PH1202

Physics Laboratory II

Experiment Number - 1

Determination of the acceleration due to gravity

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1 Aim

In this project, we will have to determine the value of the acceleration due to gravity at our place (wherever we are) by measuring the time period of a simple pendulum.

2 Equipments

The experiment required the use of the following equipments

1. Inextensible String
2. Bob (here, Ball)
3. Rigid Support

3 Description and Image of the Setup

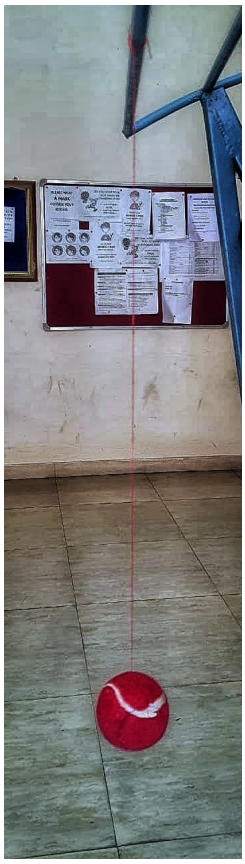

Figure 1: Image of the Setup

First a thread was hung from a rigid support (here, cloth hanger). Then, a ball was tied to the free end of the string as a bob. Then, we measure the time taken for 20 oscillations (5 to 6 readings) by taking different lengths of the string. After that we try to calculate the value of g (acceleration due to gravity) using the formula:

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

The readings were as follows:

4 Readings/Tables

For string length 55.75 *cm*:-

Sl. No.	Oscillations	Total Time Taken	Time per Oscillation (sec)	Average
1	20	30.26	1.513	1.53
2	20	29.50	1.475	
3	20	30.89	1.5445	
4	20	30.76	1.538	
5	20	30.55	1.5275	
6	20	30.72	1.536	
7	20	31.20	1.56	
8	20	30.9	1.545	
9	20	30.19	1.5095	
10	20	30.75	1.5375	
11	20	30.35	1.5175	
12	20	30.99	1.5495	

For string length 71.25 *cm*:-

Sl. No.	Oscillations	Total Time Taken	Time per Oscillation (sec)	Average
1	20	34.41	1.72	1.71
2	20	34.37	1.72	
3	20	34.40	1.72	
4	20	34.37	1.72	
5	20	34.21	1.71	
6	20	34.12	1.71	
7	20	34.17	1.71	

For string length 96.05 *cm*:-

Sl. No.	Oscillations	Total Time Taken	Time per Oscillation (sec)	Average
1	20	39.72	1.99	1.99
2	20	39.70	1.99	
3	20	39.71	1.99	
4	20	39.69	1.98	
5	20	39.72	1.99	
6	20	39.74	1.99	

For string length 139.75 *cm*:-

Sl. No.	Oscillations	Total Time Taken	Time per Oscillation (sec)	Average
1	20	47.87	2.39	2.38
2	20	47.57	2.38	
3	20	47.67	2.38	
4	20	47.49	2.37	
5	20	47.44	2.37	
6	20	47.32	2.37	
7	20	47.42	2.37	
8	20	47.52	2.38	
9	20	47.34	2.37	
10	20	47.47	2.37	

5 Calculations and Results

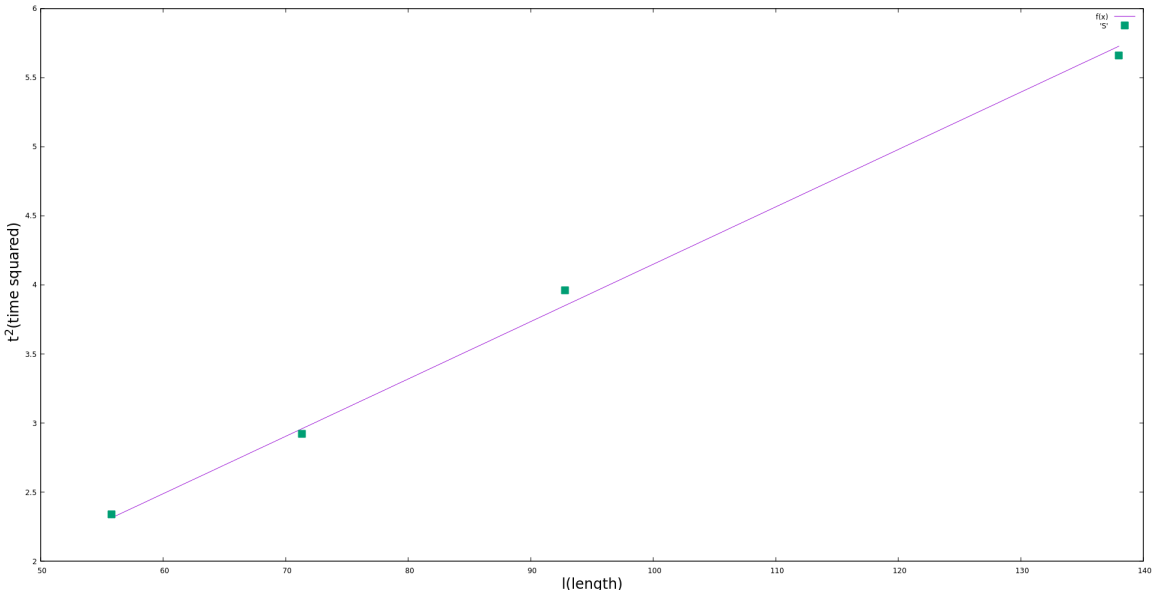

Figure 2: Graph of t^2 vs. l

From the formula $T = 2\pi\sqrt{\frac{l}{g}}$, we get,

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

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

$$Slope = \frac{T^2}{l} = \frac{4\pi^2}{g} = 0.041038\ cm^{-1}s^2\ (from\ graph)$$

$$\Rightarrow \frac{4\pi^2}{g} = 0.041038\ cm^{-1}s^2$$

$$\Rightarrow g = \frac{4\pi^2}{0.041038}\ cms^{-2} = 961.997\ cms^{-2} \approxeq 9.62\ ms^{-2}$$

$$\boxed{g \approxeq 9.62\ ms^{-2}}$$