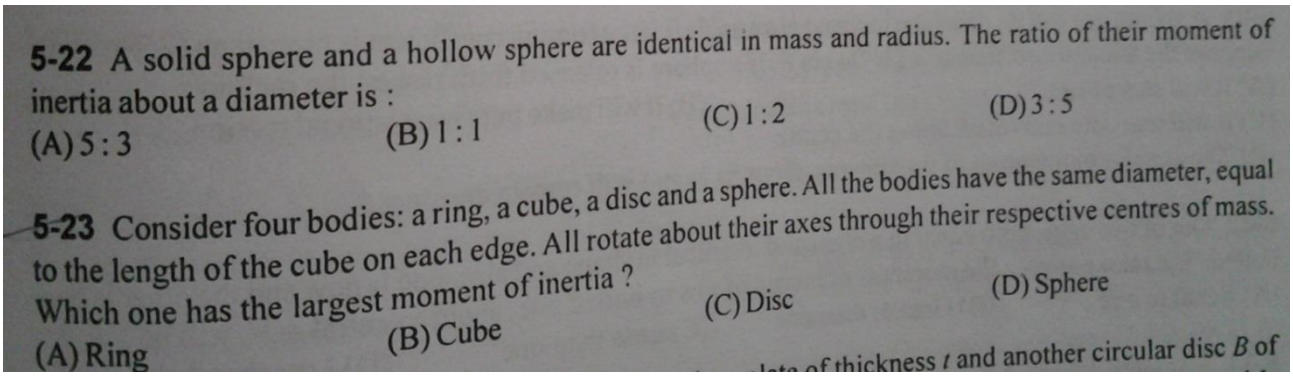
Answer on Question #56548-Physics-Mechanics-Relativity



5-22 A solid sphere and a hollow sphere are identical in mass and radius. The ratio of their moment of inertia about a diameter is :

(A) 5 : 3 (B) 1 : 1 (C) 1 : 2 (D) 3 : 5

5-23 Consider four bodies: a ring, a cube, a disc and a sphere. All the bodies have the same diameter, equal to the length of the cube on each edge. All rotate about their axes through their respective centres of mass. Which one has the largest moment of inertia ?

(A) Ring (B) Cube (C) Disc (D) Sphere

of thickness t and another circular disc B of

22.

Solution

The ratio of moments of inertia about diameter is

$$\frac{I_{ssph}}{I_{hsph}} = \frac{\frac{2}{5}mr^2}{\frac{2}{3}mr^2} = \frac{3}{5}.$$

Answer: (D) 3:5.

23.

Solution

For cube:

$$I = \frac{1}{6}ma^2$$

For ring:

$$I = mr^2 = m\left(\frac{d}{2}\right)^2 = m\left(\frac{a}{2}\right)^2 = \frac{1}{4}ma^2$$

For disc:

$$I = \frac{1}{2}mr^2 = \frac{1}{2}m\left(\frac{d}{2}\right)^2 = \frac{1}{2}m\left(\frac{a}{2}\right)^2 = \frac{1}{8}ma^2$$

For sphere (hollow):

$$I = \frac{2}{3}mr^2 = \frac{2}{3}m\left(\frac{d}{2}\right)^2 = \frac{2}{3}m\left(\frac{a}{2}\right)^2 = \frac{1}{6}ma^2$$

The largest is $\frac{1}{4}ma^2$.

Answer: (A) Ring.

https://www.AssignmentExpert.com