AP Physics 1
California Crosspoint High School
Mr. Darrell Yee
Pendulum Lab

Lab Objective

Determine which factors affect the period of a pendulum

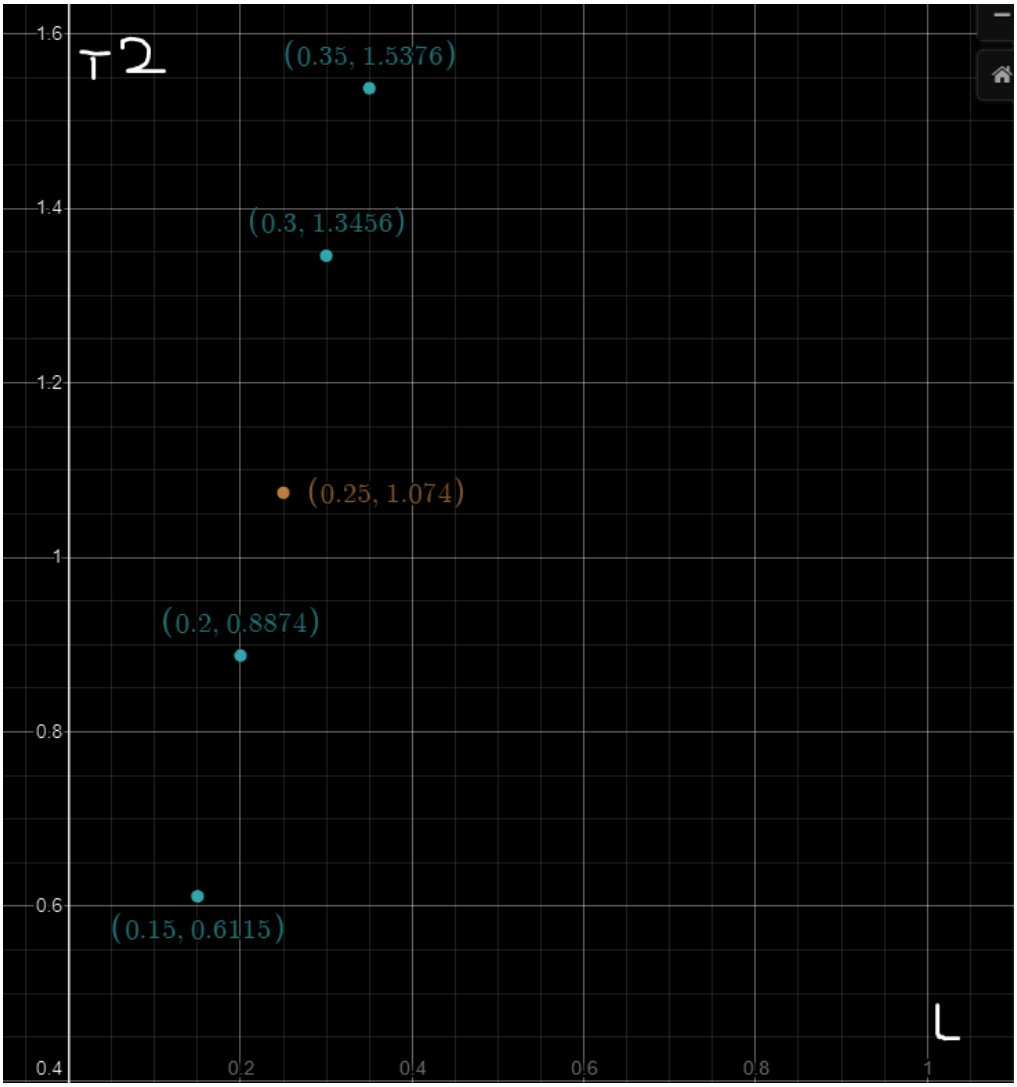
Assignment

1. Hypothesis: What factors do you anticipate will affect the period of a pendulum?
   Increasing mass and amplitude.
2. Data

