Name _____   Date _____

AP Physics   Lab Activity #9 (45 pts)

Period _____   Mrs. Nadworny

Partners: Due Date _____

Rotational Motion

NO Lab Write-Up Required
must be neatly written in pencil

Purpose

To calculate the rotational inertia of a pulley.
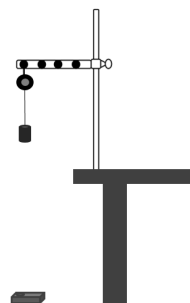
Materials (1)
Include other necessary equipment.

- pulley
- Logger Pro
- string
- Index card

- 50 g mass
- motion detector
- ring stand & clamp
-

Diagram (2)
Include other necessary labels on the diagram.

Procedure

1. Attach a pulley to the clamp. Place the motion detector on the floor beneath the pulley.
2. Measure a length of string and attach it to both a 50 gram mass and the pulley. Ensure that the string length is short enough that the mass will not come into contact with the motion detector when fully extended. Tape an index card to the bottom of the mass.
3. Wind the string around the pulley. Release the mass and use the motion detector to measure and record the distance and time.
4. Measure and record any other necessary data.

Data Collection (5)
Clearly organize the raw data you measured in the space below. The data tables for the LoggerPro graphs can remain on the graphs and do not have to be transferred here.

Data Processing

1. Which quantities should be graphed in order to best determine the acceleration of the block? Explain your reasoning. (2)

2. Plot the quantities determined in (1), following all graphing rules. Attach your two graphs (original data and straightened data) to this lab sheet. (11)

1

3. Calculate the acceleration of the block using your graph. Show all work. (2)

4. Derive an expression for the tension in the string. (2)

5. Calculate the tension in the string. Show all work. (2)

6. Derive an expression for the angular acceleration of the pulley in terms of the linear acceleration. (2)

7. Calculate the angular acceleration of the pulley. Show all work. (2)

8. Derive an expression for the moment of inertia of the pulley using the torque of a rotating body. (2)

9. Calculate the moment of inertia for the pulley. Use the expression from the previous step. Show all work. (2)

10. Calculate the moment of inertia of the pulley using the solid disk formula. Show all work. (2)

11. Compare your two results with a percent difference. (2)

Conclusion   (3)
Explain why the differences in the two values likely occurred.

(3)
neatness