Sample Lab Report

This is an example of a well-written report from the PHYS 111 or 112 lab. As explained in the lab manual, it contains only the significant details of the experiment, the analysis and some conclusions. Particularly pertinent features are called out in the marginal notes. Background material is not needed because the reader is assumed to have the lab manual available.

This document is typed and uses computer-drawn figures to facilitate posting on the web. You may prepare any or all portions of your reports by hand, as convenient, but be sure the text is legible and figures are clear. Graphs should be done on graph paper or by computer, not as rough sketches.

Physics 11x
Experiment 1,947a The large amplitude pendulum
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We are trying to measure the amplitude dependence of the period of a simple pendulum. By extrapolating to zero-amplitude we determine g.  

Short statement of intention

Procedure
We measured the period of a simple pendulum of known length as a function of release angle.

1. Rather than measure the pendulum length directly, we used a meter stick with caliper jaws to measure from the support to the bottom of the pendulum ball. We measured the diameter of the ball with calipers, and found the distance from the support to the center of the ball by subtraction. Procedures are described briefly, without much detail of the apparatus.

2. To get the angle we measured the distances s and d shown in the sketch and used the relation

\[ \sin \theta = \frac{d}{s} \]

This seemed more accurate than using the small protractor provided.
3. The actual period was measured for the first swing after release, using a photogate timer in pendulum mode placed near the bottom of the trajectory.

Data

total length = 0.757 m ± 0.002 m
ball diameter = 0.0256 m ± .0005 m
pendulum length = 0.744 m ± .002 m
string length s = 0.731 m ± .002 m

The period was measured three times for each angle and averaged

<table>
<thead>
<tr>
<th>d (m)</th>
<th>T (s)</th>
<th>aver T (s)</th>
<th>θ (rad)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.164 ±.002</td>
<td>1.7326, 1.7330, 1.7328</td>
<td>1.7328</td>
<td>.226</td>
</tr>
<tr>
<td>.104</td>
<td>1.7294, 1.7296, 1.7297</td>
<td>1.7296</td>
<td>.143</td>
</tr>
<tr>
<td>.043</td>
<td>1.7286, 1.7288, 1.7288</td>
<td>1.7287</td>
<td>.059</td>
</tr>
<tr>
<td>.226</td>
<td>1.7380, 1.7381, 1.7382</td>
<td>1.7381</td>
<td>.314</td>
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<tr>
<td>.385</td>
<td>1.7606, 1.7609, 1.7609</td>
<td>1.7608</td>
<td>.555</td>
</tr>
<tr>
<td>.292</td>
<td>1.7460, 1.7460, 1.7462</td>
<td>1.7461</td>
<td>.411</td>
</tr>
</tbody>
</table>

We used Graphical Analysis to plot T vs θ² and fit a straight line. The straight line is an acceptable fit, showing that the relationship

\[ T = T_0 (1 + \theta^2/16) \]

is reasonable. The graph is attached.

To get g we use the results from the program:

intercept = \( T_0 = 1.728 \pm .0002 \text{ s} \)
slope = \( T_0/16 = 0.108 \pm 0.001 \text{ s} \) \( \Rightarrow T_0 = 1.73 \pm .02 \text{ s} \)

and the pendulum equation

\[ T_0 = 2\pi\sqrt{g/\ell} \]

to find \( g = 9.84 \text{ m/s} \). The length of the pendulum is the largest uncertainty, at 0.3%, so it determines the uncertainty in \( g = 9.84 \pm 0.03 \text{ m/s} \).

Comments

Our results are consistent with the claims in the lab manual. The value of g is about the same as we found in the free-fall experiment.
Axes are labeled, with units. Data points marked clearly.