Name:

CENTRIPETAL FORCE AND

UNIFORM CIRCULAR MOTION

**OBJECTIVE**

The purpose of this lab is to verify the relationship between centripetal force, mass, radius and velocity for an object in uniform circular motion. That is, 

**DESCRIPTION**

One end of the cord in the centripetal force apparatus is attached a rubber stopper. A spring scale is attached to the other end of the cord. The rubber stopper is then whirled in a circle with a speed that will keep the force constant on the spring scale on the metal pole. The spring scale supplies the centripetal force that holds the stopper in circular motion.

***BE CAREFUL NOT TO HIT YOURSELF OR ANYONE ELSE WITH THE***

***RUBBER STOPPER.***

 cord Rubber stopper

You must unwind the string after each trial. To do this hold apparatus upside down and let string unwind. Make sure string does not rewind itself.

Be sure to zero your spring scale upside down with no mass before each trial.

Spring Scale

 Metal pole

**PROCEDURE**

**Part 1**

Zero the spring scale upside down with no mass attached. For trial 1, attach the small mass to the end of the cord and connect it to the spring scale through the glass tube. Adjust the position of the spring scale so the radius is a constant 0.75 m when the spring scale is stretched to 1.0 N. When the speed of the stopper is such that the desired force is constant begin recording the time to complete 25 revolutions. Practice adjusting the speed of the whirling stopper so that you are able to maintain a constant force on the spring scale. For trials 1 use a constant force of 1.0 Newtons. When the radius of the circle is adjusted, and the stopper is moving with a constant speed, one of the lab partners should measure the time required for the stopper to complete 25 revolutions. Record all data from trial one your data table. **Make sure to unwind string after each trial.** Repeat the procedure in trials 2 through 4. Keep the radius at 0.75 m and vary the force to 1.5 N, 2.0 N, and 2.5 N. Make sure to adjust the radius for each new force

**Part 2**

In trials 5 through 8 vary the radius from 0.50 m to 0.7 m, to 0.9 m to 1.0 m while keeping the force at a constant 2.0 N.

Measure the mass of the rubber stopper used in trials 1 through 8.

**Part 3**

For trials 9 through 12 use with different mass stoppers at the end of the cord. Keep the radius constant at about 0.75 m and keep the force at 2.0 N. Measure and record the mass of each of the stoppers used in the data table.

**CALCULATIONS**

Complete the data table

**ANALYSIS OF DATA**

1. For Part 1 only, (trials 1 – 4), plot a graph of centripetal force versus average speed squared.
2. For Part 2 only, (trials 5 – 8), plot a graph of radii versus average speed squared.
3. For Part 3 only, (trials 9 – 12), plot a graph of mass versus average speed squared.

**INTERPRETATION OF DATA**

1. Describe the relationship between centripetal force and average speed squared. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Describe the relationship between radius and average speed squared. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Describe the relationship between mass and average speed squared. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_