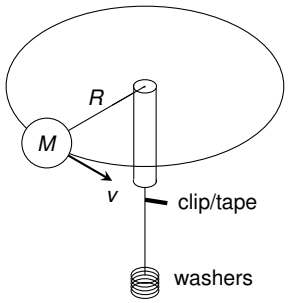
Physics 12
Centripetal Force Lab

Purpose: To find the relationship between the centripetal force and the velocity of the object moving in a circular path.



Apparatus: small tube, approximately 1.5 m length of fishing line, rubber stopper, 24 washers, stop watch, paper clip, alligator clip/tape, balance.

Procedure:

1. Measure the mass of the rubber stopper.
2. Tie one end of the fishing line to the stopper.
3. Thread the line through the top of the tube.
4. Bend the paper clip into a hook and attach it to the other end of the fishing line so that the washers can be attached.
5. Attach the alligator clip (or use tape) to the line so that approximately 0.8 to 1 m of line extends from the top of the glass tube. This will be the radius of the circular path. measure this radius when the marker is up to, but not touching the bottom of the tube.
6. Attach five or six washers to the line. Measure the mass of washers and paper clip. Don't worry about the mass of the fishing line. Calculate the weight of the washers and paperclip.
7. Practice whirling the rubber stopper in a horizontal circle above your head so that the alligator clip/tape rises up to, ***but not touching*** the bottom of the glass tube. Once you are able to keep the clip/tape steady at this point, measure the time for 30 revolutions.
8. Calculate the period.
9. Calculate the velocity of the rubber stopper by using the period and radius of swing.
10. Calculate the centripetal force of the rubber stopper by using its mass, velocity and radius.
11. Repeat this procedure, adding 3 or 4 more washers to the ones already there, until all 24 washers are on the line. in each case record the time taken for 30 revolutions, the period, the velocity and centripetal force.

mass of rubber stopper(kg)=						
radius of swing(m)=						
# of washers	mass of washers (kg)	weight of washers (N)	time for 30 revolutions (s)	period T (s)	velocity v (m/s)	Centripetal Force F_c (N)

Analysis:

1. From the observations in your table, does the centripetal force equal the weight of the washers? What is the % difference? What is the source of the centripetal force?
2. Plot of graph of F_c vs. v. Plot v on the $x-$axis. What is the shape of the graph?
3. Plot a graph of F_c vs. v^2. What is the relationship indicated?
4. What step or steps could have been added to the procedure to test the effect of the radius on the motion of the stopper?