Instructor(s) First answer is the correct answer

PHYSICS DEPARTMENT

PHY 2004 Midterm Exam 1 February 1, 2012

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. 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 ball is thrown up vertically at 25 m/s. How high will the ball go?

   (1) 31.9 m (2) 3.20 m (3) 0.51 m (4) 40.8 m (5) 7.10 m

2. (3 points) Jane sets out on a walk. She walks 8 km east and then 3 km north. How far is she from her starting point?

   (1) 8.5 km (2) 23 km (3) 17.1 km (4) 3 km (5) 30 km

3. (3 points) A stone is dropped from a bridge. It hits the water 1.5 seconds after it is dropped. What is the height of the bridge above the water?

   (1) 11.0 m (2) 39.2 m (3) 19.6 m (4) 5.5 m (5) 1.10 m

4. (3 points) A block of mass 10 kg sits on an inclined plane. The coefficient of static friction between the block and the surface is 0.51. At what angle (in degrees) must the block be raised before it begins to slide?

   (1) 27° (2) 75° (3) 47° (4) 15° (5) 67°

5. (4 points) An automobile is initially backing up at a speed of 5 m/s. At time $t = 0$ the automobile begins accelerating in the forward direction at 4 m/s^2. What is its net displacement after 4 s of acceleration?

   (1) 12 m (2) 0 m (3) 6 m (4) 3 m (5) 9 m

6. (5 points) A police cruiser is traveling at 20 m/s. A car traveling in the same direction at 30 m/s passes the cruiser. At this moment the car begins to accelerate in the forward direction at a rate of 2 m/s^2, and the cruiser begins to accelerate in the forward direction at 4 m/s^2. How far does the cruiser travel until it catches up to the car?

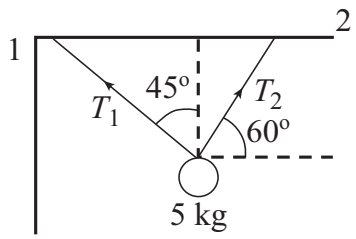
   (1) 55.5 m (2) 27.9 m (3) 100 m (4) 15.7 m (5) 175 m

7. (4 points) An astronaut wants to measure the acceleration of gravity on planet X. On Earth his powerful dart gun will shoot a dart a maximum horizontal distance of 30 m before the dart returns to the same height from which it was shot. She performs the same experiment on planet X, and finds that the dart gun shoots the dart a maximum distance of 45 m. What is the value of the acceleration due to gravity on Planet X?

   (1) 6.5 m/s^2 (2) 7.6 m/s^2 (3) 9.8 m/s^2 (4) 14.8 m/s^2 (5) 2.5 m/s^2

77777

8. (5 points) A 5 kg mass is held in equilibrium by 2 ropes aas shown. What is the value of T_2, the tension in rope 2?



(1) 36 N
(2) 13 N
(3) 47 N
(4) 61 N
(5) 72 N

Instructor(s): *N. Sullivan*

PHYSICS DEPARTMENT

PHY 2004 Midterm Exam 2 March 2, 2012

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

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$g = 9.80$ m/s^2

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1. (3 points) A 2000 kg slab of limestone is hauled up a ramp inclined at 20 degrees to the horizontal. What is the ideal mechanical advantage of this elementary machine?

   (1) 2.92 (2) 1.46 (3) 12.80 (4) 0.35 (5) 0.87

2. (3 points) A satellite is circling a small planet at a speed of 3.60 rev/day. If the satellite's orbit has a diameter of 30,000 km, how fast is the satellite moving (at a tangent to the orbital path)?

   (1) 3900 m/s (2) 4.7 m/s (3) 1940 m/s (4) 175 m/s (5) 0.175 m/s

3. (4 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

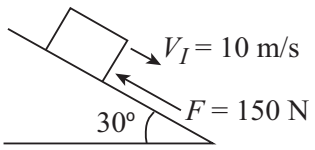
4. (4 points) A hydraulic lift is used to raise an object of weight 30,000 N. If the input piston has a diameter of 0.375 cm and the output piston has a diameter of 8.0 cm. Calculate the force needed at the input piston to raise the weight.

