Instructor(s): *Korytov/Sabin*

PHYSICS DEPARTMENT

PHY 2048 Exam 1 February 6, 2013

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.

Take g = 9.8 m/s^2 as the acceleration due to gravity.

77777

Take g = 9.8 m/s^2 as the acceleration due to gravity.

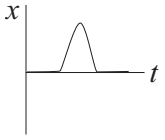
1. A ball rolls up a slope. At the end of three seconds, its velocity is 20 cm/s; at the end of eight seconds, its velocity is 0 cm/s. What is the average acceleration (in cm/s^2) from the third to the eighth second?

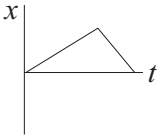
   (1) 4.0 (2) 2.5 (3) 5.0 (4) 6.0 (5) 6.67

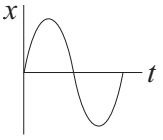
2. The coordinate of an object is given as a function of time by $x = 7t - 3t^2$, where x is in meters and t is in seconds. Its average velocity over the interval from $t = 0$ to $t = 2$ s is:

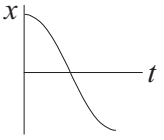
   (1) -5 m/s (2) 5 m/s (3) 11 m/s (4) -11 m/s (5) -14.5 m/s

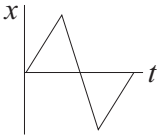
3. A car accelerates from rest on a straight road. A short time later, the car decelerates to a stop and then returns to its original position in a similar manner. Which of the five following graphs best describes the motion?

   (1) 

   (2) 

   (3) 

   (4) 

   (5) 

4. An object is thrown vertically upward with a certain initial velocity in a world where the acceleration due to gravity is 19.6 m/s^2. The height to which it rises is _____ that to which the object would rise if thrown upward with the same initial velocity on the Earth. Neglect friction.

   (1) half (2) $\sqrt{2}$ times (3) twice (4) four times (5) cannot be calculated from the given data

5. If the x component of a vector $\vec{A}$, in the xy plane, is half as large as the magnitude of the vector, its y component is:

   (1) $\sqrt{3}A/2$ (2) $A/2$ (3) $2A$ (4) $3A/4$ (5) $\sqrt{5}A/2$

6. The angle between $\vec{A} = 25\hat{i} + 45\hat{j}$ and the positive x axis is:

   (1) 61° (2) 29° (3) 151° (4) 209° (5) 241°

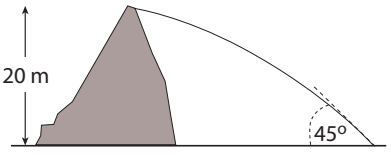
7. Two vectors lie with their tails at the same point. When the angle between them is increased by 20°, their scalar product has the same magnitude but changes from positive to negative. The original angle between them was:

   (1) 80° (2) 0 (3) 60° (4) 70° (5) 90°

8. If $\vec{A} = 2\hat{i} - 3\hat{j}$ and $\vec{B} = \hat{i} - 2\hat{j}$, then $\vec{A} - 2\vec{B} =$

   (1) $\hat{j}$ (2) $-\hat{j}$ (3) $4\hat{i} - 7\hat{j}$ (4) $4\hat{i} + \hat{j}$ (5) $-4\hat{i} + 7\hat{j}$

9. A stone 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) 32 m/s (5) 40 m/s

10. A large cannon is fired over level ground at an angle of 30° above the horizontal. The muzzle velocity is 980 m/s. Neglecting air resistance, the projectile will travel what horizontal distance before striking the ground?

(1) 85,000 m (2) 4300 m (3) 8500 m (4) 43,000 m (5) 170,000 m

11. Two objects are traveling around different circular orbits with constant speed. They both have the same acceleration but object A is traveling twice as fast as object B. The orbit radius for object A is _____ the orbit radius for object B.

(1) four times (2) one-fourth (3) one-half (4) the same as (5) twice

12. A motor boat can travel at 10 km/h in still water. A river flows at 5 km/h west. A boater wishes to cross from the south bank to a point directly opposite on the north bank. At what angle must the boat be headed?

(1) 30° E of N (2) 27° E of N (3) 45° E of N (4) 60° E of N (5) depends on the width of the river

13. A feather and a lead ball are dropped from rest in vacuum on the moon. The acceleration of the feather is:

(1) the same as that of the lead ball.
(2) more than that of the lead ball.
(3) less than that of the lead ball.
(4) $g = 9.80$ m/s^2.
(5) zero since it floats in a vacuum.

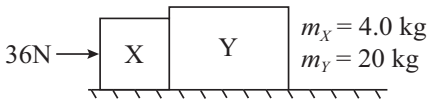
14. Two forces are applied to a 5.0-kg object; one is 6.0 N to the north and the other is 8.0 N to the west. The magnitude of the aceeleration of the object is:

(1) 2.0 m/s^2 (2) 0.50 m/s^2 (3) 2.8 m/s^2 (4) 10 m/s^2 (5) 50 m/s^2

15. A car moves horizontally with a constant acceleration of 4 m/s^2. A ball is suspended by a string from the ceiling of the car; the ball does not swing, being at rest with respect to the car. What angle does the string make with the vertical?

(1) 22° (2) 24° (3) 66° (4) 68° (5) cannot be found without knowing string length

16. Two blocks (X and Y) are in contact on a horizontal frictionless surface. A 36-N constant force is applied to X as shown. The force exerted by Y on X is:

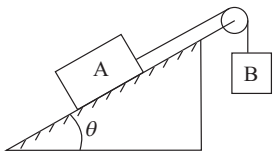


(1) 30 N (2) 1.5 N (3) 6.0 N (4) 29 N (5) 36 N

17. A block rests on a rough horizontal surface ($\mu_s = 0.50$, $\mu_k = 0.40$). A constant horizontal force, just sufficient to start the block in motion, is applied. The acceleration of the block after starting to move, in m/s^2, is:

(1) 0.98 (2) 0 (3) 3.3 (4) 4.5 (5) 8.9

18. Block A, with a mass of 10 kg, rests on a $\theta = 30°$ incline. The coefficient of kinetic friction is 0.20. The attached string is parallel to the incline and passes over a massless, frictionless pulley at the top. Block B, with a mass of 8.0 kg, is attached to the dangling end of the string. The acceleration of B is:

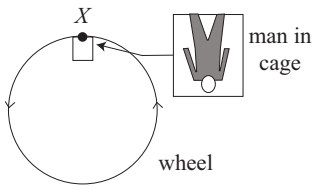


(1) 0.69 m/s^2, down (2) 0.69 m/s^2, up (3) 2.6 m/s^2, down (4) 2.6 m/s^2, up (5) 0

19. If a certain car, going with speed v_1, rounds a level curve with a radius R_1, it is just on the verge of skidding. If its speed is now doubled, the radius of the tightest curve on the same road that it can round without skidding is:

(1) $4R_1$ (2) $2R_1$ (3) $R_1/2$ (4) $R_1/4$ (5) R_1

20. A giant wheel, 40 m in diameter, is fitted with a cage and platform on which a man can stand. The wheel rotates at such a speed that when the cage is at X (as shown), the force exerted by the man on the platform is equal to his weight. The tangential speed of the man (in m/s) is:



(1) 20 (2) 14 (3) 28 (4) 80 (5) 120