Lab: Roll the Can and Spin the Chair!

Physics 1P Mr. Traeger

Name: _____ Period: _____ Date: _____

Purpose

The purpose of this lab is to investigate the basics of rotational mechanics such as torque, angular velocity, angular acceleration, moment of inertia, and conservation of angular momentum.

Materials

- Food cans: hollow and filled
- Ramp
  - Moment of inertia discs
- Stop watch
- Books
  - Swivel chair
- Meter stick
- Bicycle wheel
- Solid wood cylinder and tape roll

Part 1: Moments of Inertia, Torque, and Angular Acceleration

Procedure and Questions

1. Take a ramp outside with some books. Prop the ramp up on top of the books.
2. Also obtain a hollow can, a filled can, a moment of inertia disc with metal balls inside of it, a hollow duct tape roll, and a solid wood disc.
3. Roll the objects down the ramp, noting the time it takes for each to go from a specified point on the ramp to the bottom. You can race them against each other, or do them one at a time.
4. Fill in the qualitative data chart below.

Object	Description and Drawing of Object	Formula for Moment of Inertia (I) See homework sheet.	Time to roll down incline (seconds)	Ranking (1 = fastest, 2 = slowest)
Hollow Can Vs.				
Filled Can				
Kit (balls inward) Vs.				
Kit (balls outward)				
Wood Cylinder Vs.				
Tape Roll				

5. Write a description of what you observed among each of the three pairings. Your description must include a thorough understanding and description of ∉ = I * Ũ. In other words, what happened to Ũ when I changed?

Hollow Can vs. Filled Can	Variable Inertia Kits (Balls Inward vs. Balls Outward)	Wood Cylinder vs. Tape Roll

Part 2: Conservation of Angular Momentum
Procedure and Questions

1. Obtain a bicycle wheel. Spin it and describe how the angular momentum allows a bicycle rider to balance her or his bike.

2. Now, spin the bicycle wheel and sit in a swivel chair. Describe what happens when you spin the bicycle wheel one way and then the opposite way.

3. Now, you get to try Mr. Traegerôs demonstration. Get some heavy books, put them at armôs length, and spin yourself. Draw your arms inward and then outward. Explain what you observe in the context of L = I * ϒ and L = m * v *r. Explain what is happening in the context of both of those equations.

4. Describe how conservation of angular momentum is obeyed in the solar system and elsewhere. Give at least one example of the solar system and at least two examples from everyday life.

Conclusion: How did this lab strengthen your conceptual understanding of Moment of Inertia and Conservation of Angular Momentum?