Name _____ Physics

Standing Wave Lab

Objective: To learn how to measure the frequency, wavelength and speed of waves generated in a spring

Making a Standing Wave

Have two students hold the spring so that the tension is taught. Shake the spring gently and continuously at a frequency such that the whole spring vibrates in segments or loops between certain fixed points or nodes. The loops are called antinodes. Such a wave is called a standing wave. A spring vibrating in three loops is shown below. The distance between two adjacent nodes is one-half wavelength. Thus, three consecutive nodes measure one whole wavelength. Practice making the spring vibrate in one, two and three loops

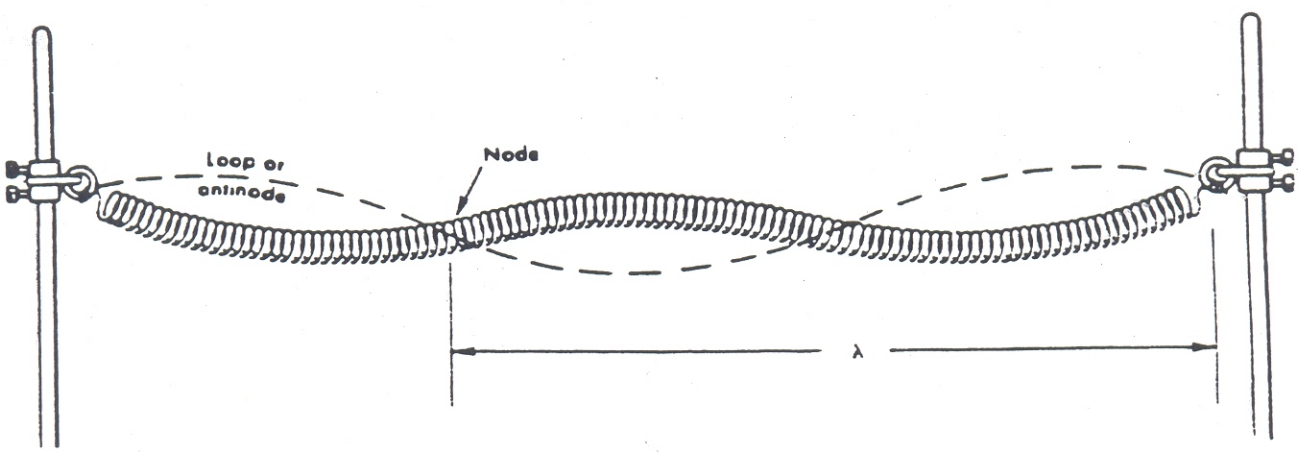

Figure 1

Measure the Speed of a Standing Wave

To measure the speed of the traveling waves, which are producing the standing waves, you must first measure the frequency and wavelength of the standing wave. Measure the frequency of a wave by timing 10 complete cycles or vibrations, then dividing by the time you get (remember, frequency is # of waves per second) Measure the length of the wave according to what you learned in class.

Procedure:

1) Measure the length of the standing wave
2) Measure the period as described above
3) Using the period, find the frequency
4) Use the wave speed equation to find the speed of the wave
5) Record the info in the table below and repeat for two and three antinodes

Trial	# of Antinodes	# of Nodes	Period	Frequency	Wavelength	Wave Speed
Trial #1	1					
Trial #1	1					
Trial #2	2					
Trial #2	2					
Trial #3	3					
Trial #3	3					

1. **Measure the total length of the spring**. Record this below and find the wavelength of the standing according to what you learned in class.

Trial #1

Trial #2

Trial #3

Trial #1

Trial #2

Trial #3

2. Finding the period. Record the time it takes for 10 complete cycles and divide the total time by 10. Place the period in the table.

Trial #1: _____ total time / 10 = _____ s

Trial #1: _____ total time / 10 = _____ s

Trial #2: _____ total time / 10 = _____ s

Trial #2: _____ total time / 10 = _____ s

Trial #3: _____ total time / 10 = _____ s

Trial #3: _____ total time / 10 = _____ s

3. Find the frequency using the period. Show all work below.

Trial #1

Trial #1

Trial #2

Trial #2

Trial #3

Trial #3

4. **Determine the wave speed and place all work below**

Trial #1

Trial #1

Trial #2

Trial #2

Trial #3

Trial #3

Graphs: Plot (1) graph of wavelength vs. frequency for the three different standing waves. Chose either of the two trials for each standing wave to plot on graph. Use a pencil and graph paper and staple it to this lab.

Questions:

1. How does the wavelength relate to the frequency for a standing wave? (see graph) _____

2. What does this tell you about the speed of standing waves for a given length and tension.

3. Compare the speed of the pulse to the speed of the standing waves for a given length and tension _____

_____

4. What, apparently, determines the speed of a wave on a spring? _____

5. Does the frequency for generating each standing wave seem to be critical? Why or why not? __