

experiment 1 Plagiarism report

by Experiment 1 Plagiarism Report Experiment 1 Plagiarism Report

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Experiment 1- A simple Pendulum.

Aim: The above experiment is aimed at studying how oscillation period are related to angle to displacement and the gravitational acceleration as a result of gravity.

Theory

According to (Dahuwa 2019), gravitational acceleration is an acceleration of the body as a result of gravitational pull. This is usually denoted by letter 'g' and the acceleration resulting from gravity refers to the constant acceleration of a falling object. Determining the local acceleration as a result is considered the oldest experiment to have been performed in the world of physics. Galileo is considered the first person to have found that, every object experiences uniform and acceleration regardless of the weight they have. It was a great discovery as it was useful when refuting common perceptions which were acceptable such as heavy materials tend to fall faster than the relatively lighter materials. Even in the present days, finding the value of 'g' is essential because it can be utilized to get the measurements that are indirectly von the geological condition/ scenario on the surface of the soil.

Dahuwa further states that, this is possible due to the high contribution to the speed of an object falling from that matter close to various objects. The acceleration locally, depends on the density of that place. This implies that, measuring the acceleration which is as a result of gravitational pull, can be provided as the crust's average density of the area and this can be utilized in the determination the composition of the subterranean. Determining the acceleration as a result of gravity is essential due to the diverging values of acceleration as a result of the gravitational pull. The variation is as a result of the variation of the subsurface rocks on the earth's surface, location on surface in relation to latitude and finally elevation considered as the distance from the Earth's

Centre. This value of acceleration as a result of gravity can be determined using this simple pendulum. The swinging period of the pendulum, time taken to have one oscillation completely (back and over) is represented by, T , which varies with pendulum's length in relation to; $T = 2\pi \sqrt{\frac{L}{g}}$,

Where; T = Period/Duration (s), L =Length (m) and G =Speed as a result of gravity (MS^{-2}).

This same equation can be written as $4\pi^2 \frac{L}{T^2} = g$.

According to Viridi (2011), series of time of string or wire strength of the pendulum has always been a fascinating motion date which can easily be measured. The application of the string or wire tension in the procedure is able to produce time series with only appositive result. The error which could be as a result of angular displacement is relatively about 7.6 percent. By plotting a T^2 vs. length graph, it gives a linear relationship, in agreement with theory. The exact line of best fit do not pass at the origin leading to systematic. When we fit a linear regression onto our data value that passes though origin. Comparing experimentally determined value and Accepted value for acceleration due to gravity gives an error 0.22%, well within the error margins that we calculated.

When undertaking the pendulum experiment, one has to properly take certain precautions in order to have excellent results. Avoiding errors as a result of Parallax, repeating observations several times before taking the reading, the suspension angle must be $\leq 30^\circ$ and a void damping effects of pendulum bob. In order reduce the systematics error in length measurement, one should take accurate measurement of the diameter of the bob used also Instead of three measurements, taking five measurements would be better to reduce the uncertainty in time period.

Procedure

The simple pendulum is defined as to be having an object with certain mass mostly called pendulum bob suspended from small much lighter string or wire

1. Set the pendulum length from suspension point to its Centre.
2. Allow it to swing through a small angle after setting it to move.
3. Take measurement of time taken for 20 oscillations using stop watch (i.e. complete swings)
4. Repeat step 3 twice more
5. Determine the periodic time, T, for one swing at this length
6. Repeat the step for reducing pendulum lengths. Decrease the length by 0.1 m at a time until you reach 0.3 m.
7. On graph paper, plot graph T^2 versus L then utilize the slope to determine acceleration value as a result of gravity.
8. Determine the percentage difference between your experimentally determined value and the accepted value for g.
9. Write a detailed report as per guidelines.

The pendulum Equation

$$T = 2\pi \sqrt{l/g}$$

(T)- Time for oscillation period and (l) is the pendulum length,

$g = 4\pi^2 \cdot L / T^2$; when plotting the T^2 graph against L, results to slope.

Slope $= r^2/L$, thus $g=4\pi^2 * 1/\text{slope}$.

