Massin' around! A Centripetal Force Lab

Objective: Students will analyze the relationship between radius, tangential velocity, and centripetal force for an object moving in a circle.

Materials:
- Circular motion lab apparatus
- Hanging hook masses

Safety:
- **WEAR SAFETY GOGGLES!** (Ha ha! You thought you were done with those! ☺)
- When swinging the mass above your head, be sure to do it in a safe way so that you do not harm people or equipment.
- The circular motion lab apparatus is made of glass and is therefore fragile. Take special care not to break it. If it does break (But don't break it!) call your teacher over immediately and do not touch the broken glass.

Procedure:

1. Set up your circular motion apparatus with the hanging mass dangling through the bottom of the tube and the rubber stopper at the top of the tube.
2. Check that everyone around you has goggles on and is aware that you are about to swing the rubber stopper. Ensure that all computer screens are facing away from where you will be swinging.
3. Begin to swing the rubber stopper horizontally above your head as shown in the picture to the right. Adjust where the tube hits the string to ensure that the radius of motion is constant at one of the marks on the string.
4. Measure the time for ten consistent swings. Then calculate the period and record it in the data table for trial 1.
5. Record the centripetal force (equal to the weight of the hanging mass) and the radius for trial 1. Calculate the tangential velocity.
6. Now EITHER change the radius OR change the amount of mass hanging from the string. (Do not change both.) Repeat steps 2-5 recording all data and conducting all calculations.
7. Repeat step 6 changing the same variable as before. (In other words, if you changed radius in step 6, change radius one more time.)

Data Tables and Graphs

Mass of rubber stopper: _____

Trial	Radius (m)	Period (s)	Tangential Velocity (m/s)	Centripetal Force (N)
1				
2				
3				

Calculations: Please type out the following calculation for run 1 only in your lab report.

- Tangential velocity for run 1

Conclusion: Be sure to write an appropriate conclusion that addresses all objectives, supports with evidence, and accounts for errors.