

Rotating Spheres

You will determine whether a solid sphere or a hollow sphere, both with the axes of rotation at the center, has a greater speed at the bottom of an incline.

You know the following:

$$h_f = 0 \text{ m}$$

$$v_0 = 0 \text{ m/s}$$

$$\omega_0 = 0 \text{ rad/s}$$

$$h = h_0$$

$$v_f = \sqrt{\frac{2mgh_0}{m + \frac{I}{r^2}}}$$

- 1) What is the equation for the moment of inertia for a solid sphere, with its axis through the center? Use s as the subscript for m and r .
- 2) Substitute this equation for I in the equation for v_f and simplify as much as possible.
- 3) What is the equation for the moment of inertia for a hollow (thin-walled) sphere, with its axis through the center? Use h as the subscript for m and r .
- 4) Substitute this equation for I in the equation for v_f and simplify as much as possible.
- 5) Which reaches the bottom of the incline first?