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 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) kg· s

    (b) kg

    (c) kg·s^4

    (d) kg·m^4/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 displacments 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
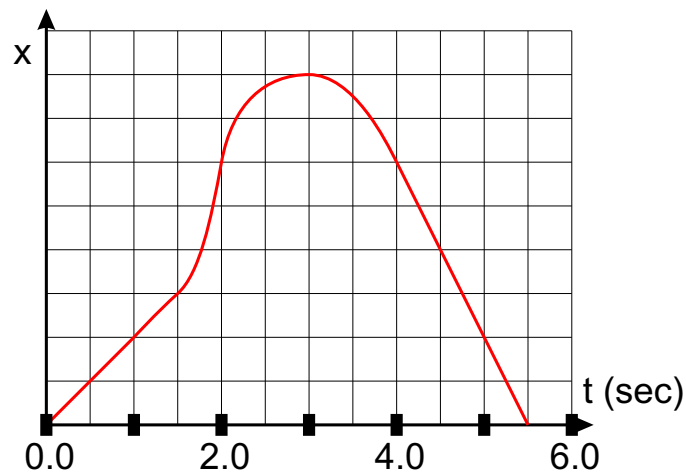
6. Consider the graph of position vs. time above. Which statement is false?

   (a) For $0 < t < 3$ s, the velocity is positive.
   (b) At $t = 3$ s, the acceleration is negative.
   (c) For $4 < t < 5.5$ s, the acceleration is zero.
   (d) At $t = 3$ s, the velocity is zero
   (e) 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?

   (a) 80 m/s
   (b) 102.5 m/s
   (c) 120 m/s
   (d) 180 m/s
   (e) 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)

   (a) directly upwards
   (b) forward at an angle of 30 degrees
   (c) forward at an angle of 60 degrees
   (d) backwards at an angle of 30 degrees
   (e) backwards at an angle of 60 degrees
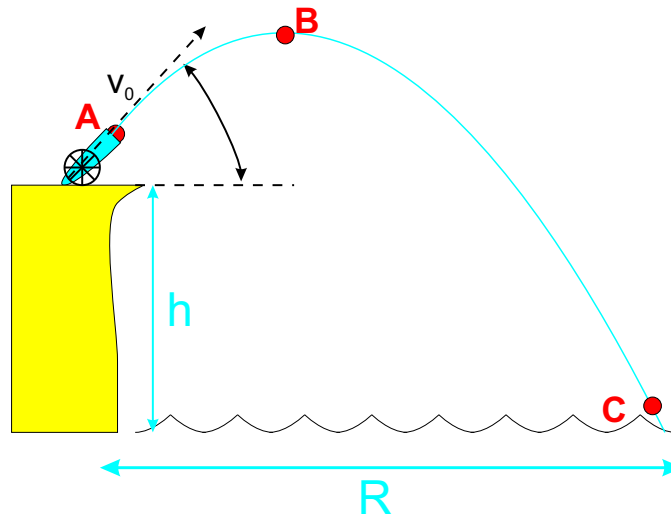
9. Consider the cannonball fired off a high cliff with the trajectory shown above. Which statement is false?

   (a) The y-component of the velocity at B is zero.
   (b) The acceleration at B is equal to the acceleration at C
   (c) The x-component of the velocity at B is equal to the x-component of the velocity at C.
   (d) 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.
   (e) 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 of the building. How high is the building?

   (a) 30.7 m
   (b) 134.2 m
   (c) 91.8 m
   (d) 40 m
   (e) 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?

   (a) 16.7 m
   (b) 20.0 m
   (c) 25.5 m
   (d) 39.5 m
   (e) 41.3 m