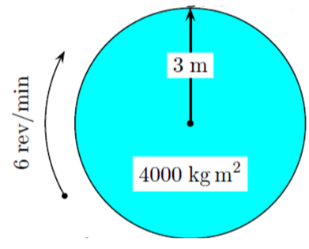
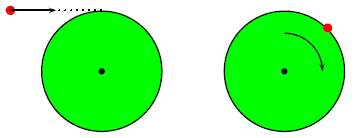
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**AP Physics 1: Angular Momentum and Rotational Kinetic Energy Practice**

1. The figure shows the rear view of a space capsule that is rotating about its longitudinal axis at 6 rev/min. What is the angular momentum of the capsule if 𝐼=4000kg m2 and R=3m?

1. A playground merry-go-round of radius 2 m has a moment of inertia 250 kg·m2 and is rotating at 10 rev/min about a frictionless vertical axle. Facing the axle, a 25 kg child hops onto the merry-go-round, and manages to sit down on the edge. Ichild = MR2 𝐼merry-go-round= ½𝑀𝑅2Show work explaining your answer choices for the following:
   1. Does the rotational inertia go up, down, or stay the same?
   2. Does the angular velocity go up, down, or stay the same?
   3. Does the angular kinetic energy go up, down, or stay the same?
   4. Does the angular momentum go up, down, or stay the same?



1. A solid cylinder of mass M = 30 kg, radius R = 0.3 m and uniform density is pivoted on a frictionless axle coaxial with its symmetry axis. A particle of mass m = 3 kg and initial velocity v0 = 10 m/s (perpendicular to the cylinder's axis) flies too close to the cylinder's edge, collides with the cylinder and sticks to it. Before the collision, the cylinder is not rotating. What is the angular velocity after the collision? Ipoint mass = MR2. 𝐼cylinder= ½𝑀𝑅2.
2. What is the angular momentum of the moon around the earth? The moon’s mass is 7.4 × 1022 kg and it orbits 3.8 × 108 m from the earth. Me = 6 × 1024 kg. I = Md2.
3. A little girl is going on the merry go round for the first time, and wants her 47 kg mother to stand next to her on the ride, 2.6 m from the merry go round’s center. If her mother’s speed is 4.2 m/s when the ride is in motion, what is her angular momentum around the center of the merry go round?
4. What is the angular momentum of a 2.0 m long, 0.50 kg bar that rotates about its center of mass at 3 rev/s? 𝐼=(1/12)𝑀𝐿2
5. Divers change their body position in midair while rotating about their center of mass. In one dive, the diver leaves the board with her body nearly straight, then tucks into a somersault position. If the moment of inertia in a straight position is 14 kg·m2 and in a tucked position is 4 kg·m2, by what factor is her angular velocity when she is tucked greater than when she is straight. Hint: you could make up your own value for the angular velocity when she is straight, maybe 1 rad/s?
6. Ice skaters often end their performances with spin turns, where they spin very fast about their center of mass with their arms folded in and their legs together. Upon ending, their arms extend outward proclaiming their finish. Not quite as noticeable, one leg goes out as well. Suppose that the moment of inertia of a skater with arms out and one leg extended is 3.2 kg·m2 and for arms and legs in is 0.80 kg·m2. If she starts out spinning 5.0 rev/s, what is her angular speed (in rev/s) when her arms and one leg is outward?