PHYSICS NAME _____
LAB: **CIRCULAR MOTION** DATE _____ PERIOD _____

LAB PARTNERS: _____, _____, _____, _____

PURPOSE: To investigate the relation between force and velocity in circular motion, with mass and radius held constant.

APPARATUS / PROCEDURE / CALCULATIONS / GRAPHS: see other side

DATA and RESULTS:

RADIUS..... 0.50 m ----------> CIRCUMFERENCE..... _____m
TIME..... 10 s
MASS OF STOPPER..... _____g = _____kg

NUMBER OF WASHERS	MASS OF WASHERS (g)	MASS OF WASHERS (kg)	CENTRIPETAL FORCE (N)	NUMBER OF REVOLUTIONS	DISTANCE (m)	VELOCITY (m/s)	VELOCITY^2 $(m/s)^2$
0							
6							
10							
14							
18							
22							

CONCLUSION / QUESTIONS:
1. Write a one-sentence Conclusion which THOROUGHLY ADDRESSES THE PURPOSE. You MUST use the words force, mass, radius, and velocity in the sentence.

_____

_____

2. (a) Write the equation for your straight line motion found in graph (show UNITS with slope):

_____

(b) Write the equation for circular motion from your text:

_____

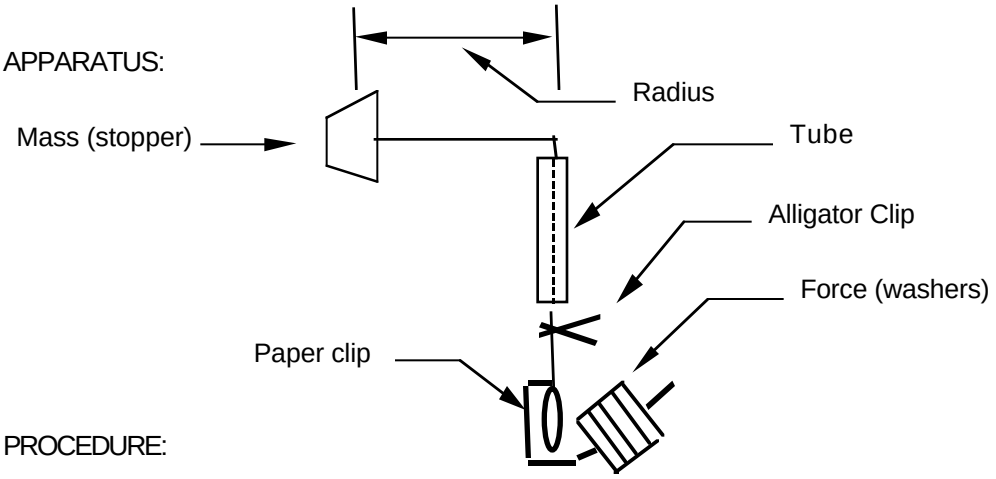
3. Notice that each of the equations in 2 has F on the left side and v^2 on the right side. Therefore the slope in the first equation should equal the m/r term in the second equation. (You can easily work out for yourself that the units of the slope are equivalent to the units of m/r.)

(a) Show a calculation for m/r (show UNITS):

(b) Show a percent error calculation comparing the value of the slope with the value of m/r:

4. Circle the correct answer in each question below:
   a) If the mass is doubled, centripetal force is [doubled] [quadrupled] [halved].
   b) If the velocity is doubled, centripetal force is [doubled] [quadrupled] [halved].
   c) If the radius is doubled, centripetal force is [doubled] [quadrupled] [halved].

APPARATUS:



PROCEDURE:

1. Using the apparatus shown in class and in the diagram above, fasten the alligator clip on the string at the bottom of the glass tube so that the clip almost hits the bottom of the tube when the radius from the top of the tube to the center of gravity of the stopper assembly is 0.50 meters.

2. Determine the mass of the stopper (to nearest 0.1 g) without detaching from apparatus (as shown in class). Record.

3. Determine the mass of 6 washers (to nearest 0.1 g). Record.

4. Place the 6 washers on the paper clip hook at the bottom of the string.

5. Whirl the stopper and adjust speed until the alligator clip ALMOST touches the bottom of the glass tube. BE SURE IT DOES NOT ACTUALLY TOUCH.

6. Begin timing, and count number of revolutions in 10 seconds. Record.

7. Repeat steps 3 - 6 for 10, 14, 18 and 22 washers.

CALCULATIONS:

1. Convert the mass of washers in grams to the mass in kilograms, and record.

2. Use mass of washers (kilograms) in each trial to determine centripetal force exerted by washers (Newtons) in each trial. Record.

3. Use radius (meters) to calculate circumference (meters). Record.

4. Use number of revolutions for each trial, and circumference (meters), to calculate total distance traveled by stopper in each trial (meters). Record.

5. Use total distance traveled by stopper in each trial, and corresponding time (10 s), to calculate average velocity for each trial (meters/second). Record.

6. Calculate the square of the velocity for each trial $(\text{meters/second})^2$.

GRAPHS:

- On a SINGLE piece of paper, use the computer graphing program to print two SEPARATE graphs.
- First Graph: Force vs. Velocity (Force on Y-axis); use POINT PROTECTORS; connect points with French curve
- Second Graph: Force vs. Velocity^2 (Force on Y-axis); use POINT PROTECTORS, REGRESSION LINE, and STATISTICS.