

PHY 231C, INTRODUCTORY PHYSICS I, EXAM I, Sep. 15, 2003

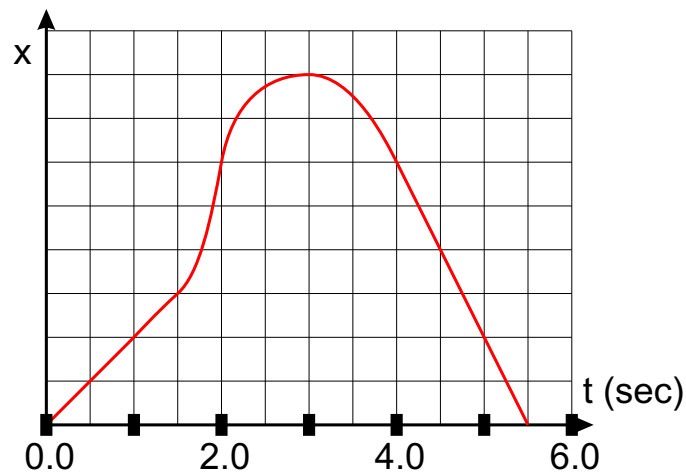
Conversions: 1 mile = 1.609 km, 1 inch = 2.54 cm

Constants: $g=9.8 \text{ m/s}^2$

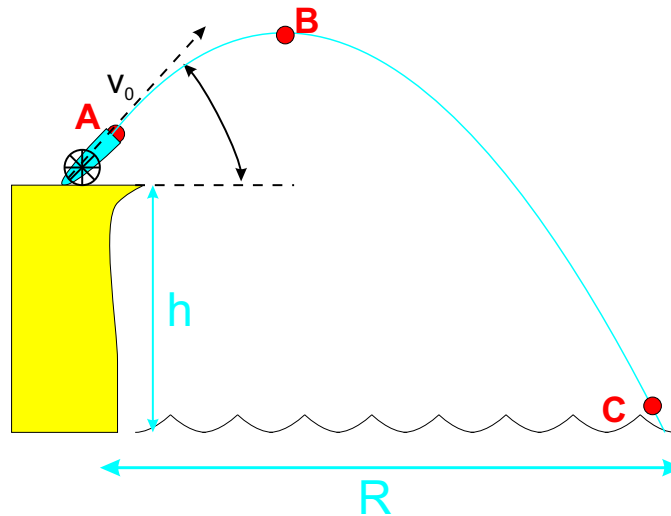
Ignore air resistance for all trajectory problems.

Choose the best answer.

1. A volleyball moves with a speed of 60 miles per hour. What is the speed in meters per second?
 - (a) 26.8 m/s
 - (b) 0.0543 m/s
 - (c) 37.3 m/s
 - (d) 111.2 m/s
 - (e) 1.73 m/s
2. Consider a length x , a velocity v , a mass m and an acceleration a . The quantity G is given by the expression, $G = mxa/v^2$. In SI units, what are the dimensions of G ?
 - (a) $\text{kg} \cdot \text{s}$
 - (b) kg
 - (c) $\text{kg} \cdot \text{s}^4$
 - (d) $\text{kg} \cdot \text{m}^4 / \text{s}^4$
 - (e) None of the above.
3. A cannonball is shot directly upwards. At a time T , it returns to the muzzle of the cannon. Which statement (A-D) is FALSE? If none of the statements is false, choose E. Assume that positive displacements refer to upward motion.
 - (a) The displacement is positive during the entire trajectory.
 - (b) The acceleration is negative during the entire trajectory.
 - (c) At a time $t = T/2$, the velocity is zero.
 - (d) In the instant before the cannonball returns to the muzzle, its speed is the same as it was the instant after it left the muzzle.
 - (e) None of these statements are false.
4. Again, consider the cannonball from the previous problem. If the muzzle velocity is doubled, the maximum height of the cannonball will
 - (a) not change
 - (b) increase by a factor of $\sqrt{2}$.
 - (c) increase by a factor of two.
 - (d) will increase by a factor of four.
 - (e) will increase by an unknown factor since the mass of the cannonball is unknown.
5. A race car accelerates uniformly from rest, and after 5 seconds is moving with a velocity of 50 m/s. How far has the race car moved in 5 seconds?
 - (a) 50 m
 - (b) 62.5 m
 - (c) 75 m
 - (d) 100 m
 - (e) 125 m



6. Consider the graph of position vs. time above. Which of the statements is false?
- For $0 < t < 3$ s, the velocity is positive.
 - At $t = 3$ s, the acceleration is negative.
 - For $4 < t < 5.5$ s, the acceleration is zero.
 - At $t = 3$ s, the velocity is zero
 - For all times shown on the graph, the acceleration is zero or less than zero.
7. A plane is capable of moving at a speed of 130 m/s in still air. Despite a strong wind of 50 m/s from the north, the plane flies directly eastward. What is the speed of the plane relative to the ground?
- 80 m/s
 - 102.5 m/s
 - 120 m/s
 - 180 m/s
 - 133.3 m/s
8. A cannon is placed on a flat car moving with a constant velocity of 30 m/s. The cannon fires a cannonball with an initial velocity of 60 m/s. If the gunner wishes for the cannonball to return precisely to the cannon, the cannon should be aimed... (Ignore air resistance)
- directly upwards
 - forward at an angle of 30 degrees
 - forward at an angle of 60 degrees
 - backwards at an angle of 30 degrees
 - backwards at an angle of 60 degrees



9. Consider the cannonball fired off a high cliff with the trajectory shown above. Which of the statements is false?
- The y -component of the velocity at B is zero.
 - The acceleration at B is equal to the acceleration at C .
 - The x -component of the velocity at B is equal to the x -component of the velocity at C .
 - The magnitude of the y -component of the velocity at A is equal to the magnitude of the y -component of the velocity at C .
 - The smallest speed occurs when the projectile is at B .
10. A snowball is launched horizontally from the top of a rectangular building with an initial velocity of 20 m/s. It lands 50 m from the base of the building. How high is the building?
- 30.7 m
 - 134.2 m
 - 91.8 m
 - 40 m
 - 19.6 m
11. Nolan Ryan throws a baseball with an initial velocity of 40 m/s. The ball leaves his hand moving horizontally at a height of 2.0 m above the ground. What horizontal distance will the ball have traveled when it hits the ground?
- 16.7 m
 - 20.0 m
 - 25.5 m
 - 39.5 m
 - 41.3 m