INDEPENDENCE SCHOOL DISTRICT

Inspiring Greatness

Science Virtual Learning

MPI Physics 210

Rotational Dynamics 12

Angular Momentum

May 5, 2020

Lesson: MPI Angular Momentum
May 5, 2020

Objective: To understand the concept of Angular Momentum and its conservation, and how to calculate it

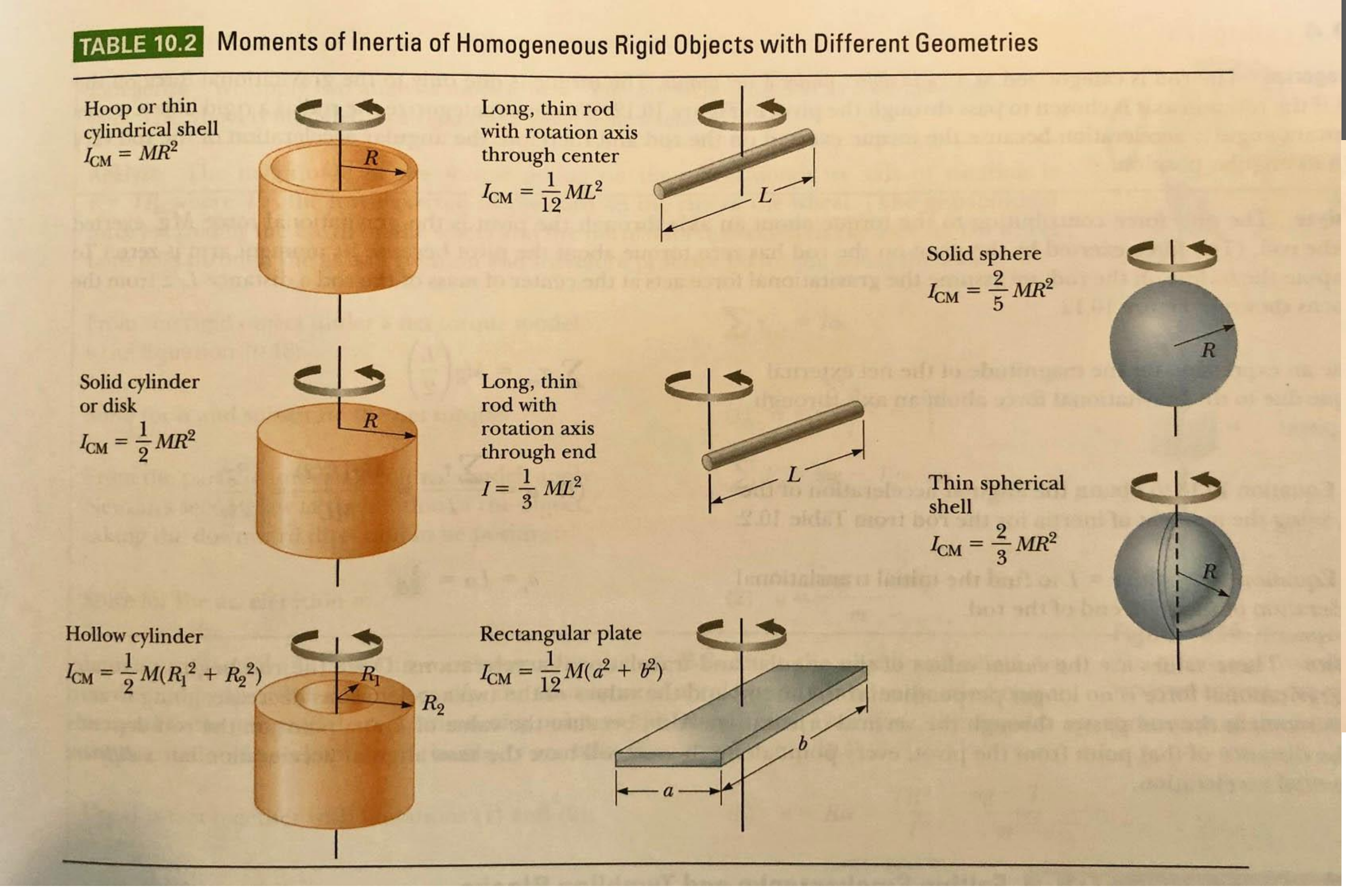
This video introduces the concept of angular momentum, and how it is calculated.

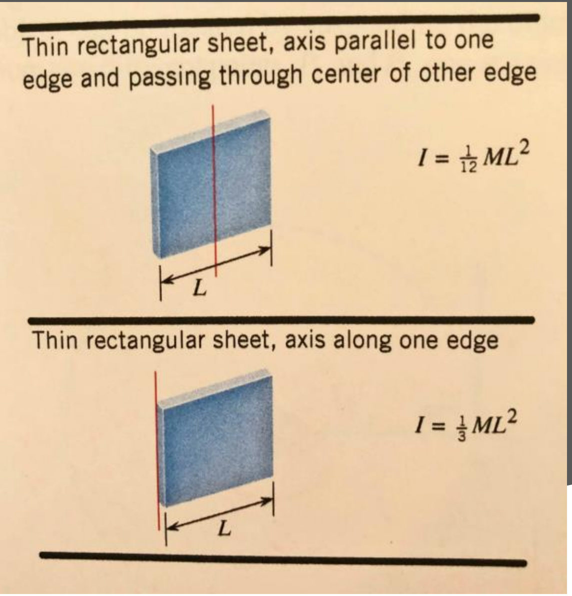
https://youtu.be/SPsn9WL3h2I

Video: Angular Momentum 1

The Earth has a mass of $5.98 \cdot 10^{24}$ kg, and a radius of $6.37 \cdot 10^{6}$ m. It rotates once a day. Calculate the angular momentum of the Earth's rotation.

Example from the first video





Moments of Inertia for Different Shapes

Equation	Missing
1. $\omega_f = \omega_i + \alpha t$	$\Delta\theta$
2. $\Delta\theta = \frac{1}{2}(\omega_f + \omega_i)t$	α
3. $\Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2$	ω_f
4. $\omega_f^{\ 2} = \omega_i^{\ 2} + 2\alpha\Delta\theta$	t
5. $\Delta\theta = \omega_f t - \frac{1}{2}\alpha t^2$	ω_i

Rotational Motion Equations

Two disks are rotating about the same axis, one above the other. The top disk has a mass of 1.25 kg, and the bottom is 0.774 kg. They both have a radius of 0.118 m. The top one is rotating clockwise at 6.88 rad /s, and the bottom one is rotating counterclockwise at 9.46 rad/s. The top one falls onto the bottom one, and they stick together. What is the new angular velocity of the disks?

https://youtu.be/WltQgVddYDs

Example 2, and video

Homework

1. A 75.0 kg person is standing on a stationary merry-go-round, 1.20 m from the axis. The merry-go-round has a 1.50 m radius, and a mass of 315 kg. The person then starts walking 1.30 m/s tangent to the circle (sideways, not inward or outward), so that she is walking counterclockwise around the merry-go-round. As a result, the merry-go-round begins spinning slowly in the opposite direction, clockwise.

a) What was the total angular momentum BEFORE she started walking? (Should be easy.)

b) What was the total angular momentum AFTER she started walking. (Should also be easy.)

c) What was the woman's angular momentum after she started walking?

d) What was the merry-go-round's angular momentum afterward? (Remember, you know the total from part b.)

e) What was the angular velocity of the merry-go-round afterward?

- Try to solve the problem yourself, then watch the first part of the solution video:
- https://youtu.be/X2BHAzcb-gs

That’s it!