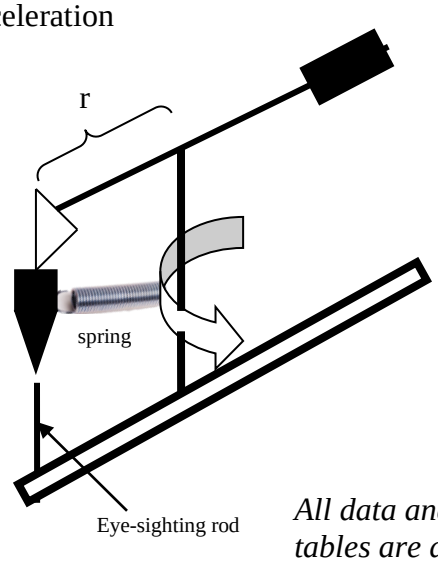
Circular Motion Lab

Purpose: The purpose of this lab is to investigate and measure the various characteristics of circular motion. We will measure the velocity of a circling object and calculate the acceleration and force present in the system.

Procedure: Set up the "circular motion apparatus" and measure the radius and mass of the circling object. Place a piece of paper on the mass (using a clothes pin) and set up the photogate so the paper passes through the photogate. Measure the width of the paper and set up the eye-sighting rod just under the point of the mass.



	paper width	mass:	radius:	velocity:
1				
2				
3				

All data and calculation tables are done in Excel. This sheet is just from Collecting data during the lab.

Set up the computer by opening the "Logger Pro" program and clicking on the Labpro icon in the upper left and then click and drag the photogate icon to the "Dig/Sonic 1" box at the top right of the Sensor menu. Right click on the *Photogate,* icon in the "Dig/Sonic 1" box and select *Gate Timing* then select "Set distance or length" to the width of the paper.

Spin the vertical shaft at a constant rate (the point of the mass should be inline with the eye-sighting rod) and start the program and measure and record the velocity of the circling object. Repeat with a differing mass and then a differing radius.

Find the velocity from the "Vel/time graph using the "Stats" button and recording the "mean" value as your velocity. Measure the mass of the spinning object and calculate the centripetal acceleration and force using the formulas for circular motion. All data and formulas are collected and displayed in Excel. Each student must do their own Excel sheet from scratch

A) $a_c = v^2/r$ 1) 2) 3)

B) $F_c = mv^2/r$ 1) 2) 3)

Error Analysis: Compare your values for *centripetal force* with the accepted value and calculate the Absolute and Relative Error. The *accepted value* "A" is the force it takes stretch out the spring using a spring scale attached to the circling mass and pulling it out to the eye–sighting rod (the mass has to be stationary when you do this!!!!). The "O" value is your calculated value from "B".

A = _____N $E_a = |O - A|$ $E_r = [E_a/A] \times 100$

E_a= 1) 2) 3)

E_r= 1) 2) 3)

Formulas

1 A	B	C	D	E	F	G	H
2Mass (kg)	Radius (m)	Vel. (m/s)	Accel(m/s^2)	O value F_c	A value F_c	E_A	E_R
3			=c3^2/b2	=a1*d4		=abs(e5-f5)	=(g7/f6)*100