Physics 111 PRACTICE COMMON Exam 3

Name (Print): _____ 4 Digit ID:_____ Section: _____

Honors Code Pledge: For ethical and fairness reasons all students are pledged to comply with the provisions of the NJIT Academic Honor Code. You must answer the exam questions entirely by yourself. **Turn off all cell phones, pagers, or other communication devices**. Use only your own calculator.

A

Instructions:

- First, write your name and section number on **both** the Scantron card and this exam sheet.
- Use the formula sheet (last exam booklet page) and no other materials.
- Budget your time. There are 10 multiple choice problems (2 pts each) and 2 long problems (10 pts each).
- **For the long workout problems, you must show how you got your answers on this set of exam sheets.** Use the backs of pages if necessary. For most, if not all, of the multiple choice problems, it will be difficult to arrive at the correct answer without showing your work. However, while partial credit will be awarded for the long workout problems, partial credit will not be awarded on the multiple choice problems.
- Answer each question on the Scantron card using #2 pencil. Also circle your answers on question papers.
- Do not hesitate to ask for clarification of any exam question, if needed, from your proctor or Professor.

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1. Alex throws a 0.15-kg rubber ball down onto the floor. The ball's speed just before impact is 6.5 m/s, and just after is 3.5 m/s. What is the change in the magnitude of the ball's momentum?

a. 0.09 kg·m/s
b. 1.5 kg·m/s
c. 4.3 kg·m/s
d. 5.7 kg·m/s
e. 126 kg·m/s

2. Lonnie pitches a baseball of mass 0.20 kg. The ball arrives at home plate with a speed of 40 m/s and is batted straight back to Lonnie with a return speed of 60 m/s. If the bat is in contact with the ball for 0.050 s, what is the impulse experienced by the ball?

a. 360 N·s
b. 20 N·s
c. 400 N·s
d. 9.0 N·s
e. 35 N·s

3. A machine gun is attached to a railroad flatcar that rolls with negligible friction. If the railroad car has a mass of 6.25×10^4 kg, how many bullets of mass 25 g would have to be fired at 250 m/s off the back to give the railroad car a forward velocity of 0.5 m/s?

a. 400
b. 2 000
c. 3 000
d. 5 000
e. 7 000

4. A 2 500-kg truck moving at 10.00 m/s strikes a car waiting at a traffic light, hooking bumpers. The two continue to move together at 7.00 m/s. What was the mass of the struck car?

a. 1 730 kg
b. 1 550 kg
c. 1 200 kg
d. 1 070 kg
e. 967 kg

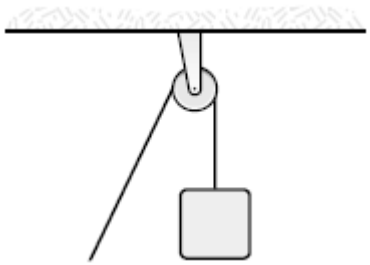
5. Point masses are distributed in the *x,y*-plane as follows: 6.0 kg at (0.0, 0.0) m, 4.0 kg at (2.0, 0.0) m, and 5.0 kg at (2.0, 3.0) m. What is the *x*-coordinate of the center of mass of this system of masses?
a. 18 m
b. 2.0 m
c. 1.2 m
d. 1.0 m
e. 0.96 m

6. A wheel rotating about a fixed axis with a constant angular acceleration of 2.0 rad/s^2 turns through 2.4 revolutions during a 2.0-s time interval. What is the angular velocity at the end of this time interval?
a. 9.5 rad/s
b. 9.7 rad/s
c. 9.3 rad/s
d. 9.1 rad/s
e. 8.8 rad/s

7. A wheel rotates about a fixed axis with an initial angular velocity of 20 rad/s. During a 5.0-s interval the angular velocity decreases to 10 rad/s. Assume that the angular acceleration is constant during the 5.0-s interval. How many radians does the wheel turn through during the 5.0-s interval?

a. 95 rad
b. 85 rad
c. 65 rad
d. 75 rad
e. 125 rad

8. A wheel (radius = 0.20 m) is mounted on a frictionless, horizontal axis. A light cord wrapped around the wheel supports a 0.50-kg object, as shown in the figure. When released from rest the object falls with a downward acceleration of 5.0 m/s^2. What is the moment of inertia of the wheel?



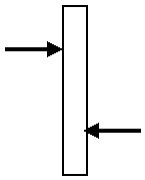
a. 0.023 kg·m^2
b. 0.027 kg·m^2
c. 0.016 kg·m^2
d. 0.019 kg·m^2
e. 0.032 kg·m^2

9. Four identical particles (mass of each = 0.24 kg) are placed at the vertices of a rectangle (2.0 m × 3.0 m) and held in those positions by four light rods which form the sides of the rectangle. What is the moment of inertia of this rigid body about an axis that passes through the center of mass of the body and is parallel to the shorter sides of the rectangle?

a. 2.4 kg·m^2
b. 2.2 kg·m^2
c. 1.9 kg·m^2
d. 2.7 kg·m^2
e. 8.6 kg·m^2

10. Which of the following diagrams shows the greatest magnitude net torque with a zero net force? All the rods, of length 2r, rotate about an axis that is perpendicular to the rod and fixed in the center of the rod. All the forces are of magnitude *F* or 2*F* and all distances from the axis are *r* or *r*/2.

a.



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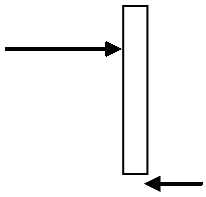

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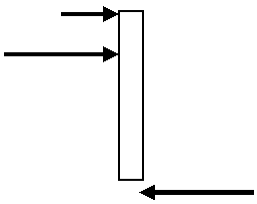
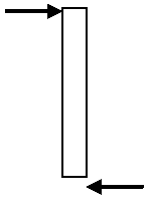
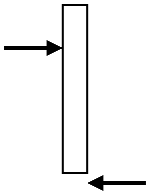


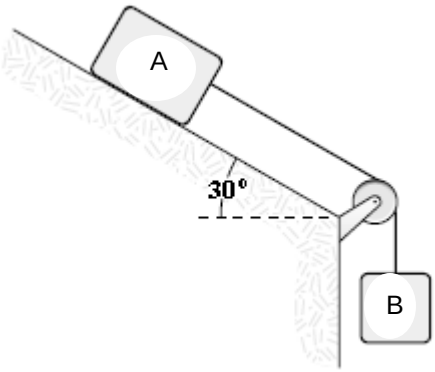
b.



d.



11. In the figure below, the surface is frictionless. Masses of block A and B are 10.0 kg and 5.00 kg, respectively. The pulley is frictionless with a mass of 1kg and a radius of 10cm.



A) Draw the free body diagram of both blocks. (2.5 pts)

B) Draw a free body diagram of the pulley. (2.5 pts)

C) What is the acceleration of the blocks (2.5 pts)

D) What is the angular acceleration of the pulley (2.5 pts)?

12. A uniform rod of mass M and length L is attached to a frictionless pivot point located 1/3 of the way from one end of the rod. The rod is initially at rest oriented horizontally. It is release from rest, and swings like a pendulum. Answer all of the questions below in terms of M, L, and physical constants such as g.

A) What is the moment of inertia of the rod about the pivot point? (3 pts)

B) What is the maximum angular velocity of the rod as it swings? (3 pts)

C) What is the angular velocity of the rod when it makes an angle of 45 degrees with respect to the horizontal? (3 pts)

D) Describe the motion of the rod if the pivot point were placed at the center of mass of the rod. (1 pt)