   (1) 66 N (2) 13.2 N (3) 132 N (4) 6661 N (5) 13,200 N

5. (3 points) A 17 kg box which is initially at rest is allowed to slide down an inclined plane that makes an angle of 27° to the horizontal. The friction between the box and the surface of the plane is negligible. If the point where the box is released is 2.5 m above the ground at the end of the inclined plane, calculate the box's velocity when it reaches the ground level.

   (1) 7.1 m/s (2) 5.2 m/s (3) 1.35 m/s (4) 15.70 m/s (5) 0.35 m/s

6. (5 points) A 25 kg block is sliding down a 30° incline with an initial velocity of 10 m/s. A force $F = 150$ N is applied to the block in the upward direction along the incline. The coefficient of kinetic friction $\mu_k = 0.7$. How far down the incline does the block travel before coming to rest?



   (1) 7 m (2) 3 m (3) 1.5 m (4) 14 m (5) 23 m

 77777

7. (5 points) A ping-pong ball of mass 4 gm and traveling with a velocity of 4 m/s collides with stationary tennis ball of mass 5 gm. Calculate the magnitude of the velocity of the tennis ball after the collision, assuming the collision is elastic.

   (1) 3.6 m/s (2) 0.44 m/s (3) 2 m/s (4) 0.67 m/s (5) 7.2 m/s

8. (3 points) The wheel of a car is rotating at a speed of 6.0 rev/s. If the wheel has a diameter of 30 cm, how fast is the car going along its straight line path?

   (1) 5.6 m/s (2) 2.4 m/s (3) 1.4 m/s (4) 3.7 m/s (5) 0.33 m/s

Instructor(s): *N. Sullivan*

PHYSICS DEPARTMENT

PHY 2004 Midterm Exam 3 April 6, 2012

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

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$g = 9.80$ m/s^2 $R = 8314$ J/kmole K

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1. (5 points) A cubic block of wood floats in water with 11% of its volume above water. If the density of water is 1,000 kg/m3, what is the density of the wood?

   (1) 990 kg/m^3 (2) 1100 kg/m^3 (3) 2200 kg/m^3 (4) 890 kg/m^3 (5) 110 kg/m^3

2. (4 points) A steel beam has a length of 10 m and a cross-sectional area of 1 cm^2. If the length of the beam changes by 5 mm with an applied force of 10,000 N, what is the Young's modulus of steel?

   (1) 200 GPa (2) 112 GPa (3) 15 Gpa (4) 2000 GPa (5) 7,200 GPa

3. (4 points) A 2 m^3 steel gas cylinder contains natural gas at a pressure of 200 kPa at a temperature of 27°C . If the gas is compressed to 300 kPa, what is the final temperature?

   (1) 177°C (2) 300°C (3) 57°C (4) 200°C (5) 427°C

4. (4 points) A 15 m^3 volume of ideal gas is compressed adiabatically. If the work done by the outside force is 2700 J, what is the change in internal energy of the gas?

   (1) 2700 J (2) −2700 J (3) 1350 J (4) −1350 J (5) 0 J

5. (3 points) A 2 meter length of steel changes length by 2.4 mm during the course of a day. If the coefficient of thermal expansion of steel is 12 parts per million per °C, what is the change in temperature of the steel?

   (1) 100°C (2) 24°C (3) 12°C (4) 373°C (5) 273°C

6. (3 points) The heat capacity of an object is 3500 J/kg K. Calculate the amount of heat required to raise the temperature of the object by 1.5°C if its mass is 60 grams.

   (1) 315 J (2) 720 J (3) 7.5 J (4) 1350 J (5) 125 J

7. (5 points) A piece of metal is weighed in air and then weighed while immersed in oil of density 600 kg/m^3. If the weight in air is 2.2 kg and the weight in the oil is 1.5 kg, calculate the density of the metal.

   (1) 1890 kg/m^3 (2) 8.86 kg/m^3 (3) 135.1 kg/m^3 (4) 3.68 kg/m^3 (5) 1.89 kg/m^3