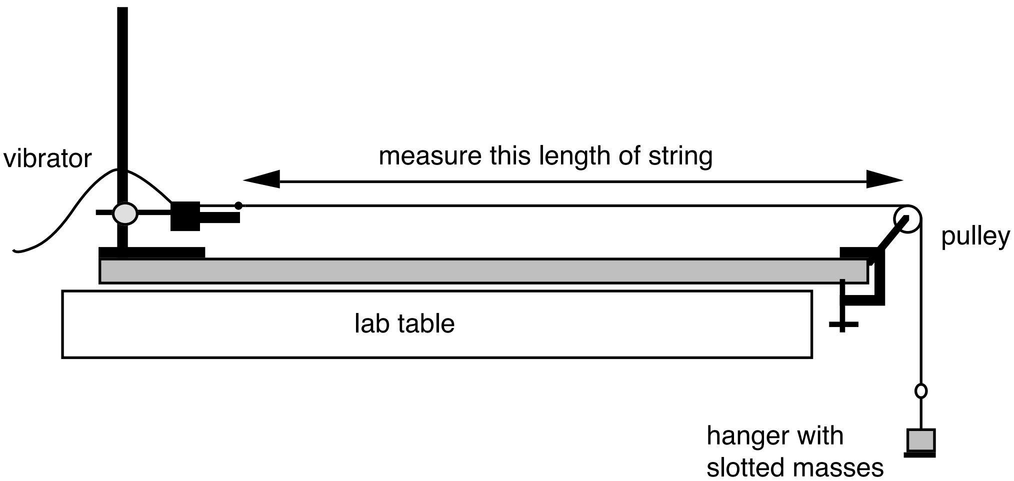
 NAME: ________________

Lab 7-3: Standing Waves in a String

Purpose:
1. To examine standing waves created in a string as waves interfere with each other as they **reflect** back and forth. (You have seen a standing wave generated in a slinky.) Identify nodes and antinodes
2. To determine the relationship between the tension in a string and the speed of a wave in that string.

Diagram:



Procedure:
1. Set up the apparatus as shown in the diagram. Adjust everything so that there is 1 meter of string from the vibrator to the pulley. **Your teacher will tell you how much mass to hang at the start.**

2. Turn on the string vibrator. You will hear it making some noise. It will be forcing the string to vibrate at 60 Hertz.

3. Increase the tension in the string by adding masses to the those already on the hanger until you get a standing wave in the string *without* a node in the middle. You should see exactly half a wave in the string; the ends of the string are nodes and the middle of the string will be an anti node. Record the total mass suspended. (Remember to include the mass of the hanger.)

4. Decrease the tension in the string by removing some of the suspended mass until you get a node in the middle of the string. You should then see a standing wave with a whole wave fitting in the string. Record the total mass suspended.

5. Decrease the tension until there are two and then finally three nodes in the string. Each time, record the total mass that is suspended.

6. Adjust the tension to get *one* node in the middle again. Carefully unclamp the stand holding the string vibrator. Slowly slide the stand towards the pulley. The standing wave will disappear, and then reappear. When a standing wave reappears in the string, record the number of nodes you see, and also the length of the string.

Data:

Trial	*# Nodes*	*Frequency (Hz)*	*Total Mass (kg)*	*String Length (m)*
1	0	60		1
2	1	60		1
3	2	60		1
4	3	60		1
5		60		

Lab 7-3: **Standing Waves in a String**

Results:

Trial	*# Waves*	*Frequency (Hz)*	*Tension (N)*	*Wave Length (m)*	*Wave Speed (m/s)*
1		60			
2		60			
3		60			
4		60			
5		60			

Calculations:

1. For each trial, calculate the **tension** in the string. Show your calculations here and record your results in the Results table.

2. For each trial, draw a picture of the standing wave.
   a. 0 nodes
   b. 1 node
   c. 2 nodes
   d. 3 nodes

3. For each trial, calculate the **wavelength** of the standing wave. Show your calculations here and record your results in the Results table.

4. For each trial, calculate the **speed** of the wave in the string. Show your calculations here and record your results in the Results table.

Conclusion:

1. What is the relationship between the *speed* of a wave in a string and the *tension* in the string?

2. For the last trial, what happened when you shortened the length of the string? Why?

3. Suppose you had an identical string *2* meters long. You adjust the tension in the string until it equals the tension you had in your first trial. What would be the speed of the wave? Draw what the string would look like, clearly indicating where nodes would exist.