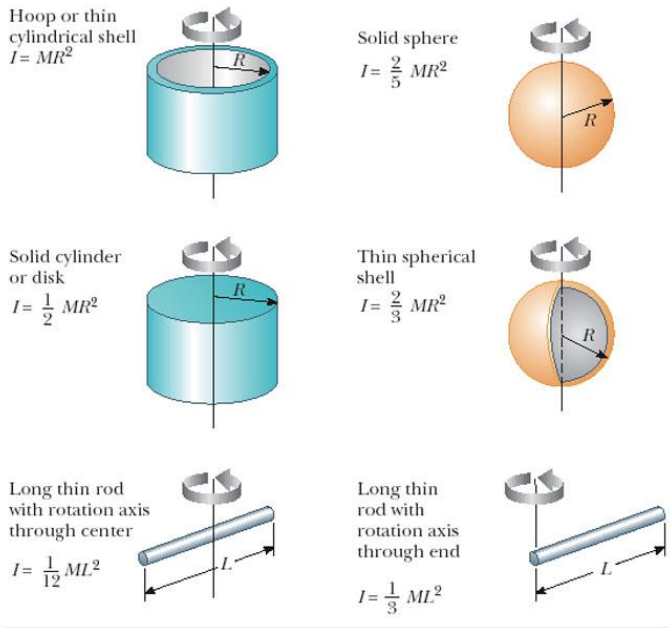
Name_____

Date_____Period_____

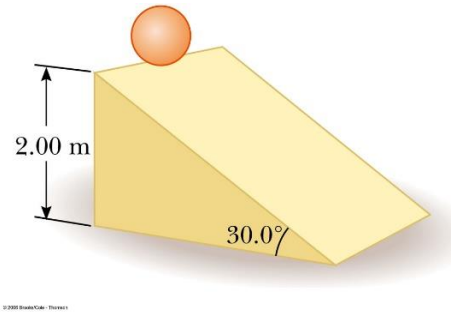
AP Physics Unit 9 – Worksheet 5

TABLE 8.1

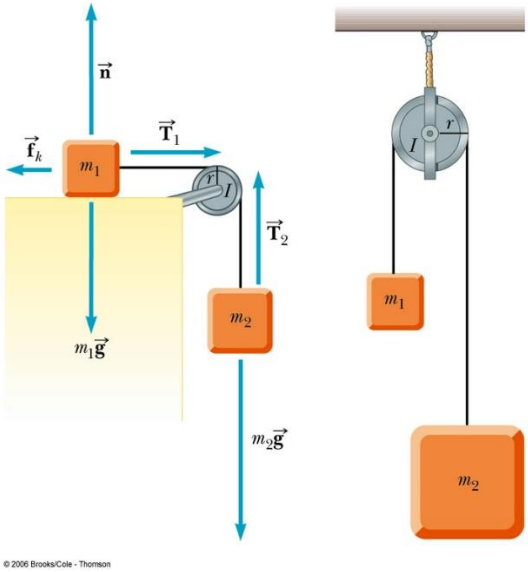
Moments of Inertia for Various Rigid Objects of Uniform Composition



1. A ball of mass M and radius R starts from rest at a height of 2.00 m and rolls down a slope of angle 30 degrees. a) Draw a force diagram of all forces acting on the ball. b) What is the linear speed of the ball when it leaves the incline?



2. Two blocks with masses m_1 = 5.00 kg and m_2 = 7.00 kg are attached by a string over a pulley with mass M = 2.00 kg. The pullet, which turns on a frictionless axle, is a hollow cylinder with radius 0.050 m over which the string moves without slipping. The horizontal surface has coefficient of kinetic friction 0.350. Find the speed of the system when the block of mass m_2 has dropped 2.00 m.



The diagram on the left goes with problem 2 and the diagram on the right goes with problem 3.

3. Two blocks with masses m_1 = 2.00 kg and m_2 = 9.00 kg are attached over a pulley with mass M = 3.00 kg, hanging straight down (Atwood's Machine). The pulley is a solid cylinder with radius 0.050 m, and there is some friction in the axle. The system is released from rest, and the string moves without slipping over the pulley. If the larger mass is traveling at a speed of 2.50 m/s when it has dropped 1.00 m, how much mechanical energy was converted to heat due to the friction in the pulley's axle? Start with a force diagram.

4. A student sits on a pivoted stool while holding a pair of weights. The stool is free to rotate about a vertical axis with negligible friction. The moment of inertia of student, weights and stool is 2.25 kgm^2. The student is set in rotation with arms outstretched , making one complete turn every 1.26 s. a) What is the initial angular speed of the system? b) As he rotates, he pulls the weights inward so that the new moment of inertia of the system becomes 1.80 kgm^2. What is the new angular speed of the system? c) Find the work done by the student on the system while pulling in the weights. Ignore any heat production associated with the motion.