Physics 2010
Fall 2005
Sid Rudolph

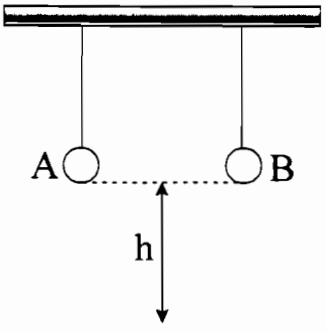
EXAM 3

1

Name:_____ Student ID #:_____

TA (circle one): Aaron Eric Farid Heather Mark

A. *[15 pts.]* Two objects, A of mass m and B of mass 2m, are both hanging from strings the same distance h above the ground. The strings holding A and B are cut at the same instant. In the blank spaces provided, enter A, B or the same to best answer the questions.



1. B — For the flight to the ground, which balls feels the greater impulse?
2. B — Which ball undergoes the greater momentum change in the flight to the ground?
3. SAME — Which ball has the greater speed just prior to hitting the ground?
4. B — Which ball undergoes the greater KE increase on the way to the ground?
5. SAME — Which ball is experiencing the greater acceleration?

3 PTS EACH

B. *[12 pts.]* Three objects, a disk ($I_{CM} = \frac{1}{2} MR^2$), a hoop ($I_{CM} = MR^2$), and a hollow ball ($I_{CM} = \frac{2}{3} MR^2$) all have the same mass and radius. Each is subject to a uniform tangential force that causes the object, starting from rest, to rotate with increasing angular speed about an axis through the center of mass for each object. In the case of the hollow ball the tangential force has a moment arm equal to the radius of the ball. In the space below, enter D for disk, H for hoop, and/or B for hollow ball, or same to best answer the question.

3 PTS EACH

1. HOOP — The object with the largest moment of inertia about the axis through the CM.
2. SAME — The object experiencing the greatest net torque.
3. DISK — The object with the greatest angular acceleration during the period the force is acting.
4. HOOP — The object rotating with the smallest angular speed assuming the force has been acting for the same length of time on each object.

C. *[5 pts.]* Explain how an airbag protects the passengers of a car from serious injury in an accident from the perspective of the physics you learned in chapter 7 of the text.

WHEN AN ACCIDENT OCCURS AND THE AIRBAG DEPLOYS THE IMPACT TIME DURING WHICH THE PASSENGER IS STRIKING THE AIRBAG TO BRING HER/HIM TO REST IS EXTENDED GREATLY RELATIVE TO NO AIRBAG PRESENT. AS A RESULT THE IMPACT FORCE BRINGING THE PASSENGER TO REST IS REDUCED. (LOOK FOR Δt LENGTHENED AND F_{imp} REDUCED)