Name_____

Date_____Period_____

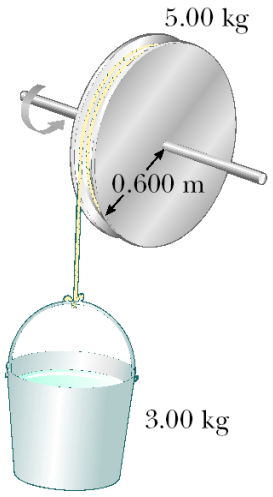
AP Physics Unit 9 – Worksheet 6

1. A 150-kg merry-go-round in the shape of a uniform, solid, horizontal disk of radius 1.50 m is set in motion by wrapping a rope about the rim of the disk and pulling on the rope. What constant force must be exerted on the rope to bring the merry-go-round from rest to an angular speed of 0.500 rev/s in 2.00 s?

2. An Atwood's machine consists of blocks of masses m_1 = 10.0 kg and m_2 = 20.0 kg attached by a cord running over a pulley. The pulley is a solid cylinder with mass M = 8.00 kg and radius r = 0.200 m. The block of mass m_2 is allowed to drop, and the cord turns the pulley without slipping. a) Why is the tension greater in the string on the side with m2? b) What is the acceleration of the system, assuming the pulley axis is frictionless? c) Find the tensions in the string. Diagram is important.

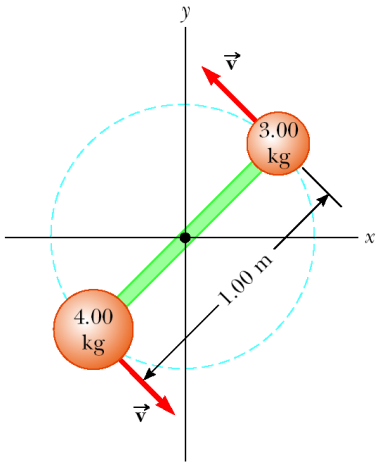
3. A horizontal 800-N merry-go-round of radius 1.50 m is started from rest by a constant horizontal force of 50.0 N applied tangentially to the merry-go-round. Find the kinetic energy of the merry-go-round after 3.00 s. (Assume it is a solid cylinder.)

4. Use conservation of energy to determine the angular speed of the spool shown in Figure P8.36 after the 3.00-kg bucket has fallen 4.00 m, starting from rest. The light string attached to the bucket is wrapped around the spool and does not slip as it unwinds.



5. Each of the following objects has a radius of 0.180 m and a mass of 2.40 kg, and each rotates about an axis through its center with an angular speed of 35.0 rad/s. Find the magnitude of the angular momentum of each object. a) hoop b) solid cylinder c) solid sphere d) hollow spherical shell

6. A light rigid rod 1.00 m in length rotates about an axis perpendicular to its length and through its center, as shown in Figure P8.45. Two particles of masses 4.00 kg and 3.00 kg are connected to the ends of the rod. What is the angular momentum of the system if the speed of each particle is 5.00 m/s? (Neglect the rod's mass.)



7. A solid, horizontal cylinder of mass 10.0 kg and radius 1.00 m rotates with an angular speed of 7.00 rad/s about a fixed vertical axis through its center. A 0.250-kg piece of putty is dropped vertically onto the cylinder at a point 0.900 m from the center of rotation and sticks to the cylinder. Determine the final angular speed of the system.

8. A playground merry-go-round of radius 2.00 m has a moment of inertia I = 275 kg · m2 and is rotating about a frictionless vertical axle. As a child of mass 25.0 kg stands at a distance of 1.00 m from the axle, the system (merry-go-round and child) rotates at the rate of 14.0 rev/min. The child then proceeds to walk toward the edge of the merry-go-round. What is the angular speed of the system when the child reaches the edge?

9. A 60.0-kg woman stands at the rim of a horizontal turntable having a moment of inertia of 500 kg · m^2 and a radius of 2.00 m. The turntable is initially at rest and is free to rotate about a frictionless, vertical axle through its center. The woman then starts walking around the rim clockwise (as viewed from above the system) at a constant speed of 1.50 m/s relative to the Earth. (a) In what direction and with what angular speed does the turntable rotate? (b) How much work does the woman do to set herself and the turntable into motion?