Instructor(s): *J. Ipser*

PHYSICS DEPARTMENT

PHY 2004 Exam 3 April 7, 2008

Name (print, last first): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.
(6) **Hand in the answer sheet separately.**

$g = 9.80$ m/s^2

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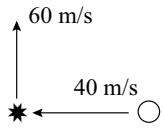
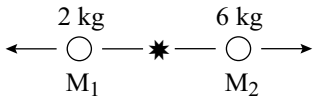
1. A ball of mass 0.1 kg is pitched horizontally at 40 m/s towards the batter. The batter pops the ball straight up. The speed of the ball as it leaves the bat is 60 m/s. The bas is in contact with the ball for 10^{-2} s. What is the magnitude of the bat's average force on the ball, in N?



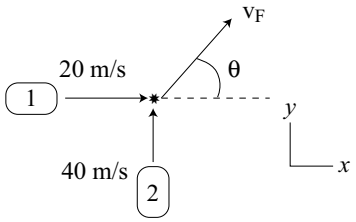
(1) 720 (2) 0 (3) 100 (4) 4900 (5) 1530

2. An object at rest explodes and breaks into 2 pieces of masses $M_1 = 2$ kg and $M_2 = 6$ kg. The kinetic energy of M_2 immediately after the explosion is 300 J. What is the speed of M_1 immediately after the collision, in m/s?



(1) 30 (2) 10 (3) 50 (4) 60 (5) 20

3. Two autos of equal mass $M_1 = M_2$ undergo a T-bone sticking collision. The autos are initially traveling perpendicular to each other, with M_1 moving along the x-axis and M_2 along the y-axis. The initial speed of M_1 is 20 m/s, and that of M_2 is 40 m/s. What is the angle between the final velocity vector $\vec{v}_F$ and the x-axis?



(1) 63° (2) 51° (3) 45° (4) 30° (5) 18°

4. Two vehicles of masses M_1 and M_2 undergo a 1-dimensional elastic collision. Before the collision, M_1 is traveling in the positive-x direction at 20 m/s and M_2 is traveling in the negative-x direction at 10 m/s. After the collision, M_2 is traveling in the positive-x direction at 40 m/s. What is the speed of M_1 after the collision, in m/s?

(1) 10 (2) 20 (3) 30 (4) 40 (5) 50

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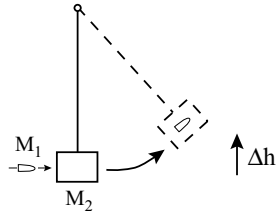
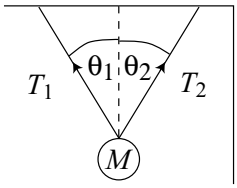
5. A bullet of mass $M_1 = 0.05$ kg strikes and imbeds itself in a pendulum block of mass $M_2 = 5$ kg as shown. After the collision, the block rises through a vertical distance Δh before its speed drops to zero. The bullet's incoming speed is 10^3 m/s. What is the value of Δh?



(1) 5 m (2) 10 m (3) 2.5 m (4) 1 m (5) 20 m

6. A mass M is suspended in equilibrium from two ropes as shown. The angles $\theta_1 = \theta_2 = 30°$. The value of the tension in rope 1 is $T_1 = 50$ N. What is the weight of the mass M, in N?

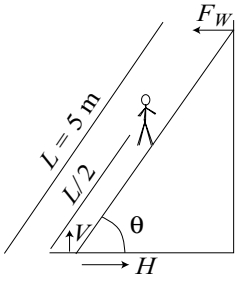


(1) 87 (2) 56 (3) 233 (4) 24 (5) 153

7. A uniform seesaw of length 5 m is in equilibrium. A child of weight 500 N sits at one end, and a child of weight 1000 N sits at the other end. The fulcrum is positioned at a point that is 2 m away from the 1000 N child. What is the weight of the seesaw, in N?

(1) 1000 (2) 1500 (3) 500 (4) 2000 (5) 0

8. A uniform ladder of length $L = 5$ m and weight 1000 N leans against a wall at an angle θ with respect to the horizontal. A climber of weight 1500 N stands at the midpoint of the ladder. The horizontal component H of the floor's force on the ladder is equal to the vertical (normal) component V. Assume that the force F_W of the wall on the ladder is horizontal. What is the value of the angle θ?



(1) 27° (2) 55° (3) 15° (4) 5° (5) 45°