Rotational Motion and Moment of Inertia
Questions

The first error in the experiment is the human error. Measuring the time, the height, radius and weight can't be 100% precise. There will always be a slight error in the measurements.

The second error in the experiment is air resistance. As the block falls it is being slowed down. Since the acceleration is zero the air resistance should be constant and might affect the calculation of the friction torque of the system.

The last error is the instrument error. The block might accelerate very slowly during the descent and the block might swing side to side a little bit. Both of these things might throw the calculations off.

Rotational Motion and Moment of Inertia
Advance Study Assignment

1. **What are the rotational analogs of force, mass and Newton's second law?**

Newton's law states that force is equal to mass times acceleration $F=ma$. To get the rotational analogs of force we have to replace the force with the torque and the mass with the inertia to get $\tau = I a$.

2. **Define moment of inertia. How is torque related to moment of inertia?**

The moment of inertia is what is the object's resistance to changes in its rotational motion. The inertia depends on the shape of the object and how you move it and how heavy the object is. It is related to torque as it is just acceleration time inertia such as in the equation $\tau = I\alpha$.

3. **Describe two methods by which the moment of inertia of a body may be experimentally determined.**

One way of determining inertia is by measuring torque and acceleration and solving the equation $T=Ia$. The other way is by having a symmetrical object that weighs the same everywhere and calculating the inertia using calculus and geometry.

4. **How is the frictional torque of a rotating system experimentally determined or compensated for?**

The frictional torque is determined by using energy, the potential energy of the height is equal to the kinetic energy lost due to friction from the torque such a s mgy = 1/2mv^2 +1/2Iw^2.

5. **Explain how tangential and angular velocities and accelerations are related to one another.**

Tangential velocity/acceleration is how an object moves in a straight line while moving in a curved path. Angular is how fast an object spins around in a point. They are related to one another through this equation, tangential velocity equals the radius times the angular velocity.

6. **A solid cylindrical object has a mass of 2.0 kg, a diameter of .10 m, and a length of 0.18 m. What is the moment of inertia of the body about an axis along the axis of the cylinder? Show your work.**