

# Pendulum Lab 5th hour Physics

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### Introduction

The purpose of this lab was to determine what the main factor is that affects the period of a pendulum. The three factors are String length, Amplitude, and Mass. The amplitude is the starting potential energy, or at what angle you hold the pendulum and then let it go. A period in this case would be each time the pendulum does a full revolution past the central point. We would also measure the frequency, or how many times the pendulum passes the central point in a given amount of time. The pendulum was set up using a metal rod with a wood piece on top that had the correct angle measures on it. A string is then simply pulled through wood slot at the top which then holds the pendulum. The hypothesis is that amplitude is the main factor that affects the period of a pendulum.

### Materials

Pendulum  
Meter Stick  
15 Washers  
Stopwatch  
Notebook to record data  
Pencil

### Procedure

Testing the initial potential energy(amplitude)

1. Place 6 washers onto the weight by slipping them over the string onto the weight. This will be your constant until testing mass.
2. Take the string and fasten it to the pivot point by tucking the string into where the pin, on the backboard, is split.
3. Measure out 40cm of string. This will be your constant until testing string length. The string will be measured from the pivot point to where the string meets the weight. Adjust the string to the correct length by sliding the string up or down in the pin.
4. Have one person ready the stopwatch, and another person pull the string back to 10 degrees. When the person with the stopwatch says go, let go of the pendulum and count until it completes 10 full periods. Take the time you got and divide that by 10. That is the

time you want to record. Repeat this process going up by intervals of 5 until you reach the max of 30 degrees.

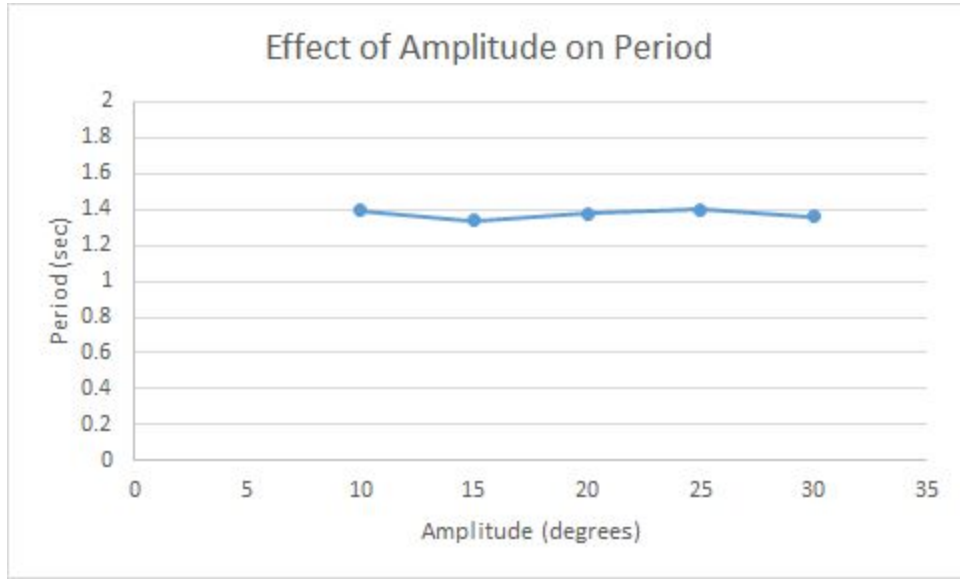
#### Testing the Mass

1. Repeat steps 1-3 from the first test but this time place only 3 washers on the weight rather than 6.
2. Have someone ready the stop watch and another person pull the string out to 30 degree. This will be the constant for the remainder of the tests. When the person with the stop watch says go, release the pendulum and count 10 full periods. Stop the stopwatch after 10. Take the time and divide it by 10, and that final time is what you will record. Repeat this process 5 more times but each time add 3 more washers until you reach the max of 15.

