Lab: Investigating Centripetal Force

Physics 1P Mr. Traeger

Name: _____ Period: _____ Date: _____

Purpose

The purpose of this lab is to investigate the centripetal force required to keep a rubber stopper in circular motion.

Materials

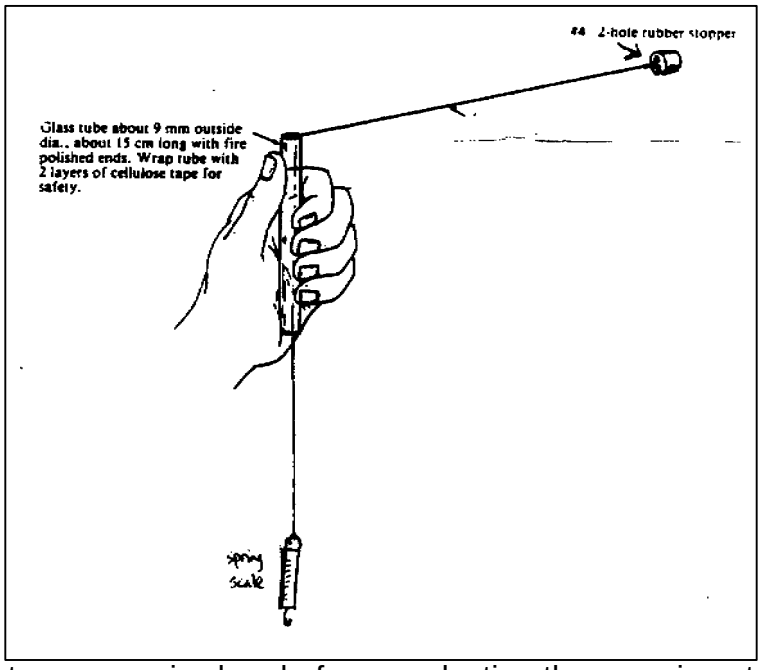
- Glass tube
- 30 lb. test Dacron cord
- 2.5 N, 5 N, and 10 N spring scales
- rubber stoppers of varying mass
- meter stick
- stopwatch
- safety glasses/goggles
- electronic balance
- calculator

Procedure

1. Get into groups of 4. One person will swing the stopper, one person will read the spring scale, one person will time the revolutions, and one person will record data.

2. Gather the necessary materials. Find an area between the 9-12 library and the gym that is free from obstructions and other people.

3. Assemble your apparatus as illustrated. Thread the cord through the glass tube and then tie a rubber stopper at one end and a spring scale at the other end.



4. Make sure that your area is clear before conducting the experiment. Put on your safety glasses/goggles.

5. Swing the stopper in an even horizontal circle above your head. Try to keep the velocity the same each time.

6. Record the time that it takes to complete 10 to 20 revolutions. Divide this time by the number of revolutions. This will be the period (T). With the period and the radius of the circle, you will be able to calculate the linear velocity of the rubber stopper.

7. Record the force in Newtons that is measured on the spring scale.

8. Measure and record the distance from the top end of the glass tube to the middle of the rubber stopper in meters. This will be the radius of the circle.

9. Measure and record the mass of each stopper that you used when you return to the lab. While you are doing the experiment, record the number stamped on the stopper.

10. You will first record data while keeping mass constant and varying the radius. You will then record data while varying mass and keeping the radius constant. Complete 4 trials for each.

11. Return to the lab to complete your analysis.

Data

Constant Mass, Changing Radius

Stopper # and mass (**m**) in kg	time in seconds	# of revolutions	Period (T) in seconds	Radius (**r**) in meters	Velocity (**v**) in meters/second. $v = 2\pi r/T$	Measured Force in Newtons (spring scale)	Calculated Force in Newtons ($\mathbf{mv^2/r}$)

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Changing Mass, Constant Radius

Stopper # and mass (**m**) in kg	time in seconds	# of revolutions	Period (T) in seconds	Radius (**r**) in meters	Velocity (**v**) in meters/second. $v = 2\pi r/T$	Measured Force in Newtons (spring scale)	Calculated Force in Newtons ($\mathbf{mv^2/r}$)

Calculations (Show the work for your calculations here)

Questions

1. Did your calculated force match your measured force? If not, what do you think were the experimental errors?

2. Do you think that experimental errors could have affected your calculations?

3. Which error do you believe had the biggest effect on your results?

4. How could you improve the accuracy of this experiment?

5. How could we extend this lab and apply it to real-world problems?

Conclusion