Name _____ Date _____

SI Physics Lab #25 (100 pts)

Period _____ Mrs. Nadworny

Partners: Due Date: _____

Pendulum Lab

NO Lab Write-Up Required

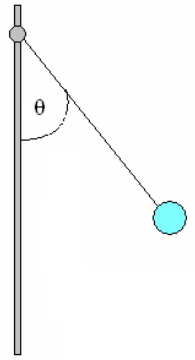
Research question

What is the effect of length, mass, and the angle of release on the period of a pendulum?

Materials

- 5 pendulum bobs
- pendulum clamp
- meter stick / ruler
- ring stand
- stopwatch
- paper clip
- protractor

Experiment #1 – Length



Variables (3 pts)

Independent Variable –

Dependent Variable –

Constants/Control –

Hypothesis (2 pts)

Procedure (2 pts)

1. Measure and record the _____ of one bob. [Choose one with a long string.]
2. Attach the bob to the pendulum clamp. Measure and record the _____ of string (including the bob, to the nearest hundredth of a centimeter).
3. Hold the bob at a _____ angle. Release.
4. Measure and record the _____ it takes to complete _____ full swings. Calculate the _____ of the pendulum.
5. Repeat steps 2 - 4 for _____ more different lengths, varying by at least _____ each time.

Data Collection (8 pts)

Trial	Length (cm) ± _____	Mass (g) ± _____	Angle (º) ± _____	Time (s) ± _____	# of Swings	Period (s)

Data Analysis Show one sample calculation of the period. Calculate the range of the periods. Show your work using the GUESS method. (5 pts)

Experiment #2 – Angle

Variables (3 pts)

Independent Variable –
Dependent Variable –
Constants/Control –

Hypothesis (2 pts)

Procedure (2 pts)

1. Use the same bob from Experiment #1. Record its _____ below.
2. Attach the bob to the pendulum clamp. Measure and record the _____ of string (including the bob, to the nearest hundredth of a centimeter). [Use a shorter length]
3. Hold the bob at a _____ angle. Release.
4. Measure and record the _____ it takes to complete _____ full swings. Calculate the _____ of the pendulum.
5. Repeat steps 3 - 4 for four different angles, decreasing by _____ each time.

Data Collection (8 pts)

Trial	Length (cm)	Mass (g)	Angle (º)	Time (s)	# of Swings	Period (s)
	± _____	± _____	± _____	± _____		

Data Analysis Show one sample calculation of the period. Calculate the range of the periods. Show your work using the GUESS method. (5 pts)

Experiment #3 – Mass

Variables (3 pts)

Independent Variable –
Dependent Variable –
Constants/Control –

Hypothesis (2 pts)

Procedure (2 pts)

1. Measure and record the _____ of all _____ bobs.
2. Attach one bob to the pendulum clamp so that it is the same length as Experiment #2.
3. Hold the bob at a _____ angle. Release.
6. Measure and record the _____ it takes to complete _____ full swings. Calculate the _____ of the pendulum.
4. Repeat steps 2 - 4 for each bob, keeping the length the same for each.

Data Collection (8 pts)

Trial	Length (cm)	Mass (g)	Angle (º)	Time (s)	# of Swings	Period (s)
	± _____	± _____	± _____	± _____		

