PENDULUM                Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Purpose: To investigate what factors affect the period of a simple pendulum and determine the relationships for those affected.

Apparatus: Pendulum: clamp, stand, string, and balls; stop-watch, balance, PC, and meter stick.



Theory: How to make a simple pendulum?

Take a mass, fix a string, and hang it from a support.

The length, L is measured from the support point to
the center of gravity (C.G) of the hanging mass.

When you displace the mass, the pendulum will oscillate. The period, T of the oscillations is the time the pendulum takes to complete one oscillation. If you time just one oscillation, the measured value of T won’t be accurate because of the reaction times involved in starting and stopping the stop-watch. You need to time at least 10 oscillations to measure the period, T.

Q: One finds that a pendulum takes 23 seconds for 10 oscillations. What is the period, T?

A: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The amplitude, A of the oscillations is the maximum distance the mass moves from its equilibrium position. See figure below.

|  |  |
| --- | --- |
| pendul2 | You can also see how to time oscillations to measure the period, T in the figure. T is the time for one complete oscillation. If you start the clock on one side then you need to wait until the mass goes to the other side and comes back, to count one. The clock will continue to run and you will continue to count. When the mass comes back the 10th time to the starting side you will stop the clock. The clock reading is the total time for 10 T’s. |

DATA

I. Influence of amplitude, A on the period.

Length of pendulum, L = \_\_\_\_\_\_ Mass of pendulum, M = \_\_\_\_\_\_ Gravity, g = \_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Amplitude, A (cm) | 10 T | Period, T |
| 5 |   |   |
| 10 |   |   |
| 15 |   |   |
| 20 |   |   |
| 25 |   |   |
| 30 |   |   |
| 35 |  |  |

II. Influence of mass, M on the period:

Length of pendulum, L = \_\_\_\_\_ Amplitude of pendulum, A = \_\_\_\_Gravity, g = \_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Mass, M | 10 T | Period, T |
|   |   |   |
|   |   |   |
|   |   |   |
|   |   |   |
|   |   |   |
|   |   |   |
|  |  |  |

 III. Influence of length, L on period.

Amplitude of pendulum, A = \_\_\_\_\_ Mass of pendulum, M = \_\_\_\_\_\_Gravity, g = \_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Length, L (cm) | 10T | T |
| 0 |   |   |
| 10 |   |   |
| 20 |   |   |
| 40 |   |   |
| 60 |   |   |
| 80 |   |   |
| 100 |   |   |
| 120 |   |   |
| 140 |   |   |
| 160 |   |   |

 IV. Influence of gravity, g on period. For this, go to the following website and collect the data there.
<http://www.elmer.unibas.ch/pendulum/upend.htm>

Length of pendulum, L = \_\_\_\_\_\_\_\_\_\_

Mass of pendulum, M = Constant Amplitude = Constant

|  |  |  |
| --- | --- | --- |
| Gravity, g (m/s2) | 10T | T |
| 2 |   |  |
| 4 |   |  |
| 6 |   |  |
| 8 |   |  |
| 10 |   |  |
| 12 |   |  |
| 14 |   |  |
| 16 |   |  |
| 18 |   |  |

Attach the graphs and write a Conclusion on the last page.