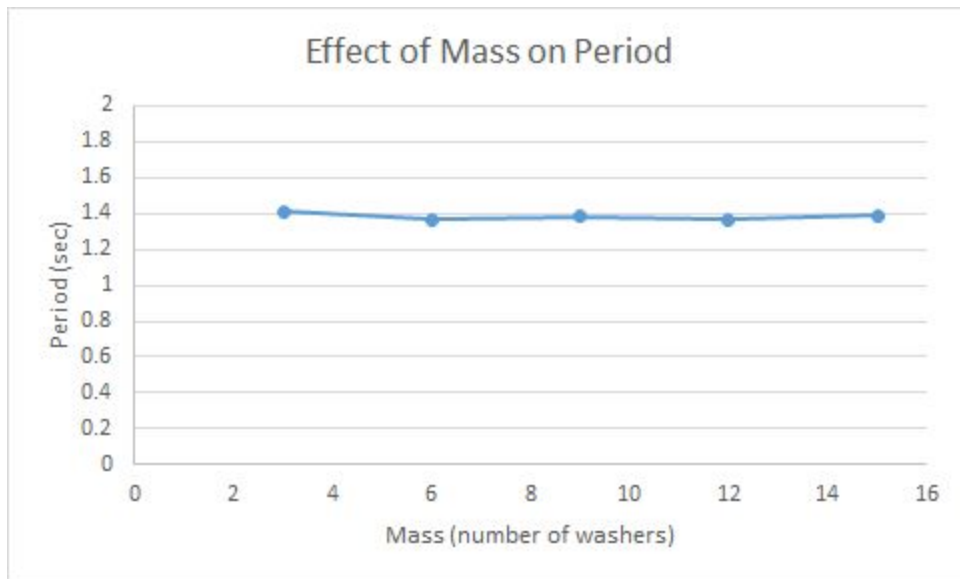
#### Testing the string length.

1. Again repeat steps 1-3 from the first test. This time however, measure the string out to 20 cm.
2. Have someone ready the stopwatch and another person pull the string out to 30 degrees. When the person with the stopwatch says go, let go of the pendulum. Count 10 full periods, and then stop the watch. Divide that time by 10 and that final time is what you record. Repeat the process 5 more times, and each time make the string 10cm longer, until you reach 60cm.

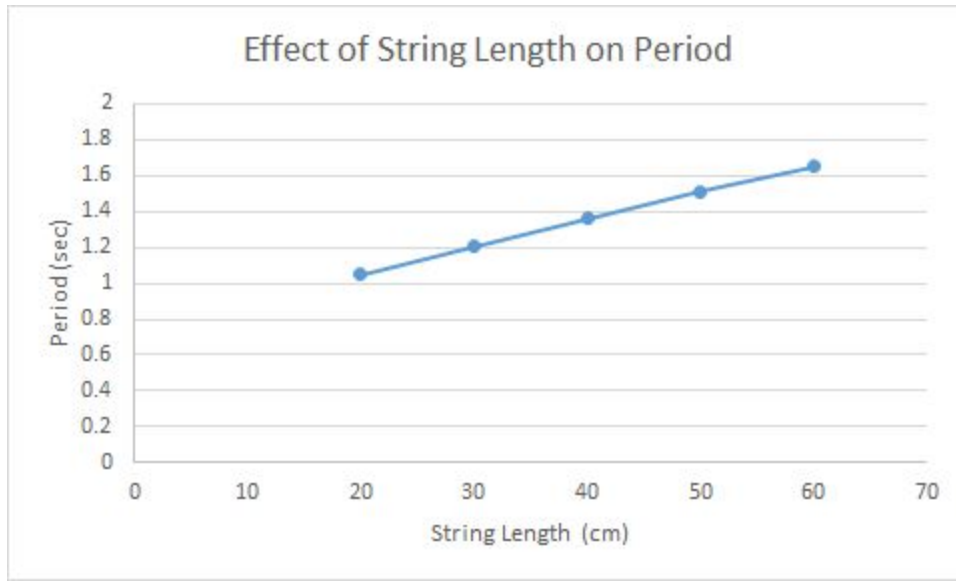
Variable	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Amplitude (degrees)	10	15	20	25	30
	1.359	1.337	1.380	1.400	1.359
Mass (number of washers)	3	6	9	12	15
	1.409	1.368	1.383	1.368	1.390
String Length (cm)	20	30	40	50	60
	1.050	1.206	1.395	1.509	1.650



$1.359 - 1.359 / 30 - 10 = 0 / 20$  Slope = 0



$1.390 - 1.383 / 15 - 9 = 0.007 / 6$  (rounded) Slope = 0



Each time was divided by 10, so each length has to be divided by 10 to get the right slope.

$$1.650 - 1.050 / 6 - 2 = 0.6 / 4 \quad \text{Slope} = 0.150$$

### Conclusion

In conclusion, it is clear to see by the data that string length had the most effect on the period of the pendulum. This is because the shorter the string, the less distance the pendulum had to travel; therefore, it would have a faster period with a shorter string and a longer period with a longer string. As we can see by the data, both amplitude and mass had basically the same time across the board. This is because no matter the weight on the pendulum or the starting energy you give the pendulum, it will always travel at relatively the same speed through each period. Some possible sources of error could have been different reaction times between the person with the stopwatch and the person handling the pendulum. Another could have been the using the stopwatch rather than the computer because the computer would have been way more accurate. This could be improved next time by actually using the computer to get the precise data. Also by having our data table set up with enough points the first time rather than having to fix it.