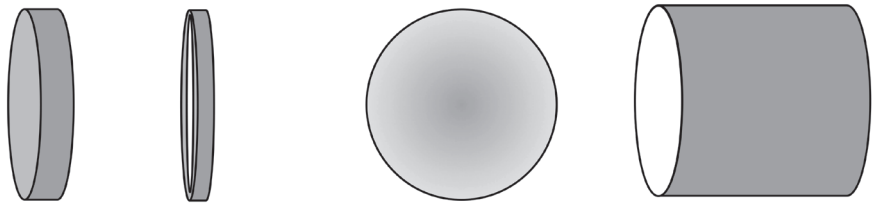
Checkout Questions

Lab 10. Rotational Motion: How Do the Mass and the Distribution of Mass in an Object Affect Its Rotation?

Pictured below are four objects (a solid disc, a hoop, a sphere, and a solid cylinder). The mass and radius for each object are also provided. Use this information to answer question 1.



Solid disc
m = 350 g
r = 15 cm
$I = \frac{1}{2}MR^2$

Hoop
m = 350 g
r = 15 cm
$I = MR^2$

Sphere
m = 350 g
r = 15 cm
$I = \frac{2}{5}MR^2$

Solid cylinder
m = 350 g
r = 15 cm
$I = \frac{1}{2}MR^2$

1. If all four objects are released from the top of a ramp and allowed to roll to the bottom, what will be the finishing order for the objects?

    a. All objects will come to the bottom at the same time.
    b. The sphere will come to the bottom first, then the solid disc and solid cylinder at the same time, then the hoop.
    c. The hoop will come to the bottom first, then the solid disc and solid cylinder at the same time, then the sphere.
    d. The solid cylinder and the solid disc will come to the bottom first, then the sphere, then the hoop.

    Justify your answer using what you know about rotational motion.

2. Jeremy and Susan are playing on a merry-go-round. Susan says she wants to sit close to the center of the merry-go-round while Jeremy pushes the merry-go-round. Jeremy wants to sit closer to the outer edge. To get the merry-go-round to move at an angular velocity of one rotation per minute, who would need to turn the merry-go-round with a large force? Assume Jeremy and Susan each has a mass of 40 kg.

   a. Jeremy
   b. Susan
   c. The same force is needed.

   Use what you know about rotational motion to justify your answer.

3. Scientific research requires imagination and creativity.

   a. I agree with this statement.
   b. I disagree with this statement.

   Explain your answer, using an example from your investigation about the effect of a mass and the distribution of mass on a rotating object.

4. There is a difference between observations and inferences in science.

   a. I agree with this statement.
   b. I disagree with this statement.

   Explain your answer, using an example from your investigation about the effect of a mass and the distribution of mass on a rotating object.

5. Why is it important to identify patterns and the underlying causes for those patterns in science? Be sure to include examples from at least two different investigations in your answer.

6. Why is useful to think about the relationship between structure and function during an investigation? Be sure to include examples from at least two different investigations in your answer.