Borrowed from Mr. Forrest /A. P. Physics 2015/2016
Date: _____
Per. _____

Name: _____
Partners: _____
_____
_____

Torque Measurement and Estimation Lab (V1.0)

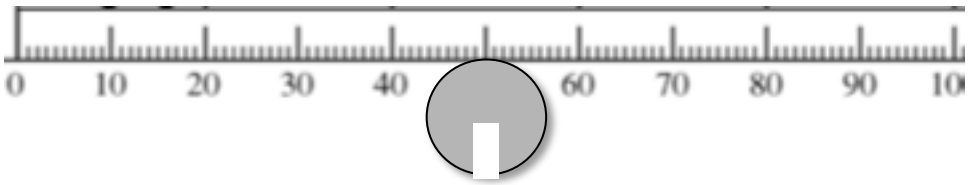
For 2015, mass the magnetic beads on the top of an overturned cup!

Materials:

1 meter stick | semicircular base | 10 g mass | 20 g mass | metallic beads (several)
purple beads | smaller multi-colored beads | fine measuring devices

Additional materials depending on methodology: Skill | patience

Purpose: To use the concept of torque to solve for the mass of objects indirectly.



Procedure – Part 1 **Name or code on meter stick:** _____

1) Set up the meter stick to balance on the circular slotted mass as shown. Use the 10g, 20 or both of these masses to determine the mass of your meter stick indirectly. Describe your method below, and show all mathematical calculations clearly, including general formulas. Make sure to use an appropriate level of precision and give a RANGE in your predicted answer that tries to incorporate your uncertainties.

Predicted mass = _____ Measured mass = _____

% error:

Reasons of uncertainty / error: Please be specific where you think most of the uncertainty happened.

2) Now using the tools you have available (NOT the electronic balance as of yet), determine how many grams (on average) each of the metallic beads would mass. Again, make sure to use an appropriate level of precision and give a RANGE in your predicted answer that tries to incorporate your uncertainties. Explain your method/show work clearly in the space below – draw a sketch if you want to help!

Predicted mass = _____, and within a range of _____

3) Now using the metallic beads you have available to determine how many grams (on average) each of the purple beads would mass. As before, make sure to explain/show work and to give a range in your answer.

Predicted mass = _____, and within a range of _____

4) Now using the purple beads you have available to determine how many grams (on average) each of the smaller multi-colored beads would mass. Do the same things as asked in steps 2 and 3.

Predicted mass = _____, and within a range of _____

Q?) Were there any extra precautions you took to measure the smaller multi-colored beads compared to the earlier items? If so, what were they and why did you take these measures?

Analysis:

1) Now determine how many of the (a) metal beads, (b) purple beads and (c) smaller multi-colored beads would equal the mass of your meter stick. As always, show your work clearly and use an **appropriate level** of precision.

2) How did you decide on your range of uncertainty for the metal beads compared to the smaller multi-colored beads? Was there a difference in how you decided on this? If so, why? If not, why not?

3) Now we're going to find out the accepted values using an electronic balance. Describe how you would go about using the balance to determine the mass of a single smaller multi-colored bead. You may ask Mr. Forrest clarification questions before you answer this, and you MUST show this to him before you use an electronic balance.

4) Now let's get the accepted mass of those beads! If you need to show any math by your data, please do so.

$m_{\text{metallic}} =$ _____ $m_{\text{purple}} =$ _____ $m_{\text{smaller multi-colored}} =$ _____

5) Determine your % error and note whether each bead was within your range.

Metallic:

Purple:

Smaller multi-colored:

6) Based on the trends you observed, analyze you and your lab partners ability to analyze uncertainty and make prediction in this lab. Were you too precise in your range? Too broad? Forgot to take some uncertainties into account (if so, which ones?). Basically this is your overall analysis of the lab, so do a good job.

BONUS: ***I have silver glass beads … which are even smaller …..***