

Instructor(s): *Matcheva/Sabin*PHYSICS DEPARTMENT
Exam 1

PHY 2048

September 26, 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.

Take $g = 10 \text{ m/s}^2$ as the acceleration due to gravity.

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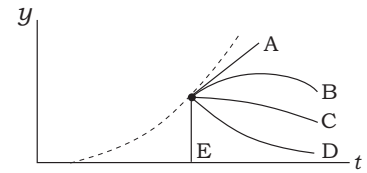
1. Over a short interval, starting at time $t = 0$, the coordinate of an automobile in meters is given by $x(t) = 27t - 4.0t^3$, where t is in seconds. The magnitudes of the initial (at $t = 0$) velocity and acceleration of the auto respectively are:

- (1) 27 m/s; 0 (2) 0; 12 m/s² (3) 0; 24 m/s² (4) 27 m/s; 12 m/s² (5) 27 m/s; 24 m/s²

2. Neglecting the effect of air resistance, a stone dropped off a 175-m high building lands on the ground in:

- (1) 6 s (2) 3 s (3) 4 s (4) 18 s (5) 36 s

3. An elevator is moving upward with constant acceleration. The dashed curve shows the position y of the ceiling of the elevator as a function of time t . At the instant indicated by the dot, a bolt breaks loose and drops from the ceiling. Which curve best represents the position of the bolt as a function of time?

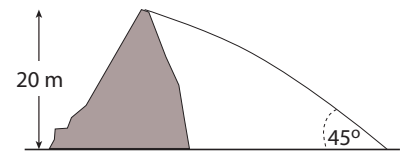


- (1) B (2) A (3) C (4) D (5) E

4. A particle goes from $x = -2\text{m}$, $y = 3\text{m}$, $z = 1\text{m}$ to $x = 3\text{m}$, $y = -1\text{m}$, $z = 4\text{m}$. Its displacement is:

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

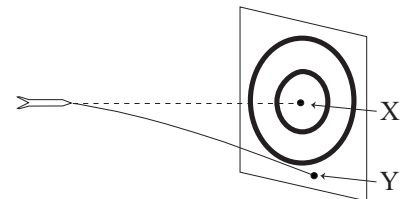
5. A stone is thrown horizontally from the top of a 20-m high hill. It strikes the ground at an angle of 45° . With what speed was it thrown?



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

6. A dart is thrown horizontally toward X at 20 m/s as shown. It hits Y 0.1 s later. The distance XY is:

- (1) 0.05 m
 (2) 1 m
 (3) 0.5 m
 (4) 0.1 m
 (5) 2 m



7. A stone is tied to a 0.50-m string and whirled at a constant speed of 4.0 m/s in a vertical circle. The magnitude of its acceleration in m/s^2 at the bottom of the circle is:

- (1) 32, up (2) 9.8, up (3) 9.8, down (4) 8.0, up (5) 32, down

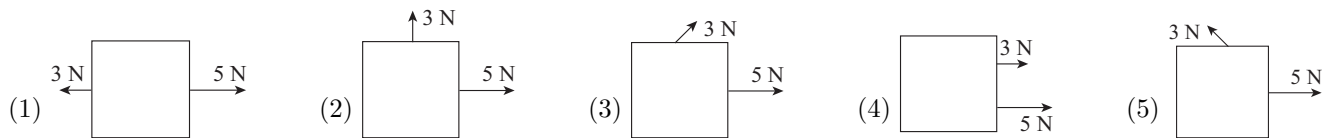
8. Two projectiles are in flight at the same time. The acceleration of one relative to other:

- (1) is zero.
- (2) is always 9.8 m/s^2 .
- (3) can be as large as 19.8 m/s^2 .
- (4) can be horizontal.
- (5) none of these

9. Acceleration is always in the direction:

- (1) of the net force.
- (2) of the displacement.
- (3) of the initial velocity.
- (4) of the final velocity.
- (5) opposite to the frictional force.

10. Two forces, one with a magnitude of 3 N and the other with a magnitude of 5 N, are applied to an object. For which orientation of the forces is the magnitude of the acceleration of the object the least?



11. A 25-kg chair is pushed across a frictionless horizontal floor with a force of 20 N, directed 20° below the horizontal. The acceleration of the chair is:

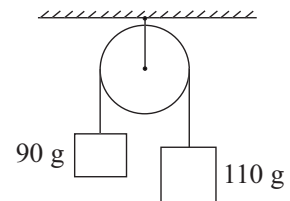
- (1) 0.75 m/s^2
- (2) 0.27 m/s^2
- (3) 0.80 m/s^2
- (4) 170 m/s^2
- (5) 470 m/s^2

12. A 90-kg man stands in an elevator that has downward acceleration of 1.5 m/s^2 . The force exerted by him on the floor is about:

- (1) 765 N
- (2) zero
- (3) 90 N
- (4) 880 N
- (5) 1035 N

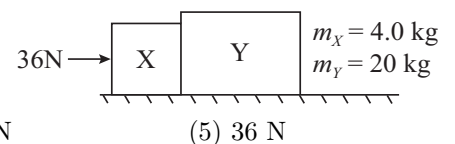
13. Two blocks are connected by a string and pulley as shown. Assuming that the string and pulley are massless, the magnitude of the acceleration of each block is:

- (1) 1.0 m/s^2
- (2) 0.05 m/s^2
- (3) 0.02 m/s^2
- (4) 0.1 m/s^2
- (5) 10 m/s^2



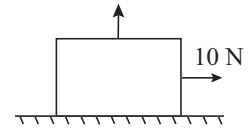
14. Two blocks (X and Y) are in contact on a horizontal frictionless surface. A 36-N constant force is applied to X as shown. The force exerted by X on Y is:

- (1) 30 N
- (2) 1.5 N
- (3) 6.0 N
- (4) 29 N



- (5) 36 N

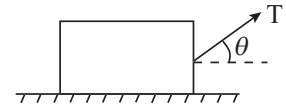
15. A box with a weight of 50 N rests on a horizontal surface. A person pulls horizontally on it with a force of 10 N and it does not move. To start it moving, a second person pulls vertically upward on the box. If the coefficient of static friction is 0.4, what is the smallest vertical force for which the box moves?



- (1) 25 N (2) 10 N (3) 14 N (4) 4 N

(5) 35 N

16. A block of mass m is pulled along a rough horizontal floor by an applied force \vec{T} as shown. The vertical component of the force exerted on the block by the floor is:



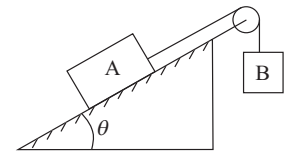
- (1) $mg - T \sin \theta$ (2) mg (3) $mg - T \cos \theta$ (4) $mg + T \cos \theta$

(5) $mg + T \sin \theta$

17. A 5.0-kg crate is on a frictionless incline that makes an angle of 30° with the horizontal. The maximum force that can be applied parallel to the plane without moving the crate is:

- (1) 25 N (2) 0 (3) 3.3 N (4) 42 N (5) 55 N

18. Block A, with a mass of 10 kg, rests on a $\theta = 35^\circ$ 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) 3.5 kg (3) 5.9 kg (4) 10.5 kg

(5) 2.5 kg

19. An object moves in a circle. If the radius is doubled keeping the speed the same, then the centripetal force must be:

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

20. One end of a 1.0-m string is fixed, the other end is attached to a 2.0-kg stone. The stone swings in a vertical circle, passing the bottom point at 4.0 m/s. The string tension (in newtons) at this point is about:

- (1) 52 (2) 0 (3) 20 (4) 32 (5) 12