LAB Round and Round

INTRODUCTION:
In this lab, you will increase centripetal force by adding more stoppers and observing the change of the object's rotation speed. You will then graph the data and derive a conclusion about the relationship between the speed of the orbiting object and the centripetal force acting on it.

PURPOSE:
To observe the relationship between the speed of an orbiting object and the centripetal force acting upon it.

MATERIALS:
- 1-meter length piece of twine
- 1 small 1-hole rubber stopper (#1)
- masking tape
- meter stick
- safety glasses

- 3/8" Pex tube cut in 6" lenghts (from lumber supply)
- 5 large 1-hole rubber stoppers (#4)
- stopwatch or a clock with a second hand

PROCEDURE:
1. Attach one end of a 1-meter long piece of twine to a small rubber stopper.

2. Thread the other end of the twine through the Pex tube.

3. Once the twine is all of the way through the tube, attach one of the large 1-hole rubber stoppers to the free end of the twine.

4. Slide the Pex tube up to the small rubber stopper and place a small piece of tape around the twine approximately 45 cm from this end.

5. Hold the tube in your hand with the small rubber stopper on top and the larger stopper hanging freely at the bottom. (Be sure to wear safety glasses!)

6. Begin rotating the Pex tube so that the small stopper is orbiting in a circle above it:
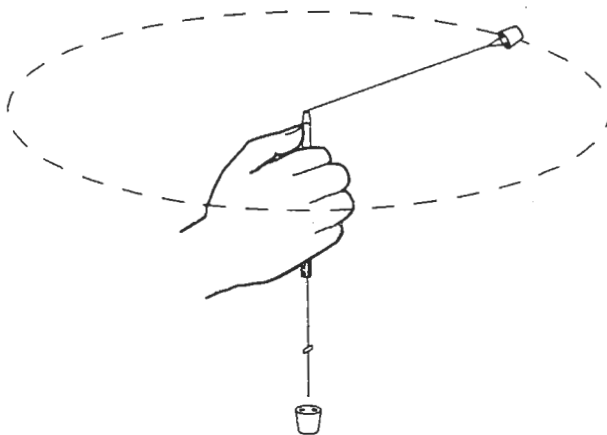
7. Adjust the speed of the small stopper so that the tape marker on the string is 1-2 cm below the Pex tube.

8. Using a stop watch, count the number of times the stopper rotates in 15 seconds.

9. Record this information in the data table in the following section.

10. Repeat the above procedure adding a large stopper to the bottom of the string each time until a total of five stoppers have been tested. Record all information in the data table.

11. According to the data table, what does the number of stoppers at the bottom of the string represent? _____

DATA TABLE

CENTRIPETAL FORCE (# of stoppers)	SPEED OF ORBITING OBJECT (# of rotations in 15 seconds)

ANALYSIS: Prepare a graph below of "Centripetal Force (# of stoppers) vs. Speed of Orbiting Object (# of rotations)".

CONCLUSIONS:

1. What happened to the speed of the stopper as the weight at the bottom (centripetal force) increased? _____

2. In what direction was the centripetal force pulling on the stopper?
    a. away from the center of its path
    b. towards the center of its path
    c. downward
    d. centripetal force had no effect on the object

3. In order for an object to stay in an orbital path, as centripetal force increases, the speed of the orbiting object must (decrease/increase).