Name _____ Hour _____

Pendulum Lab

Purpose: Determine the effect mass and length have on a pendulum.

Info: A pendulum consists of a mass called a __bob__ suspended from a support. The period of a pendulum is the time for it to swing__back and forth once____.

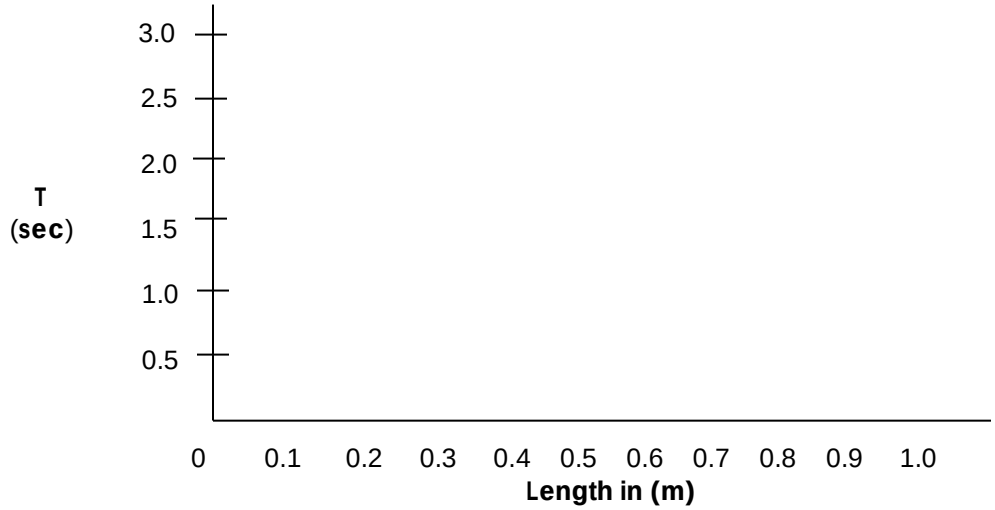
Part 1: Length of a pendulum

Data: Pick 8 different lengths of string (**at least 2 over 70 cm and at least 3 under 10 cm**) and time how long it takes for the mass to swing back and forth 5 times. Divide by 5 to determine the average **period** of the pendulum for each length. **Keep swings small- around 10-15^0.**

***It works best if you start with your longest, and then cut that to make it shorter each time.**

	Length (cm)	Length (m)	Time for 5 swings back and forth	Period (T)	T^2
1	97			1.96	
2	90			1.92	
3	79			1.79	
4	68			1.67	
5	43			1.34	
6	9			0.77	
7	3			0.56	
8	2			0.52	

Make a **Period vs. Length** graph below: **(Collect the data on the back first.)**



1. What is the shape of your graph? _____
2. What type of relationship exists between T^2 and length? _____
3. a. **In a <u>different color</u>**, re-plot your graph using **T^2 vs. length**. (You may have to extend your graph vertically)
   b. What type of relationship exists between T^2 and L? _____

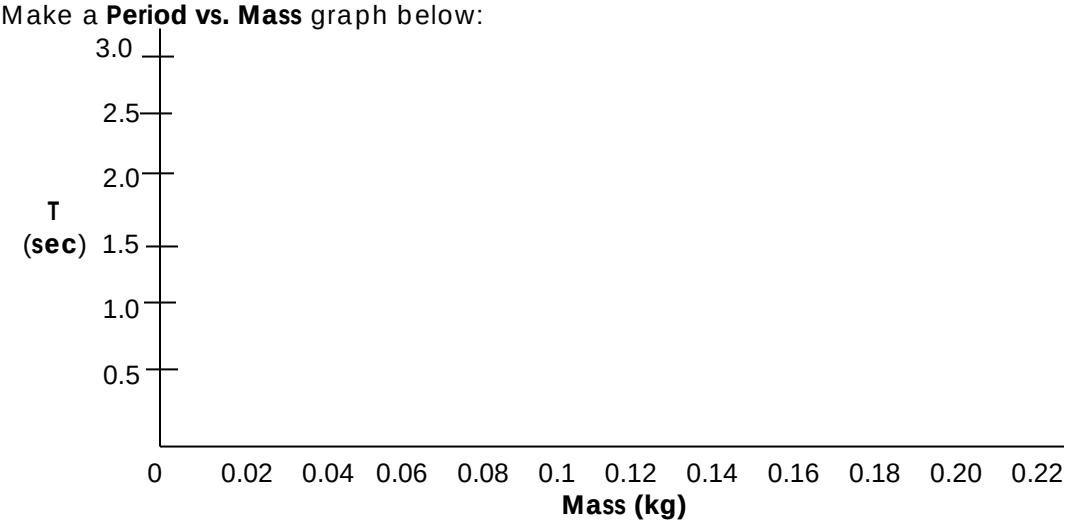
Name _____ Hour _____

Part 2: Mass of a Pendulum

Data: Pick 5 **very different** masses and time how long it takes for the mass to swing back and forth 5 times. Divide by 5 to determine the average **period** of the pendulum for each mass.

	Mass (g)	Mass (kg)	Time for 5 swings back and forth	Period (T)
1	200			1.55
2	250			1.51
3	100			1.52
4	50			1.53
5	25			1.56

Make a **Period vs. Mass** graph below:



4. What type of relationship exists between the period and mass of a pendulum? _____

Conclusion:

5. **Derive the equation for a pendulum**. ☺ That means to show how to get it!
   i. Start with $a_c = v^2/r$ and plug in $v = 2\pi r/T$ into it for v:

   ii. Simplify and solve for T^2:

   iii. Then rename your variables. The radius is just length of a pendulum (r=L) and $a_c = g$.)

   The equation for a pendulum is: ☐

   Iv What relationship exists between T and L? _____ Does your equation show this? _____
   v. What relationship exists between T^2 and L? _____ Does your equation show this?_____
   vi. What relationship exists between T and m? _____ Does your equation show this?_____

6. Calculate how long a pendulum should be on earth to have a period of 1.2 sec if the mass is 1.2 kg. (*ans. 0.36 m)* Look at your graph on the front to verify again that you are correct. ☺