

## Title: Pendulum Lab II

### Purpose:

- To determine the relation among mass, length, gravity, and period of a pendulum

### Materials:

- Exploration of Physics Spring and Pendulum Lab

### Procedure:

Go to Exploration of Physics ....Motion....Spring and Pendulum

#### Part A: Length of a Pendulum

- Set mass constant at 5.0 kg and length at 1.0 m (gravity constant at  $9.8 \text{ m/s}^2$ )
- ✓ Time Axis (this will give you a 5 second viewing window...sufficient for this part of the lab)
- Let run through one cycle and then pause.
- Read time for one period *from the graph*.
- Record your results in the data tables (see below)
- Repeat by increasing the length at 0.5 m intervals as indicated in the data table.
- Graph your data and draw line of best fit or connect dots as appropriate!

#### Part B: Mass of a Pendulum

- Set length constant at 5.0 m and mass at 0.1 kg (gravity constant at  $9.8 \text{ m/s}^2$ )
- ✓ Time Axis (this will give you a 5 second viewing window...sufficient for this part of the lab)
- Let run through one cycle and then pause.
- Read time for one period *from the graph*.
- Record your results in the data tables (see below)
- Repeat by increasing the mass at 0.5 to 1.0 kg intervals as indicated in the data table.
- Graph your data and draw line of best fit or connect dots as appropriate!

#### Part C: Gravity Effects

- Set mass constant at 10.0 kg, length constant at 5.0 m, and gravity at  $9.8 \text{ m/s}^2$
- DO NOT** ✓ Time Axis (this will give you a 25 second viewing window...which you will need for gravity below  $9.0$ ). You may want to ✓ Time Axis when you increase gravity above  $9.0 \text{ m/s}^2$
- Let run through one cycle and then pause.
- Read time for one period *from the graph*.
- Record your results in the data tables (see below)
- Repeat by increasing the gravity at  $1.0 \text{ m/s}^2$  intervals as indicated in the data table.
- Graph your data and draw line of best fit or connect dots as appropriate!

### Discussion:

- Summarize what you did.
- Discuss your results....remember to include data to support your statements.
  - Does length affect period? Is the relation direct or inverse or constant?  
Give examples of the data to support your statements!
  - Does mass affect the period? Is the relation direct or inverse or constant?  
Give examples of the data to support your statements!
  - Does gravity affect the period? Is the relation direct or inverse or constant?  
Give examples of the data to support your statements!
- Did you verify the conclusions from your previous pendulum lab?  
Restate the conclusions from the lab and discuss whether or not they were supported by this lab...provide support!!
- Describe sources of error.
- Suggest improvements.

### Conclusion: (answer the questions)

- What is the relation between mass and period of a pendulum?
- What is the relation between length and period of a pendulum?
- What is the relation between gravity and period of a pendulum?

### Reflection: Personal Statement



**Results:**

Data Chart A: Pendulum Length <sup>a</sup>

Length (m)	Period (s)
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	
5.5	
6.0	
6.5	

<sup>a</sup> mass = 5.0 kg, gravity = 9.8 m/s<sup>2</sup>

Data Chart B: Pendulum Mass <sup>b</sup>

Mass (kg)	Period (s)
0.1	
0.5	
1.0	
2.0	
3.0	
4.0	
5.0	
6.0	
7.0	
8.0	
9.0	
10.0	

<sup>b</sup> length = 5.0 m, gravity = 9.8 m/s<sup>2</sup>

Data Chart C: Gravity Effects <sup>c</sup>

Gravity (m/s <sup>2</sup> )	Period (s)
1.0	
1.7 (moon!)	
2.0	
3.0	
4.0	
5.0	
6.0	
7.0	
8.0	
9.0	
10.0	
11.0	
12.0	
13.0	
14.0	
15.0	

<sup>c</sup> mass = 10.0 kg, length = 5.0 m