

EXPERIMENT #10 - PHYSICS230

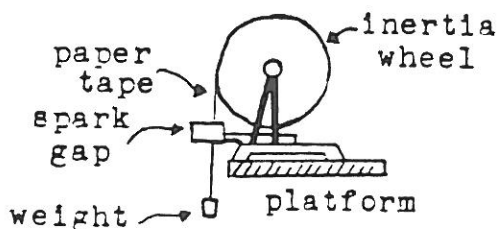
Angular Acceleration

OBJECT: To study the angular acceleration and moment of inertia of a rotating wheel.

EQUIPMENT: Welch Rotational-inertia apparatus
spark timer
weights, clamps, paper tape

GENERAL DIRECTIONS:

1. Examine the rotational-inertia apparatus to determine its principle of operation. Place the inertia wheel and its supporting structure on a platform at a reasonable distance above the floor as shown in the following diagram:



Connect the spark timer to the apparatus properly.

2. Place the paper tape around the rim of the wheel and through the spark gap. Attach a reasonable weight (about 50 grams) to the end of the tape. Turn on the timer and adjust the spark gap to obtain a good spark. Release the inertia wheel by pulling back on the rubber-tipped plunger and allow the hanging weight to descend to the floor as a preliminary test run. Examine the tape to be sure everything is operating properly.
3. Determine the kinetic friction torque of the wheel by finding the proper value of weight that must be attached to the paper tape in order that the wheel turns at a constant angular speed after it is initially given this motion.
4. Attach a reasonable weight to the paper tape and let it accelerate the inertia wheel as described in part 2. Analyze the data from this tape and determine the linear acceleration of the descending weight.
5. Detach the inertia wheel from its supporting structure. Measure its radius, thickness, and mass. Also include the radius and thickness of the bearing structure at the center of the wheel.
6. Derive the equation of motion including friction for the inertia wheel and solve for the wheel's moment of inertia. Using the experimental data and this equation calculate the value of the wheel's moment of inertia.
7. From the mass and dimensions of the wheel calculate the wheel's moment of inertia and compare this value to the value calculated in part 6. Find the per cent error and explain why there may be an error.