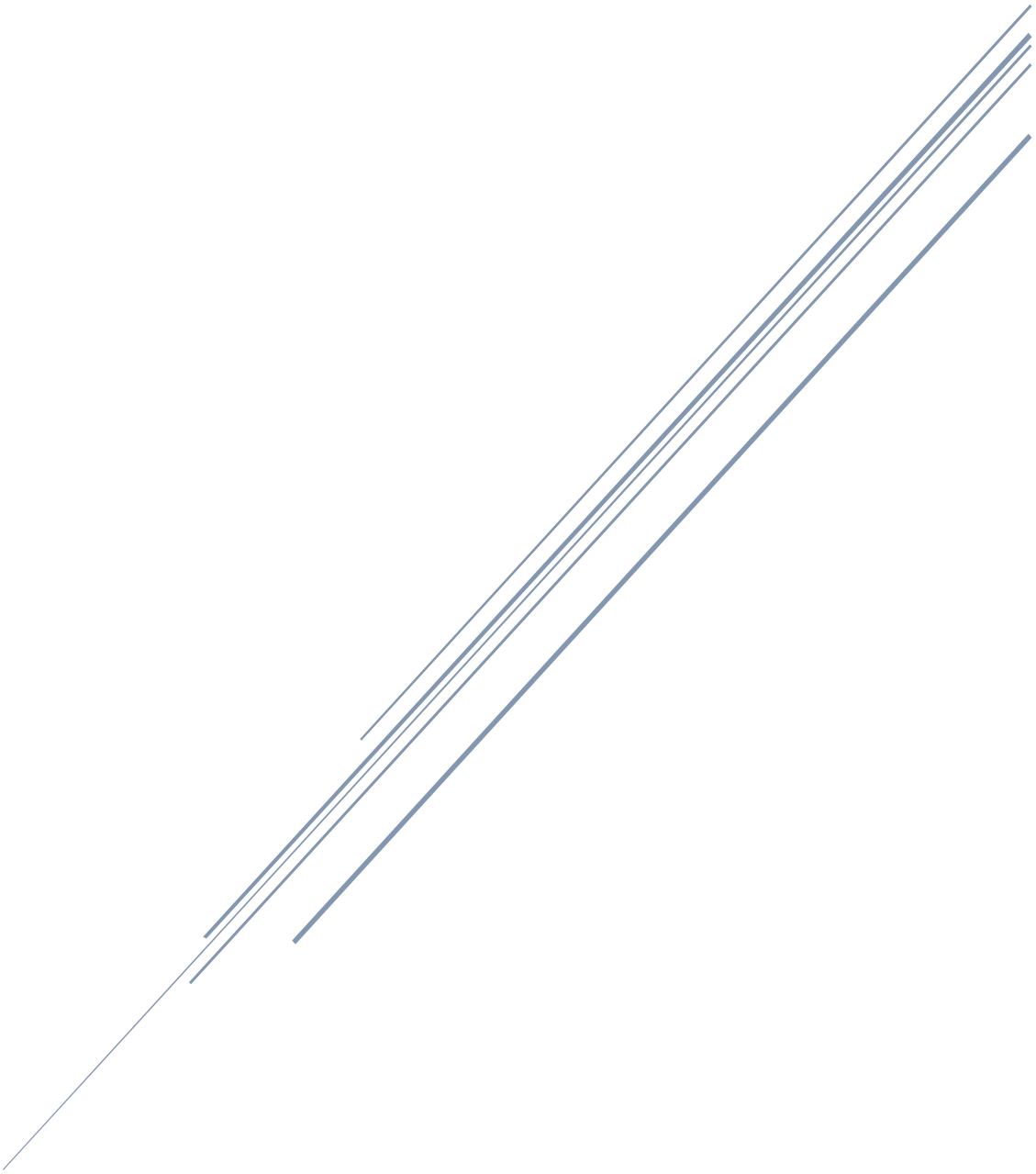
ACCALURATION DUE TO THE GRAVITY

Laboratory Report



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Objectives:

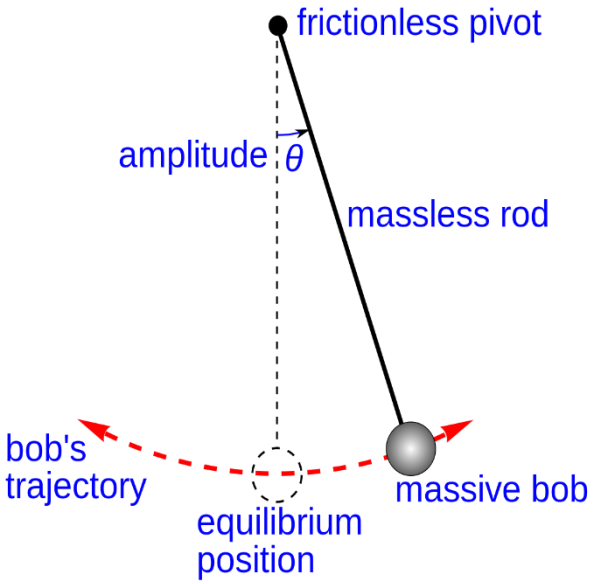
The experiment was carried out to use a pendulum to get acculturation due to the gravity. The experiment was involved two members of the group to test this experiment and verify the acceleration due to gravity.

