Name _____   Physics

Gravity and The Simple Pendulum

Chapter 5 Physics Lab

Objectives

Construct simple pendulums and find their periods of motion

Calculate the value of a_g (gravity), the free fall acceleration

Examine the relationship between length and period for different pendulums

Intro The period of a pendulum is the time required for the pendulum to complete one cycle. In this lab, you will construct models of a simple pendulum using different lengths of cord.

You will design an experiment to measure the period of each model and to determine how the period depends on length.

Your experiment should include several trials at a constant mass but at different lengths

In the experiment, you will also use the period and the length of the cord for each trial to calculate the free-fall acceleration, a_g..

Materials List

- String (1.7 m)
- Meterstick
- 50 g mass
- Iron ring
- Ring Stand
- Protractor
- Stopwatch

Procedure

1. Construct an apparatus similar to Figure 1
2. Measure out the length of string necessary according to the table
3. Pull back the bob 15 degrees from vertical and release
4. Time (3) vibrations and record the period for (1) vibration in the table below. Repeat.
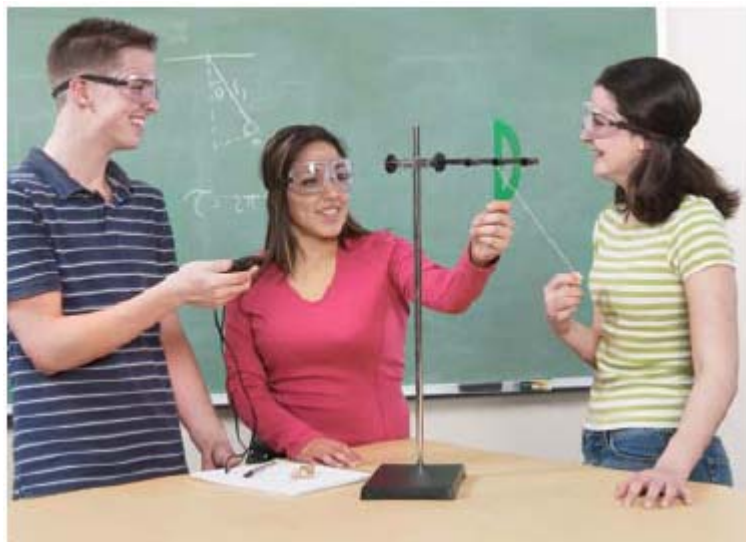5. Complete the table, graphs and questions.

Figure 1
* Hold the bob so that the cord is perfectly straight while you measure the angle.
* Release the bob gently so that it swings smoothly. Practice counting and timing cycles to get good results.

The Effect of Length on the Period

Length (m)	Trial 1	Trial 2	Average
0.6 m			
0.8 m			
1.0 m			
1.5 m			

Solve the pendulum equation $T = 2\pi\sqrt{\dfrac{L}{g}}$ for gravity

Use the average period for each length and solve for the acceleration due to gravity. Show all of your work below.

Questions

1. Calculate the percent error for each of the average of your trials. Use g = 9.8 m/s² as the actual acceleration due to gravity near the surface of the earth.

2. What are some of the sources of error in this experiment? List (3)

    a. _____

    b. _____

    c. _____

3. A 0.65-meter-long pendulum consists of a 1.0-kilogram mass at the end of a string. The pendulum is released from rest at position A, 0.25 meter above its lowest point. The pendulum is timed at five positions, A through E.

DATA TABLE

Position	Elapsed Time
A	0.00 s
B	0.20 s
C	0.40 s
D	0.60 s
E	0.80 s
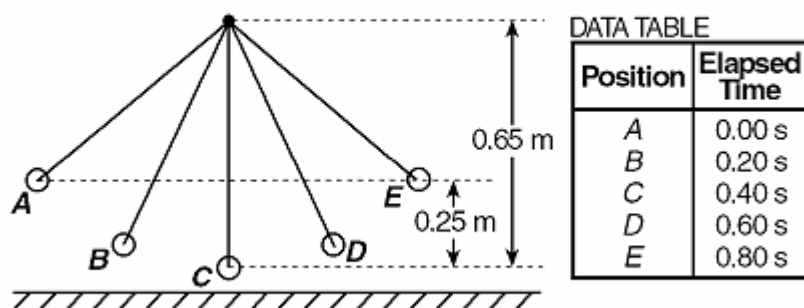
Based on the information in the diagram and the data table, determine the period of the pendulum.

4. A student conducted a series of experiments to investigate the effect of mass, length, and amplitude (angle of release) on a simple pendulum. The table below shows the initial conditions for a series of trials.

Trial	Mass (kg)	Length (m)	Angle of Release (°)
R	2	3	10.
S	3	2	15
T	3	2	10.
U	1	3	10.
V	3	2	5
W	2	2	15
X	2	1	15
Y	3	3	10.
Z	2	3	15

    a. Which *three* trials should the student use to test the effect of mass on the period of the pendulum?

    b. Which *three* trials should the student use to test the effect of length on the period of the pendulum?