Instructor(s): *Field/Hirschfeld*

PHYSICS DEPARTMENT

PHY 2048 Exam 1 Feb. 4, 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. If you believe that no listed answer is correct, **leave the form blank**.
(6) **Hand in the answer sheet separately.**

Where needed use $g = 9.80$ m/s^2

1. A sphere has a radius of 21 cm and a mass of 1.9 kg. Its mass density is about:

   (1) 49 kg/m^3 (2) 2.0×10^{-6} kg/m^3 (3) 2.0×10^{-2} kg/m^3 (4) 1.4 kg/m^3 (5) 14 kg/m^3

2. During a short interval of time the speed v in m/s of an automobile is given by $v = at^2 + bt^3$, where the time t is in seconds. The units of a and b are respectively:

   (1) m/s^3; m/s^4 (2) m·s^2; m·s^4 (3) s^3/m; s^4/m (4) m/s^2; m/s^3 (5) m/s^4; m/s^6

3. A particle moves along the x axis from x_i to x_f . Of the following values of the initial and final coordinates, which results in a negative displacement?

   (1) $x_i = -4$m, $x_f = -8$m
   (2) $x_i = 4$m, $x_f = 6$m
   (3) $x_i = -4$m, $x_f = 2$m
   (4) $x_i = -4$m, $x_f = -2$m
   (5) $x_i = -4$m, $x_f = 4$m

4. Two automobiles are 150 kilometers apart and traveling toward each other. One automobile is moving at 60 km/h and the other is moving at 40 km/h. In how many hours will they meet?

   (1) 1.5 (2) 2.5 (3) 2.0 (4) 1.75 (5) 1.25

5. The coordinate of a particle in meters is given by $x(t) = 16t - 3.0t^3$, where the time t is in seconds. The particle is momentarily at rest at $t =$

   (1) 1.3 s (2) 0.75 s (3) 5.3 s (4) 7.3 s (5) 9.3 s

6. A car, initially at rest, travels 20 m in 4 s along a straight line with constant acceleration. The acceleration of the car is:

   (1) 2.5 m/s^2 (2) 0.4 m/s^2 (3) 1.3 m/s^2 (4) 4.9 m/s^2 (5) 9.8 m/s^2

7. Vectors $\vec{A}$ and $\vec{B}$ lie in the xy plane. We can deduce that $\vec{A} = \vec{B}$ if:

   (1) $A_x = B_x$ and $A_y = B_y$
   (2) $A_x^2 + A_y^2 = B_x^2 + B_y^2$
   (3) $A_x + A_y = B_x + B_y$
   (4) $A_y/A_x = B_y/B_x$
   (5) $A_x = A_y$ and $B_x = B_y$

8. Let $\vec{S} = (1m)\hat{i} + (2m)\hat{j} + (2m)\hat{k}$ and $\vec{T} = (3m)\hat{i} + (4m)\hat{k}$. The angle between these two vectors is given by:

   (1) $\cos^{-1}(11/15)$
   (2) $\cos^{-1}(14/15)$
   (3) $\cos^{-1}(11/225)$
   (4) $\cos^{-1}(104/225)$
   (5) can not be found since $\vec{S}$ and $\vec{T}$ do not lie in the same plane.

9. The value of $\hat{i} \cdot (\hat{j} \times \hat{k})$ is:

(1) +1 (2) −1 (3) zero (4) $\sqrt{2}$ (5) 3

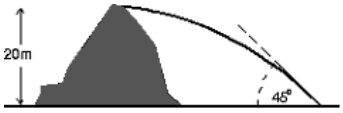
10. A plane traveling north at 200 m/s turns and then travels south at 200 m/s. The change in its velocity is:

(1) 400 m/s south (2) zero (3) 200 m/s north (4) 200 m/s south (5) 400 m/s north

11. Identical guns fire identical bullets horizontally at the same speed from the same height above level planes, one on the Earth and one on the Moon. Which of the following three statements is/are true?
I. The horizontal distance traveled by the bullet is greater for the Moon.
II. The flight time is less for the bullet on the Earth.
III. The velocities of the bullets at impact are the same.

(1) I and II only (2) III only (3) I and III only (4) II and III only (5) I, II, III

12. A ball is thrown horizontally from the top of a 20-m high hill. It strikes the ground at an angle of 45°. With what speed was it thrown?



(1) 20 m/s (2) 14 m/s (3) 28 m/s (4) 40 m/s (5) 32 m/s

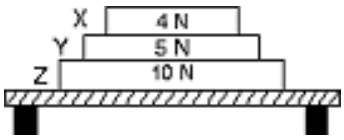
13. A 1-kg mass on a horizontal air track (so we can ignore friction) is attached to a compressed, massless, horizontal, ideal spring fixed on its other end to an end of the air track and the spring is released. If the mass initially has an acceleration of 5.6 m/s^2, the force of the spring on the mass has a magnitude of:

(1) 5.6 N (2) 2.8 N (3) 11.2 N (4) 0 N (5) Insufficient information (length of spring, spring constant, ?)

14. A 1000-kg elevator, near the surface of the Earth, is rising and its speed is increasing at 3 m/s^2. The tension in the elevator cable is:

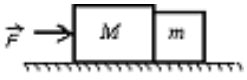
(1) 12800 N (2) 6800 N (3) 9800 N (4) 3000 N (5) 1000 N

15. Three books (X, Y, and Z) rest on a table. The weight of each book is indicated. The net force acting on book Y is:



(1) zero (2) 4 N down (3) 5 N up (4) 9 N down (5) None of these

16. Two blocks with masses m and M are pushed along a horizontal frictionless surface by a horizontal applied force $\vec{F}$ as shown. The magnitude of the force of either of these blocks on the other is:



(1) $mF/(m+M)$ (2) mF/M (3) $mF/(M-m)$ (4) $MF/(M+m)$ (5) MF/m

17. The speed of a 0.41-kg hockey puck, sliding across a level ice surface, decreases at the rate of 0.61 m/s^2. The coefficient of kinetic friction between the puck and ice is:

(1) 0.062 (2) 0.031 (3) 0.124 (4) 0.248 (5) 0.496

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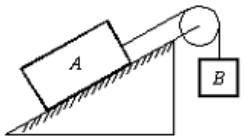
18. A crate is sliding down an incline that is 35° above the horizontal. If the coefficient of kinetic friction is 0.40, the acceleration of the crate is:

(1) 2.4 m/s^2 (2) 0 (3) 5.8 m/s^2 (4) 8.8 m/s^2 (5) 10.3 m/s^2

19. Block A, with a mass of 10 kg, rests on a 35° incline. The coefficient of static friction is 0.40. An attached string is parallel to the incline and passes over a massless, frictionless pulley at the top. The largest mass m_B, attached to the dangling end, for which A remains at rest is:



(1) 9.0 kg (2) 2.5 kg (3) 3.5 kg (4) 5.9 kg (5) 10.5 kg

20. A block is suspended by a rope from the ceiling of a car. When the car rounds a 45-m radius horizontal curve at 22 m/s (about 50 mph), what angle does the rope make with the vertical?

(1) 48° (2) 25° (3) 65° (4) 90° (5) 14°