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**Sequoyah High School**

 **AP Physics C**

**Rotational Motion Lab**

**Objectives:**

* Measure the translational acceleration of a object falling from a pulley (as illustrated in the figure below), and
* Use the measured acceleration to analyze the validity of assumption that the pulley exhibits rotational inertia consistent with a disk (*I* = ½ MR2).



**Equipment:**

Pulley, hanging mass, motion detector with CBL data acquisition system.

**Background:**

Most rotational motion problems involving an object falling from a pulley advise the solver to assume that the pulley exhibits the rotational inertia of a disk:

 $I= \frac{1}{2}MR^{2} $(1)

 To verify the validity of this assumption, one could measure the translational acceleration of the falling object and relate this acceleration to the angular acceleration of the pulley. After determining the angular acceleration of the pulley, applying Newton’s Second Law for Rotational Motion (equation 2) would yield an empirical value for the rotational inertia of the pulley.

 $ = Iα$ (2)

The torque is provided by the weight of the falling object located a distance R from the axis of rotation of the pulley. Translational acceleration of the falling object can be determined by obtaining distance and time data.

**Experimental Procedure:**

Things to consider while developing the procedure:

* Is the acceleration of the falling object constant? If so, constant acceleration formulas may be applied.
* How will you obtain distance and time data? Once the data are collected, how will you graph them to yield acceleration?

**Conclusion:**

Your conclusion should address the translational acceleration of the block and relate this value to the angular acceleration of the pulley. The conclusion should also compare the percent difference between the calculated moment of inertia and the moment of inertia that would be obtained from the disk formula (equation 1).