Name: ____________________________________ Date: __________________

Rotational Motion

Objective: To observe what factors affect the rotational motion of an object as it rolls down an inclined plane.

Procedure:

Part A:

1. Make a ramp with a board and support. It should be at an angle of ten degrees.
2. Select three different balls. Record the material in the data table. Predict which one will reach the bottom of the ramp first by placing an "X" in the appropriate box.
3. Place a meterstick across the ramp near the top and rest two of the balls on the stick. Quickly remove the stick to allow the balls to roll down the ramp.
4. The "winner" is then rolled against the third ball. Make an "X" next to the actual winner.
5. If there is ambiguity in the results, run a second trial to confirm the winner.

Part B:

1. Repeat Part A using two balls made of the same material but with different diameters.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Part C:

1. Repeat Part A using three different hollow cans. Measure the diameter of the cans and record in the table.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Part D:

1. Repeat Part A using three different solid cans. The contents should not "slosh." Measure the diameter of the cans and record in the table.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Part E:

1. Repeat Part A using a hollow cylinder and a solid cylinder. The contents of the solid one should not "slosh." Measure the diameter of the cans and record in the table.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Part F:

1. Repeat Part A using a solid ball and a solid cylinder. The contents of the solid one should not "slosh." Measure the diameter of the cans and record in the table.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Part G:

1. Repeat Part A using a solid ball and a hollow cylinder. The contents of the solid one should not "slosh." Measure the diameter of the cans and record in the table.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Part H:

1. Repeat Part A using two solid cylinders. The contents of one should not "slosh" and the other can should "slosh." Measure the diameter of the cans and record in the table.
2. Predict a winner first by placing an "X" in the appropriate box. Make an "X" next to the actual winner.

Data:

Part A:

Ball material	Predicted winner	Actual winner

Part B:

Ball material	Predicted winner	Actual winner
Small diameter		
Large diameter		

Part C:

Cylinder Diameter	Predicted winner	Actual winner

Part D:

Cylinder Diameter	Predicted winner	Actual winner

Part E:

Cylinder Type	Predicted winner	Actual winner

Part F:

Solid Type	Predicted winner	Actual winner

Part G:

Solid Type	Predicted winner	Actual winner

Part H:

Solid Cylinder	Predicted winner	Actual winner
Sloshing		
Nonsloshing		

Analysis:

1. What can you conclude about the time it takes for two solid balls of different diameter to roll down the same incline?
2. What can you conclude about the time it takes for two hollow cylinders of different diameter to roll down the same incline?
3. What can you conclude about the time it takes for two solid cylinders of different diameter to roll down the same incline?
4. What can you conclude about the time it takes for a hollow and a solid cylinder of different diameter to roll down the same incline? How do you explain this result?
5. What can you conclude about the time it takes for a solid ball and a solid cylinder of different diameter to roll down the same incline?
6. What can you conclude about the time it takes for a solid ball and a hollow cylinder of different diameter to roll down the same incline?
7. How can you explain the results for the sloshing vs. nonsloshing soup?
8. Based on what you observed, which shape had the greatest rotational inertia – that is resistance to gravity accelerating it down the board.