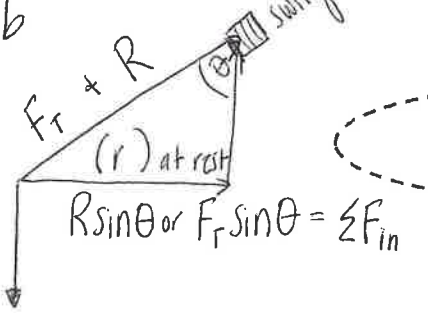
"r" = $R\sin\theta$ or radius measured in lab (at rest)

R = radius measured in lab when spinning

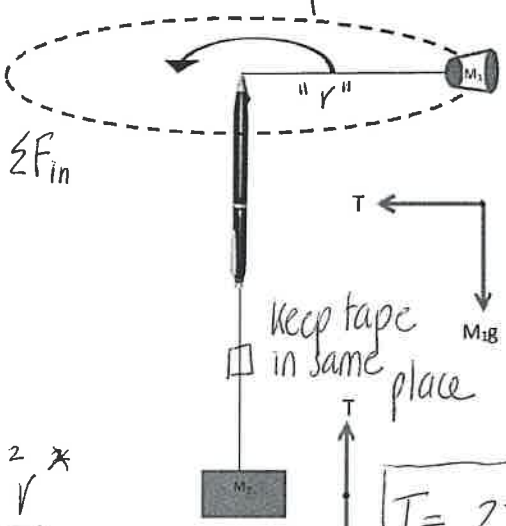
angle does not matter

Keep radius constant

Mathematical model:



$R\sin\theta$ or $F_T\sin\theta = \Sigma F_{in}$



$$F_T\sin\theta = \frac{m4\pi^2 r}{T^2}$$

$$F_T\sin\theta = \frac{m4\pi R\sin\theta}{T_2}$$

so... $$F_T = \frac{m4\pi^2 R}{T^2}$$

$$\frac{mv^2}{r} = mg \quad (\Sigma F_{in}) \quad v = \frac{2\pi r}{T}$$

mass of stopper; mass of washers

$$\Sigma F_{in} = \frac{m4\pi^2 r}{T^2} \quad *$$

$$T^2 = m4\pi^2 r / \Sigma F_{in}$$

$$T = \frac{2\pi\sqrt{mr}}{\sqrt{F_{in}}}$$

SAFETY: ***You must use good judgment and common sense while swinging the rubber stopper. Keep alert at all times for flying objects***

may share data table + graphs w/ lab group

In a suitable table record all of the data collected (TYPED)
Include uncertainties due to the measuring apparatus used.
Use your data to graph the relationship between the period and force. Hint: You'll want to find a directly proportional relationship. If you find that your data isn't directly proportional (it should be), you should create another graph to discover how they can be made directly proportional. linearize 1st graph for 2nd graph
Be sure to include error bars to indicate the uncertainty, and a maximum and minimum slope to determine the overall uncertainty. max + min slope for linearized graph
Include all of your graphs created (there should be at least two)

The Analysis, Evaluation and Communication sections need to be completed as per the handouts in class.

TYPED CONCLUSION IN OWN WORDS INCLUDE SAMPLE CALCULATIONS

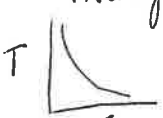
- state min + max slope values
- discuss if your calculated value falls within range of slope values
- discuss 3 procedural errors and 3 ways to improve the accuracy of the lab

DO NOT SAY HUMAN ERROR!

linearize graph #1 for graph #2
graph #2 will have min + max slopes

slope = $2\pi\sqrt{mr}$ (mass of stopper; radius)

Graph #1
Average Time vs. Inward Force (Period)



Graph #2

Average Time (Period) T vs. One over the square ROOT of Inward force