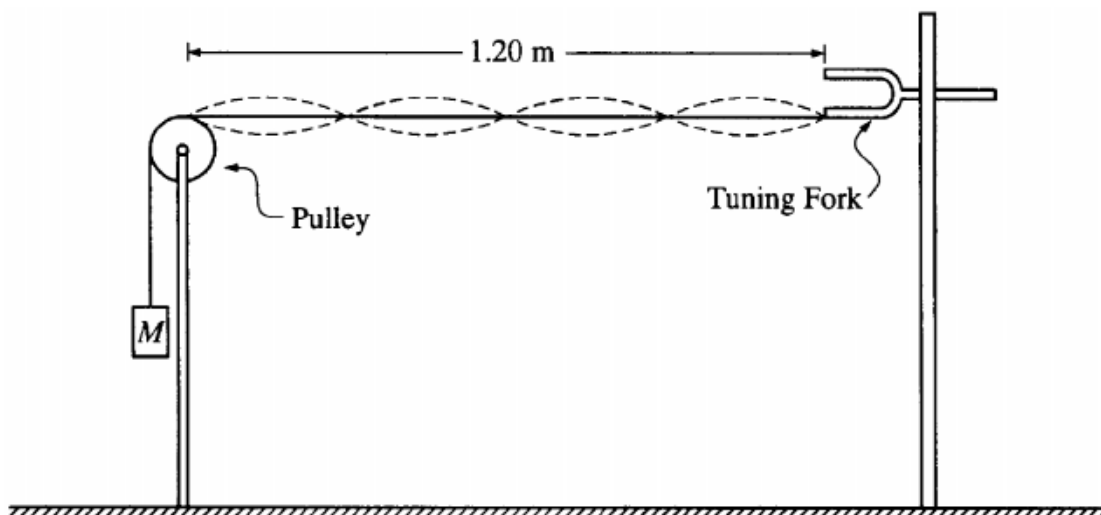
3. A string of length L , shown above, oscillates at a frequency at which a standing wave is produced. What is the wavelength of the wave in the string?
 - A. L
 - B. $L/2$
 - C. $L/3$
 - D. $2L/4$
 - E. $2L/5$



4. A string with a length of 3 m, shown below, oscillates at a frequency 6 Hz. What is the speed of the wave in the string?
 - A. 3 m/s
 - B. 6 m/s
 - C. 9 m/s
 - D. 12 m/s
 - E. 15 m/s



5. A guitar string produces 4 beats per second when tuned with a 350 Hz tuning fork and 9 beats per second when tuned with a 355 Hz tuning fork. What is the actual frequency of the guitar?



6. To demonstrate standing waves, one end of a string is attached to a tuning fork with frequency 120 Hz. The other end of the string passes over a pulley and is connected to a suspended mass M as shown in the figure above. The value of M is such that the standing wave pattern has four "loops." The length of the string from the tuning fork to the point where the string touches the top of the pulley is 1.20 m. The linear density of the string is 1.0×10^{-4} kg/m, and remains constant throughout the experiment.
- Determine the wavelength of the standing wave.
 - Determine the speed of transverse waves along the string.
 - The speed of waves along the string increases with increasing tension in the string. Indicate whether the value of M should be increased or decreased in order to double the number of loops in the standing wave pattern. Justify your answer. Assume a set frequency (why do we assume this?)
 - If a point on the string at an antinode moves a total vertical distance of 4 cm during one complete cycle, what is the amplitude of the standing wave?