In this experiment, the main objective was to record the time with a stopwatch in 20 Oscillations of the pendulum and measure the length of the string.

- To measure the acceleration due to gravity using the pendulum.
- To calculate the acceleration due to the gravity at a place.
- To plot a graph with results using a pendulum.

Theory:

The diagram that is shown on the right demonstrates that a pendulum consists of a mass (m) hanging from a string of length (l) and fixed at a pivot point (P). When displaced to an initial angle and released, the pendulum will swing back and forth with the periodic motion.



The length(l) can be measured by a ruler from the pivot point of the pendulum and its centre gravity which is the centre gravity of the bob mass.

Time (T) is the time taken by the massive bob of the pendulum to make one complete oscillation from swinging back and forth.

The acceleration due to the gravity is the time of a pendulum depends on the length of the pendulum, which can be calculated with these formulas

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

For small amplitude of oscillations

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

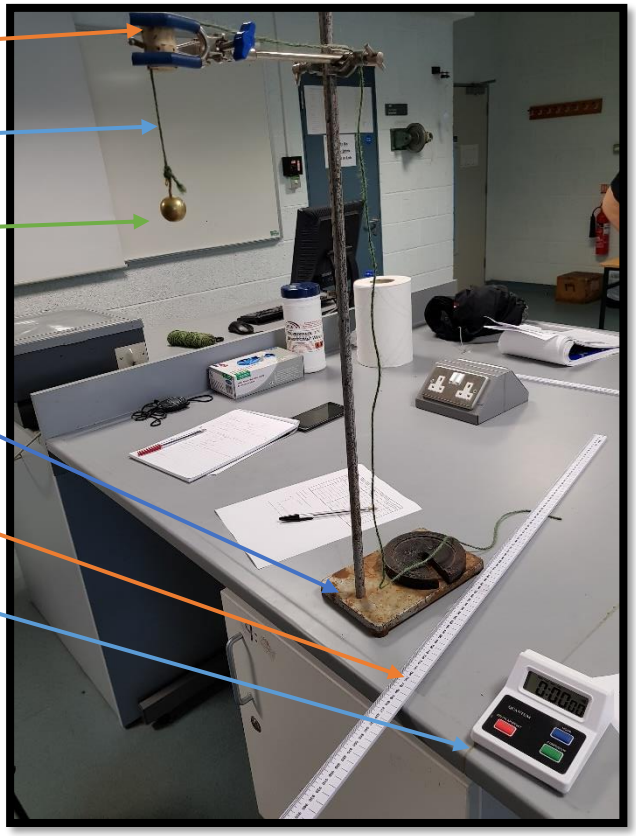
If we have the values for the time (T) and the length (l), then the acceleration due to the gravity (g) can be found with these formulas

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

Apparatus:

In this experiment, the materials that are required for this experiment are listed below with pointing the arrows at the materials shown in the photo.

- Cork
- String
- Bob
- Retort Stand with Weight
- Metre ruler
- Stop Clock



These are all the parts are required to test this experiment and the results sheet is also needed to write down the result of the experiment.

Procedure:

At the very beginning of this experiment, our first action was to set up the pendulum properly on the table and chose the random length of the string between the cork and middle of the bob measure the distance between those lengths and write down the length onto the Results, then use the stop clock same time as the bob released to check the time of the 20 oscillations. Write down the time after 20 oscillations onto the results. This had to repeat 3 times.

In the results, the averages of the time are included and "time for one oscillation". The (Time) divided over (20 oscillations) $\frac{time}{20\ oscillations}$ to get the times for one oscillation. To get the total averages for the times, add all three times(S) and divided by the 3 to get the total averages $\frac{time1+time2+time3}{3}$.