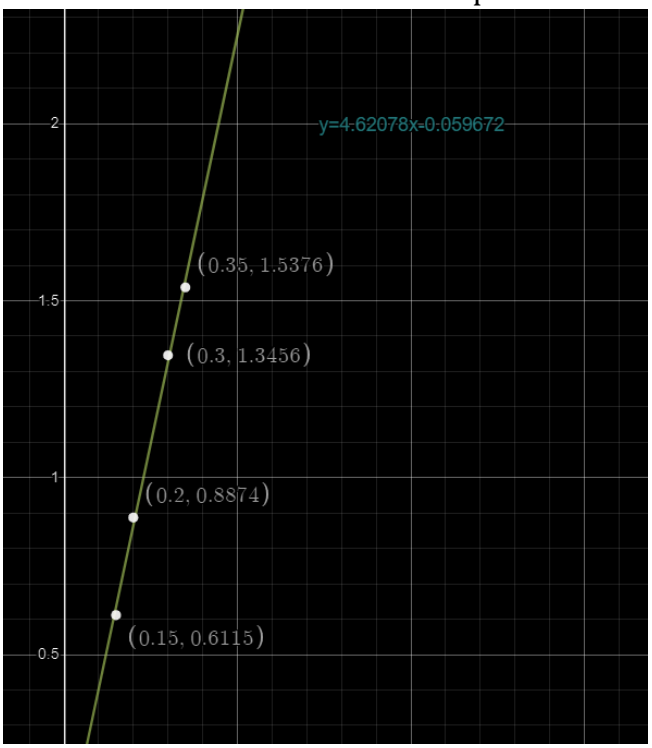
	Mass (kg)	Angle (^{0})	Length (m)	Time for 5 Cycles (s)	Period(s)
Control – Constant Mass, Angle, and Length					
Case 1 Trial 1	0.200	45	0.25	5.31	1.062
Case 1 Trial 2				5.43	1.086
Average Period for Control (s):					
Varying Mass with Constant Angle and Length					
Case 2	0.100	45	0.25	5.4	1.08
Case 3	0.500			5.35	1.07
Varying Angle with Constant Mass and Length					
Case 4	0.200	15	0.25	5.13	1.026
Case 5		30		4.97	0.994
Varying Length with Constant Mass and Angle					
Case 6	0.200	45	0.15	3.91	0.782
Case 7			0.20	4.71	0.942
Case 8			0.30	5.8	1.16
Case 9			0.35	6.2	1.24

3. Results/Discussion
   a. What factors do and do not affect the period of a pendulum?
      i. Do your experimental results support your hypothesis? Explain.
         No. Mass doesn't have an effect on the pendulum. Only length affects the period.
      ii. Below is the equation for the period of a pendulum. Do your experimental results agree with the equation? Explain. $T = 2\pi\sqrt{\frac{L}{g}}$
         Yes. As we can see in the equation, the only variable terms are length. The greater the length, the greater the period. In C2-C5, the results are relatively similar. From C6 to C9, the length increases, thus causing an increase in the period.
   b. For the averaged Control case and the four cases in which Length was varied (5 total points), make a graph of Period – squared(y) vs Length(x).

i. Label the axes with the quantity and units.



ii. Draw a best fit line and find the slope of the best fit line. Label the slope value



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iii. Use the best fit line slope of the graph to find the value of gravitational acceleration. Show work.

$T = 2\pi\sqrt{\frac{L}{g}}$

$T^2 = \frac{4\pi^2 L}{g}$

Because length is the input, we write it in the form $y = mx + b$, b being irrelevant as we are only using slope.

$T^2 = \frac{4\pi^2}{g}L$

$m = \frac{4\pi^2}{g}$

$4.62078 = \frac{4\pi^2}{g}$

$g = 8.54367\frac{m}{s^2}$

iv. Find the percent error of your calculation of g. Use $9.8\frac{m}{s^2}$ as the actual value. Show work.

$E = \frac{|g_A - g_E|}{g_A}$

$E = \frac{|9.8-8.54|}{9.8} = 0.1285 = 12.85\%$