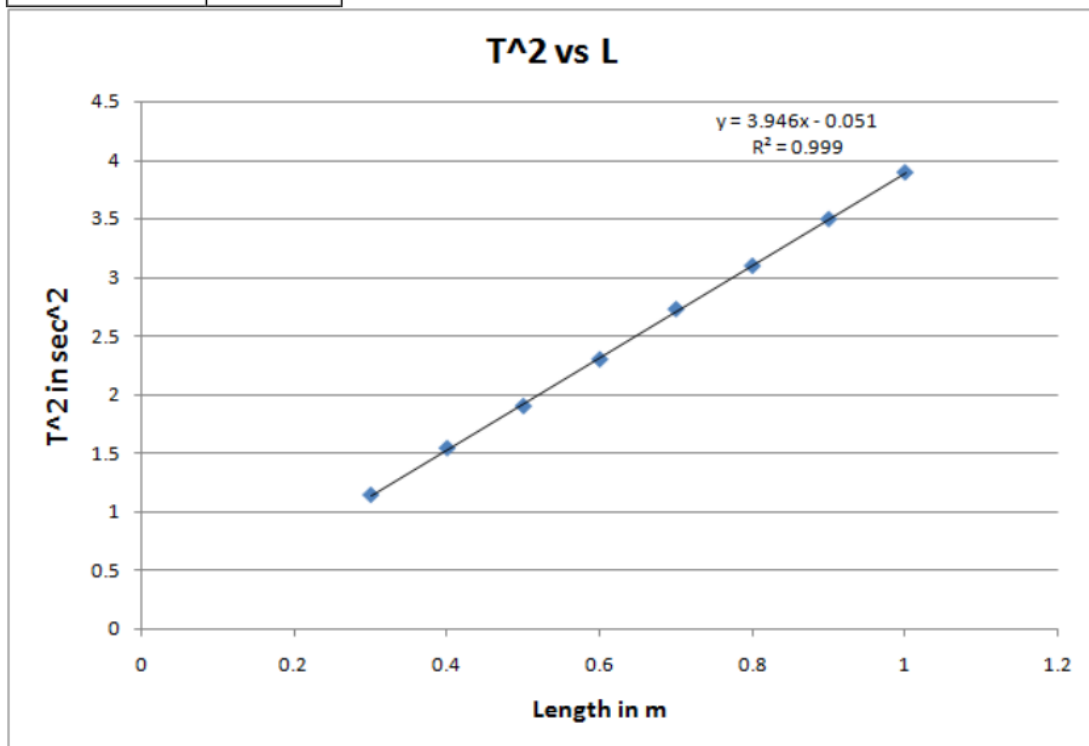
Table 1

length of the pendulum L in m	Time for 20 rounds/ oscillations in sec	Time for one round/ oscillation T in sec	T ² sec ²			
	First Trial	Second Trial	Third Trial	average		
1	39.5	39	40	39.5	1.975	3.9
0.9	38	37.8	37	37.6	1.88	3.53
0.8	35.5	35.3	35.4	35.4	1.77	3.133
0.7	33.1	33	33.1	33.067	1.653	2.73
0.6	30.5	30	30.5	30.33	1.5167	2.3
0.5	27.7	27.5	27.6	27.6	1.38	1.9
0.4	24.8	25	24.7	24.83	1.242	1.54
0.3	21	21.7	21.4	21.36	1.068	1.14

Table 2

length of the pendulum in m	T ² in sec ²
1	3.9
0.9	3.53

0.8	3.133
0.7	2.73
0.6	2.3
0.5	1.9
0.4	1.54
0.3	1.14



Considering the graph;

$$\text{Slope} = T^2 / L = 3.946 \text{ sec}^2 / \text{m}$$

$$1 / \text{slope} = L / T^2 = 0.253 \text{ m/sec}^2$$

Acceleration as a result of gravity $g = 4\pi^2 \frac{L}{T^2}$

L =length (m)

T = Time (sec)

g =Gravitational Acceleration (m/s^2)

$$g = 4 \times (3.14)^2 \times (0.253) = 9.978 m/s^2 \text{ Experimentally determined value}$$

Accepted value for acceleration due to gravity $g = 10 m/s^2$

$$\text{Difference in Percentage} = (|\text{Accepted value} - \text{experimental value}| / \text{Accepted value}) \times 100 = 0.22\%$$

Work Cited

Dahuwa, D., Yusuf, A., Bello, A.M. and Idris, U.W., 2019. Determination of Acceleration Due To Gravity in Katagum Local Government Area of Bauchi State.

Viridi, S. and Khotimah, S.N., 2011. A simple pendulum: Obtaining motion of pendulum bob from string tension time series. arXiv preprint arXiv:1108.3421.

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