

PHYSICS 190: MECHANICS and HEAT; Lab 7: Torque and Rotational Inertia

Kinetic Friction

1. set up

- a. materials needed: Motion Detector, Universal Lab Interface (ULI), computer with Logger Pro software, rotational inertia platform with ring and disc, table clamp pulley, slotted mass set, slotted mass hanger and string
- b. place the ring on the platform
- c. wrap string around rotational inertia platform's drum and attach to slotted mass hanger making sure that the string passes over the table clamp pulley
- d. position the Motion Detector above the slotted mass hanger so that it can detect the vertical motion of the hanger
- e. release the hanger allowing it to descend
- f. adjust the amount of mass on the hanger until it moves at a constant speed
- g. add 100 grams to the amount on the hanger
- h. use Logger Pro to determine the acceleration of the hanger with this new amount of mass

2. measurements

- a. measure and record radius of the drum
- b. record the hanging mass for zero acceleration
- c. record the acceleration and the mass for this acceleration

3. analysis

- a. calculate the torque acting on the drum with and without an acceleration
- b. calculate the angular acceleration of the platform
- c. use the torque and angular acceleration to calculate the rotational inertia of the platform/ring combination
- d. repeat steps "1c" to "3c" for platform/disc and platform/disc/ring

4. Questions

- a. What is the rotational inertia of the ring?
- b. What is the rotational inertia of the disc?
- c. What is the rotational inertia of the platform?
- d. If you had a graph of the applied torque as a function of the angular acceleration to what does the slope correspond?
- e. Why does this graph have a positive "y" intercept?