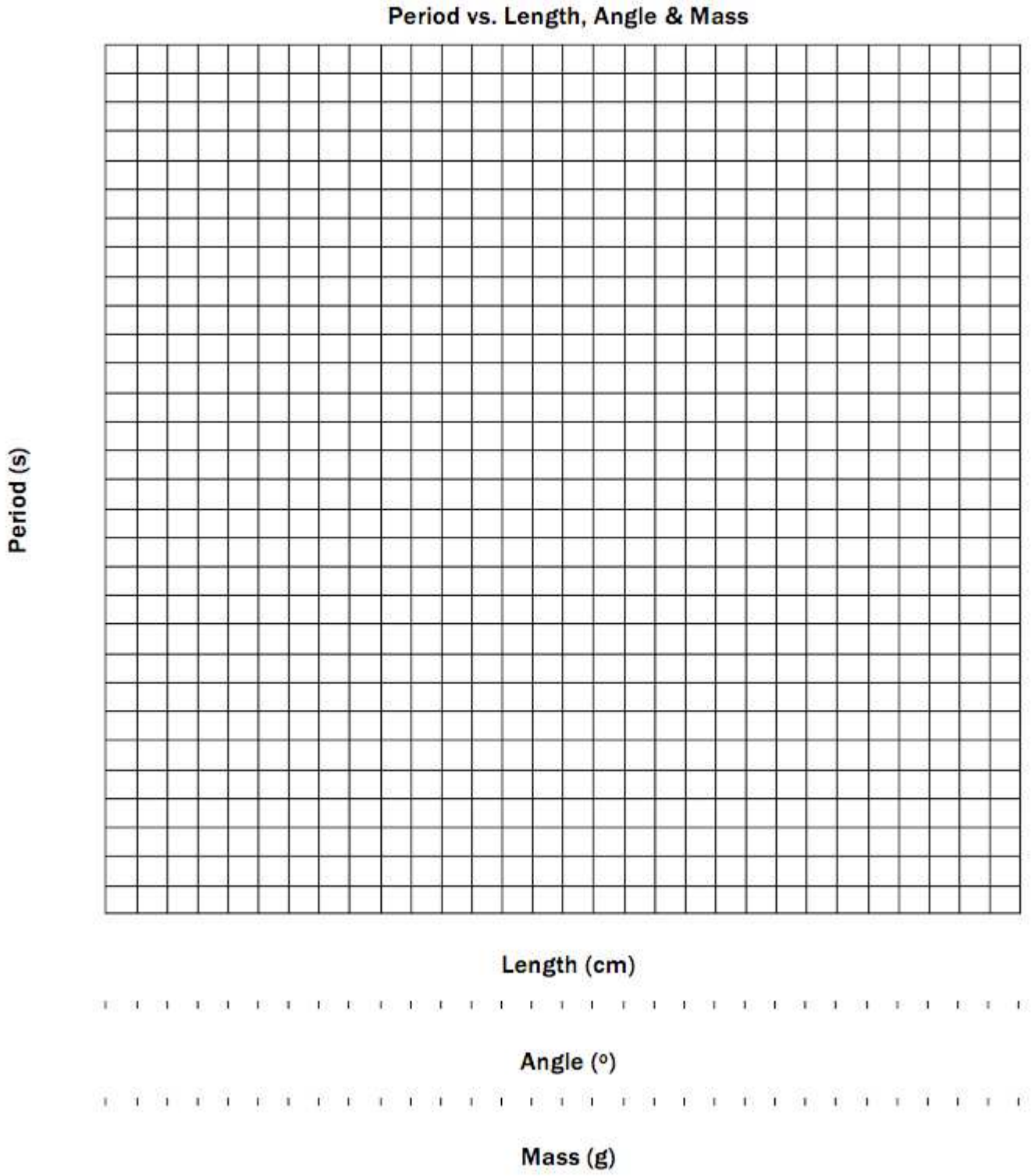
Data Analysis Show one sample calculation of the period. Calculate the range of the periods. Show your work using the GUESS method. (5 pts)

Continued on next page

Graphs (20 pts)

KEY		
☐ Length	☐ Angle	☐ Mass

- Create ONE graph to display all THREE sets of your data.
  - Mark an appropriate scale according to the data for each set of axes.
  - In one color plot each of your data points and draw a best fit line for your length data.
  - In another color, plot each of your data points and draw a best fit line for your angle data.
  - In another color, plot each of your data points and draw a best fit line for your mass data.



Data Analysis Calculate the slope of all THREE of your best fit lines. Show your work using the GUESS method. (10 pts)

Conclusion Questions (10 pts)

1. Which factor had the greatest influence on the period of a pendulum? Use the **values** and **shapes** of the slopes from each of your graphs AND your calculated **ranges** to provide proof. (4 pts)

_____

_____

_____

2. Write about one idea that was reinforced during the lab or one new concept you learned. (2 pts)

_____

_____

_____

3. Describe one possible source of error in this lab. Identify what the error was. Explain how it happened. Explain how it affected your data collection (did it increase or decrease your length, mass, angle, time). Explain how it affected your overall results (did it increase or decrease your period, slope). (4 pts)

_____

_____

_____