P1310L, Rolling Without Slipping
Lab 11, Raw Data Sheet

Submitted by: _____ Experiment's date: _____

Team members:

1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor must initial:_____

Introduction

Write a short paragraph about the purpose of this lab.

Analysis

Instructions: Follow the steps on this worksheet, using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Show at least one sample calculation for each result requested. The results must include appropriate SI units. If a table is used, then it must have headers (for rows or columns) that include units

Kinematics of the Center of Mass

1. Starting from the statement of energy conservation as given in equation (11.6) derive equation (11.7).

2. Starting from the following definition of an object's acceleration, derive eq. (11.9)

$$a_{cm} = \frac{dv_{cm}}{dt}. \tag{1}$$

3. Derive equation (11.7) from the Lab Manual.

Solid Disk:

4. Determine the average traveling time for the solid disk.

5. Use equation (11.10) from the lab manual, the distance traveled by this object, and the average time found in the previous question to obtain its center of mass acceleration.

6. Use your data and the previous result to determine the velocity of the object's center of mass at the end of the ramp.

7. Combine your previous result with the height dropped by the center of mass to determine the value of the constant k in equation (11.4).

8. Find the percent difference between your calculated value and the accepted one, given in Table 11.1.

Solid Sphere:

9. Similarly to the Solid Disk case, determine the value of the constant k in equation (11.4) for the solid sphere.

10. Find the percent difference between your calculated value and the accepted one for this case.

Metal Hoop

11. Determine the value of the constant k in equation (11.4) for the metal hoop.

12. Find the percent difference between your calculated value and the accepted one for this case.

Conclusion

Summarize your results and write a brief reflection on the experiment; in particular, comment on whether the theory makes reasonable predictions despite the observed variability.