Chapters/ Sections will be Covered

Book: Fundamentals of Physics by David Halliday, Jearl Walker, and Robert Resnick

Chapter Title: Rotation

Sections: Kinetic Energy of Rotation
Parallel-Axis Theorem

Class Activity: Math Problem #1

People use Blu-ray to watch movies, and the disc slows down to stop when they finish watching a movie.

If the disc's angular velocity at $t = 0\ s$ is $27.5\ rad/s$, and its angular acceleration is a constant, $-10\ rad/s^2$,

a) What is the disc's angular velocity at $t = 0.3\ s$?

b) What angle does it make with the $+x$ axis at this time?

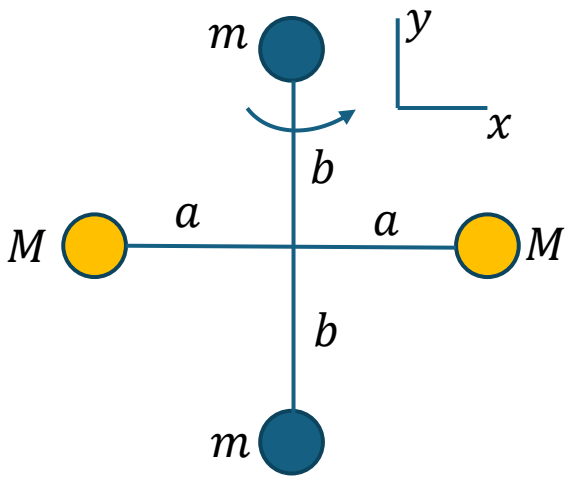
Class Activity: Math Problem #2

You are designing an airplane propeller that is to turn at 2400 rpm. The forward airspeed of the plane is to be 75 m/s, and the speed of the tips of the propeller blades through the air must not exceed 270 m/s.

(a) What is the maximum possible propeller radius?

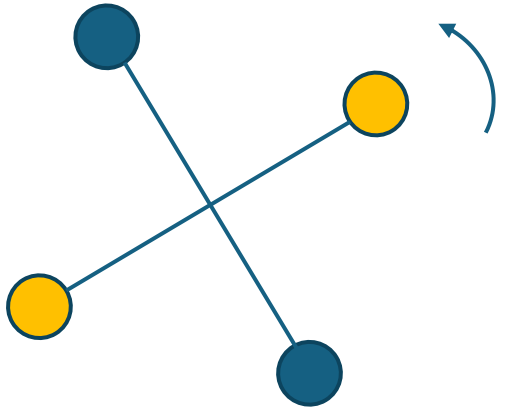
(b) With this radius, what is the acceleration of the propeller tip?

Class Activity: Math Problem #3



Four tiny spheres are fastened to the ends of two rods of negligible mass lying in the xy plane to form an unusual baton. We shall assume the radii of the spheres are small compared with the dimensions of the rods.

a) If the system rotates about the y axis with an angular speed ω, find the moment of inertia and the rotational kinetic energy of the system about this axis.



b) Suppose the system rotates in the xy plane about an axis (the z axis) through the center of the baton. Calculate the moment of inertia and rotational kinetic energy about this axis.

Sample Quiz Question

A chopper has a long blade. What type of kinetic energy does it require to take off?
a) Low kinetic energy
b) Zero energy
c) High kinetic energy
d) None of the above

What is the option below that the moment of inertia of a rigid body does not depend on?
a) Mass
b) Radius
c) Structure
d) Rotational position

Sample Quiz Question

When rotational kinetic energy is zero?
a) Angular acceleration is zero
b) Angular velocity is constant
c) Angular displacement is zero
d) Axis of rotation is fixed

How moment of inertia calculated using the parallel axis theorem?
a) About the center of mass
b) Only about the rotational axis
c) Only for rotational objects
d) About any axis parallel to the COM axis

Sample Quiz Question

Where parallel axis theorem can be applied?
a) Intersecting axis
b) Perpendicular axis
c) Parallel axis
d) Tangent axis

Which of the following is analogous to moment of inertia?
a) Radius
b) Force
c) Acceleration
d) Mass

Probable Final Questions: Lecture 16

Find the kinetic energy due to rotation of a rigid body.

Provide an explanation of the parallel axis theorem for a rigid body.