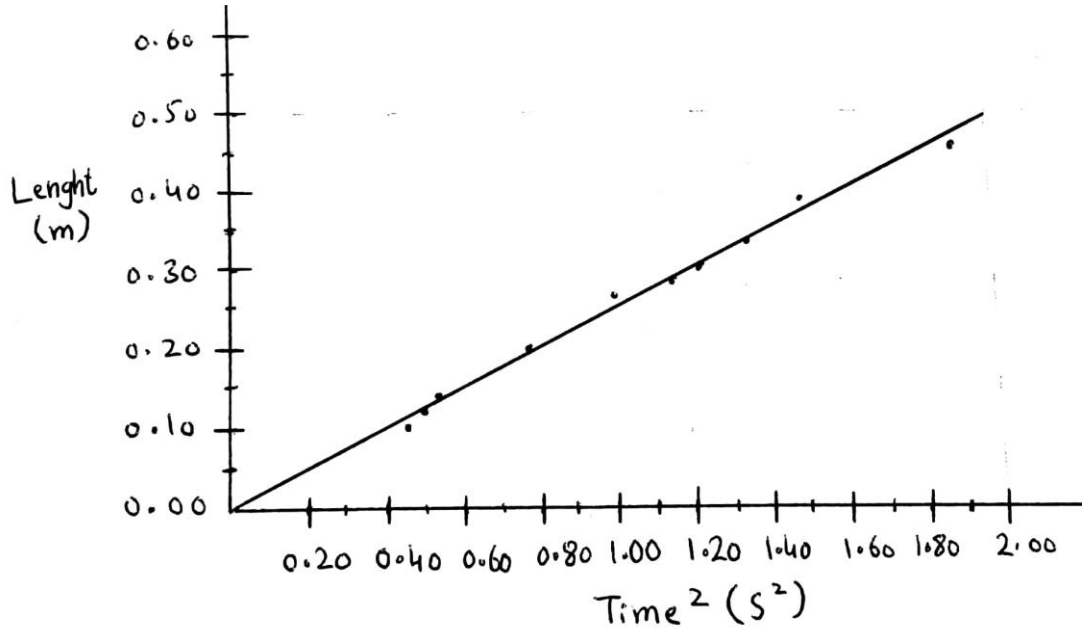
To get the last average of time in the second square(s^2), take the time 1, time 2 and time 3 to the power of 2 over the 3 to the power of 2, as shown below.

$\frac{time1+time2+time)^2}{(3)^2}$.

And plotting points on the graphs of $\frac{L}{T^2}$ shown in the results.

Result:

Length (L) (m)	Time for 20 oscillations			Time for one oscillation				(Average of Time 1, 2 and 3)² (T^2) (s^2)
	Time 1 (s)	Time 2 (s)	Time 3 (s)	Time 1 (s)	Time 2 (s)	Time 3 (s)	Average of Time 1, 2 and 3 (T) (s)	
0	0	0	0	0	0	0	0	0
0.100	14(s)	13.10	12.70	0.7	0.65	0.63	0.66	0.43
0.120	13.97	14.50	13.25	0.69	0.72	0.66	0.69	0.47
0.140	15.09	15.25	13.09	0.75	0.76	0.65	0.72	0.51
0.200	18.12	18.00	17.00	0.90	0.9	0.85	0.88	0.78
0.260	19.96	20.82	19.19	0.99	1.04	0.95	0.99	0.98
0.280	21.34	21.53	21.06	1.06	1.07	1.05	1.06	1.12
0.300	21.65	21.88	21.88	1.08	1.09	1.09	1.08	1.18
0.340	22.70	23.78	23.37	1.13	1.16	1.16	1.15	1.32
0.400	23.84	23.97	25.31	1.19	1.19	1.26	1.21	1.47
0.450	27.87	27.53	26.78	1.39	1.37	1.33	1.36	1.85



Discussion of result:

The discussion that was taken place during this experiment was between two members of the group. The main discussion was about counting the turns of Oscillations and pressing the start button for the stopwatch same time.

It was an extremely difficult task to perform at the same time while counting the oscillations and keeping an eye on the stopwatch without the help of someone. It was a good idea to get split into groups to perfume the tasks.

The discussion was taken in action during one of the members can focus on counting the 20 Oscillation and the second member of the group can stop a clock if the person counting the oscillation says so.

Conclusions:

This experimental data was collected and analysed using calculations and graphs. The longer the length of the string was, the more time it took to complete the 20 oscillations. The shorter the distances of the string were, the faster it took to complete the 20 oscillations. It means that the length is directly proportional to time. This can also be described with gravity. As the object falls, they accelerate according to the gravity equation. Longer pendulums have farther to fall, therefore they have more time to accelerate, and build up more momentum.

The results section demonstrates the time and the length of the oscillations in the graph and it can clearly show the chart of the time 1,2 and 3 and the averages for the times in (s) and (s^2).

This experiment must have some faults during the counting of the 20 Oscillations which can be known as the human faults which can be calculated with the equation of “Percentage error for the acceleration due to the gravity”

Percentage error = $\frac{Approximate\ value - Exact\ value}{Exact\ value}$ x 100%

To get the Approximate value the equation can be used to find it which is shown below

G = $\frac{4\pi^2\ x\ lenght}{T^2}$

The exact value is the constant of acceleration gravity = 9.81

Appendices:

This will improve our skills in the future while we are working in this kind of field where physics is required.

We learned about acceleration due to gravity from this experiment, and we also improved our practical experience which will help us in many problems.

References:

These are some of the websites that were used full while working on the project.

Sources:

[1] https://en.wikipedia.org/wiki/Acceleration_due_to_gravity

[2] https://www.coursehero.com/file/9196855/Pendulum-Lab-Conclusion/

[3] https://en.wikipedia.org/wiki/Pendulum

[4] https://en.wikipedia.org/wiki/Pendulum#/media/File:Simple_gravity_pendulum.svg