Webreview 2.2 - Linear Motion Practice Test

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. The position of a particle as it moves along the x axis is given for \( t > 0 \) by \( x = (t^3 - 3t^2 + 6t) \) m, where \( t \) is in s. Where is the particle when it achieves its minimum speed (after \( t = 0 \))?
   a. 3 m
   b. 4 m
   c. 8 m
   d. 2 m
   e. 7 m

2. A particle moving with a constant acceleration has a velocity of 20 cm/s when its position is \( x = 10 \) cm. Its position 7.0 s later is \( x = -30 \) cm. What is the acceleration of the particle?
   a. \(-7.3 \) cm/s\(^2\)
   b. \(-8.9 \) cm/s\(^2\)
   c. \(-11 \) cm/s\(^2\)
   d. \(-15 \) cm/s\(^2\)
   e. \(-13 \) cm/s\(^2\)

3. In 2.0 s, a particle moving with constant acceleration along the x axis goes from \( x = 10 \) m to \( x = 50 \) m. The velocity at the end of this time interval is 10 m/s. What is the acceleration of the particle?
   a. \(+15 \) m/s\(^2\)
   b. \(+20 \) m/s\(^2\)
   c. \(-20 \) m/s\(^2\)
   d. \(-10 \) m/s\(^2\)
   e. \(-15 \) m/s\(^2\)

4. An object moving on the x axis with a constant acceleration increases its x coordinate by 80 m in a time of 5.0 s and has a velocity of 20 m/s at the end of this time. Determine the acceleration of the object during this motion.
   a. \(-1.6 \) m/s\(^2\)
   b. \(+6.4 \) m/s\(^2\)
   c. \(+1.6 \) m/s\(^2\)
   d. \(-2.0 \) m/s\(^2\)
   e. \(-6.4 \) m/s\(^2\)

5. A ball is thrown vertically upward with an initial speed of 20 m/s. Two seconds later, a stone is thrown vertically (from the same initial height as the ball) with an initial speed of 24 m/s. At what height above the release point will the ball and stone pass each other?
   a. 17 m
   b. 21 m
   c. 18 m
   d. 27 m
   e. 31 m
6. A stone is thrown from the top of a building with an initial velocity of 20 m/s downward. The top of the building is 60 m above the ground. How much time elapses between the instant of release and the instant of impact with the ground?
   a. 2.0 s
   b. 6.1 s
   c. 3.5 s
   d. 1.6 s
   e. 1.0 s

7. The velocity at the midway point of a ball able to reach a height $y$ when thrown with velocity $v_i$ at the origin is:
   a. $\frac{v_i}{2}$
   b. $\sqrt{\frac{v_i^2}{2gy}}$
   c. $\sqrt{\frac{v_i^2}{2}}$
   d. $\sqrt{\frac{v_i^2}{2} + 2gy}$
   e. $gy$

8. A particle moving along the x axis has a position given by $x = 54t - 2.0t^3$ m. At the time $t = 3.0$ s, the speed of the particle is zero. Which statement is correct?
   a. The particle remains at rest after $t = 3.0$ s.
   b. The particle no longer accelerates after $t = 3.0$ s.
   c. The particle can be found at positions $x < 0$ m only when $t < 0$ s.
   d. All of the above are correct.
   e. None of the above is correct.

9. The position of an object at equal time intervals is shown below:

Which graph below correctly represents position versus time for this object?

a.  
   b.  
   c.  
   d.  
   e.  

10. Five motion diagrams in which points represent the positions of an object at equal time intervals are shown below. Which statement is correct?

![Motion Diagrams]

a. A has the greatest speed and the greatest acceleration.
b. C has decreasing speed.
c. D slows down and then speeds up.
d. D speeds up and then slows down.
e. E has a greater speed than A.

11. The equation that solves a problem is \( \left( 18 \ \text{m/s} \right)^2 - \left( 0 \ \text{m/s} \right)^2 = 2 \left( 3.0 \ \text{m/s}^2 \right) (3.0 \ \text{m}) \). The problem is:

a. What is the initial velocity of a car that goes from rest to 18 m/s in 3.0 s?
b. What is the final velocity of a car that goes from rest to 18 m/s in 3.0 s?
c. What is the initial velocity of a car that accelerates at 18 m/s for 3.0 s?
d. What is the final velocity of a car that accelerates at 3.0 m/s\(^2\) over a 6.0 m distance?
e. What is the final velocity of a car that accelerates at 3.0 m/s\(^2\) over a 3.0 m distance?

12. The area under a graph of \( v_x \) vs. \( t \) from \( t = t_i \) to \( t = t_f \) represents

a. \( x_i \).
b. \( x_f \).
c. \( x_f - x_i \).
d. \( \frac{1}{2} (x_i + x_f) \).
e. \( x_i + x_f \).

13. Cart A, of mass \( m \), starts from rest and travels in a straight line with acceleration \( a \). It traverses a distance \( x \) in time \( t \). Cart B, of mass \( 4m \), starts from rest and travels in a straight line with acceleration \( \frac{a}{2} \). At time \( t \) it has traversed the distance

a. \( \frac{x}{4} \).
b. \( \frac{x}{2} \).
c. \( x \).
d. \( 2x \).
e. \( 4x \).
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Answer Section

MULTIPLE CHOICE

1. B
2. A
3. D
4. C
5. A
6. A
7. C
8. E
9. E
10. D
11. E
12. C
13. B