Instructor(s): *N. Sullivan*

PHYSICS DEPARTMENT

PHY 2004　　　　　　　　　　　　　　Midterm Exam 2　　　　　　　　　　　　　October 19, 2011

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 <u>blue</u> or <u>black</u> 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. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

$$g = 9.80 \text{ m/s}^2$$

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1. (3 points) A ramp inclined at 15 degrees to the horizontal is used to haul a load of 120 N up a height of 2 m. What is the ideal mechanical advantage of this elementary machine.

    (1) 3.86　　　　　　(2) 1.93　　　　　　(3) 2.00　　　　　　(4) 0.35　　　　　　(5) 0.87

2. (4 points) Jane is standing in a canoe that has a mass of 40 kg. The canoe is at rest on the surface of a smooth lake. Jane jumps off the canoe heading south with a speed of 6 m/s. If Jane has a mass of 100 kg what is the speed of recoil of the canoe in the southerly direction after she jumps?

    (1) −15 m/s　　　　(2) 7.5 m/s　　　　(3) 0　　　　　　(4) 15 m/s　　　　(5) −7.5 m/s

3. (4 points) A yellow billard ball of mass 4 gm and traveling with a velocity of 4 m/s collides with stationary red billard ball of mass 5 gm. Calculate the velocity of the red ball after the collision, assuming the collision is elastic.

    (1) 3.6 m/s　　　　(2) 0.33 m/s　　　　(3) 2 m/s　　　　(4) 0.67 m/s　　　　(5) 7.2 m/s

4. (4 points) A satellite is circling a small plant at a speed of 3.60 rev/hour. If the satellite's orbit has a diameter of 300 km, how fast is the satellite moving (at a tangent to the orbital path)?

    (1) 940 m/s　　　　(2) 4.7 m/s　　　　(3) 1940 m/s　　　　(4) 175 m/s　　　　(5) 0.175 m/s

5. (6 points) A 1200 kg car is traveling along a road with a speed of 20m/s at point A. The driver stops accelerating when he passes point A and 70 m away at point B his speed has dropped to 12 m/s. Calculate the average force of friction between A and B.

    (1) 2190 N　　　　(2) 219 N　　　　(3) 19 N　　　　(4) 190 N　　　　(5) 0 N

6. (5 points) A hydraulic press has an input piston with a diameter of 0.375 cm and an output piston with a diameter of 8.0 cm. Calculate the force needed at the input piston to create an output force of 60,000 N.

    (1) 132 N　　　　(2) 13.2 N　　　　(3) 66.1 N　　　　(4) 6661 N　　　　(5) 13,200 N

7. (4 points) A 120 kg barrel which is initially at rest is rolled down an inclined plane. The friction between the barrel and the surface of the plane is negligible. If the point where the barrel is released is 1.5 m above the ground at the end of the inclined plane, calculate the barrel's velocity when it reaches the ground level.

    (1) 5.42 m/s　　　　(2) 2.71 m/s　　　　(3) 7.35 m/s　　　　(4) 15.70 m/s　　　　(5) 1.35 m/s