Experiment 9 Simple Pendulum

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We made a pendulum with a quart sized freezer bag, a weight, some string, and a pivot point. We measured how long a period is by measuring the time for 10 periods and dividing that number by 10. We then graphed a line using the known string lengths and squaring the time to get a slope that would equal (4π2/g) and compared that value to a calculated value. The experimental slope, which was 4.08, was only 1.5% larger than the theoretical slope at 4.02.

Results

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Questions for Discussion

1. How well do the data points follow with the trend line? Do they all lie on the line, or do some not lie on the line? If they do not lie on the line, what could be some reasons for this?

Some of them ended up above the line, some others ended up below the line. A possible reason for them ending up above the line is that the string was a little longer than expected. A possible reason for them ending up below the line is that the string was a little shorter than expected.

1. Using the slope of the line from your graph determine the acceleration due to gravity and compare it with 9.801 m/s2.

Slope=4π2/g

g=4π2/slope=4π2/4.08=9.666

the experimental gravity is 0.135 lower than the actual gravity.

1. Even though there was no uncertainty analysis values calculated in this experiment, make a list of what sources of uncertainty are associated with this experiment. State which are considered random sources of uncertainty, and which are considered systematic sources of uncertainty.

String length: random, the force of the swing might cause the string to lengthen mid-swing.  
Time: systematic, the time could have constantly been started earlier/later than needed.

1. The value for the acceleration due to gravity in Dayton, Ohio is 9.80100 m/s2. Say you adjusted a grandfather’s clock perfectly here in Dayton. The Period of Oscillation being equal to 2 seconds. Then you moved to Denver, Colorado where the acceleration due to gravity is 9.79673 m/s2. However, you forgot to adjust the grandfather’s clock when you got there. After a whole year, how far off in time would the grandfather’s clock be?

T1=2s

Length:

T2=

Dayton:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 year | 365 days | 24 hours | 3600 seconds | 1 period | =15768000 |
|  | 1 year | 1 day | 1 hour | 2 seconds |  |

Denver:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 year | 365 days | 24 hours | 3600 seconds | 1 period | =15764564.8 |
|  | 1 year | 1 day | 1 hour | 2.000436 seconds |  |

# of missing periods = Dayton – Denver =15768000-15764564.8=3435.2 periods

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 3435.2 periods | 2s | 1 minute | 1 hour | =1.91 hours |
|  | 1 period | 60 seconds | 60 minutes |  |

After a whole year, the clock in Denver would be just under 2 hours behind.