

Simple Harmonic Motion

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Spring Oscillations: Using Hooke's Law

What color is your spring?

You will be determining the spring constant from Hooke's Law. Complete the table below. **Make sure to read the instructions.**

Table 1

Mass (kg)	Gravitational Force (N)	Length (m)

What is the spring constant of your spring, calculated with Hooke's Law? (*Remember that you'll need to use the difference between the two measurements because you don't know the relaxed length. See the instructions for details.*)

The actual spring constant is written on the box for the springs. What is the percent error of your measurement as compared to the actual value?

Spring Oscillations: Using a Graph of T^2 vs. m

You will be determining the spring constant from T^2 vs. m graph. Complete the table below. **Make sure to read the instructions.**

Table 2

Total Vibrating Mass (kg)	Time for 10 Vibrations (s)				Observed Period T (s)
	1	2	3	Average	

What is the slope of the plot of T^2 versus m ?

What is the spring constant k as determined from the slope?

What is the percent difference between the two values of the spring constant?

What is the percent error of your measurement as compared to the actual value?

Simple Pendulum: Using a Graph of T^2 vs. L

You will be determining the acceleration due to gravity from a T^2 vs. L graph. Complete the table below. **Make sure to read the instructions.**

Table 3

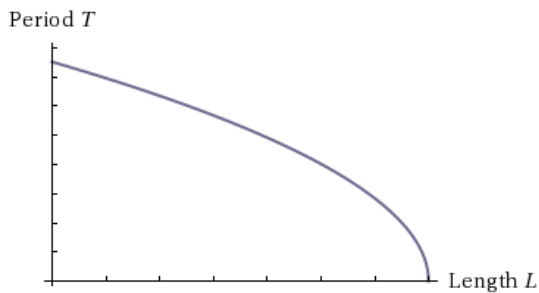
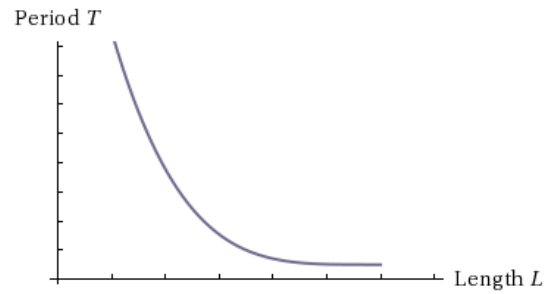
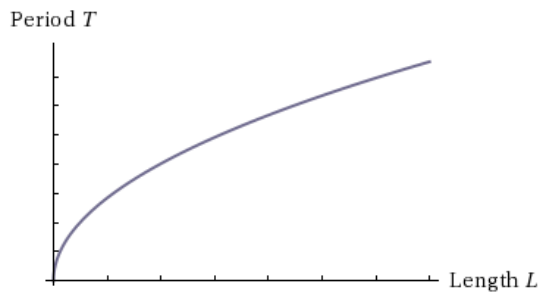
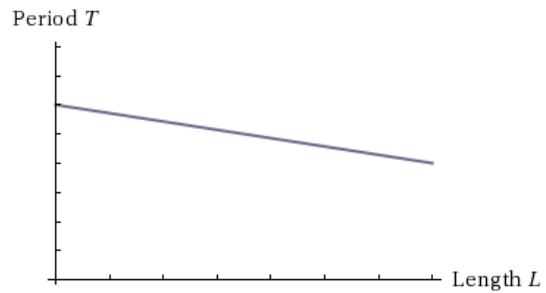
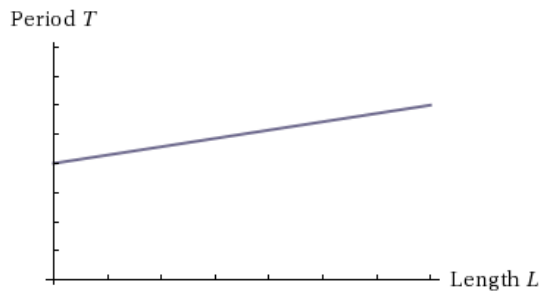
Pendulum Length L (m)	Time for 10 Oscillations (s)				Observed Period T (s)
	1	2	3	Average	

What is the slope of the plot of T^2 versus L ?

What is the acceleration due to gravity g as determined from the slope?

What is the percent error of your measurement as compared to the actual value?

Look at the values of L and T_{observed} in Table 3. Which of the following graphs correctly represents the relationship between T versus L ? (Note: The order of these options may be different in the WebAssign question.)



Analysis

Consider the measurement of the spring constant made by measuring the period of oscillation. In this lab, we made an assumption about lack of air resistance. If air resistance were a significant factor to the mass's motion, would ignoring its effect (as we did in the lab) cause a calculated value for the spring constant that is too high or too low? Justify your answer.

Which method was more accurate for the determination of k ? Why do you think this method yielded better results, and what might have contributed to discrepancies between the two methods? (Give specific contributing factors, not vague responses like “human error” or “measurement uncertainty.”)

Of your oscillation measurements, which was more accurate, k or g ? What might have contributed to any errors here? How might the measurements be improved?