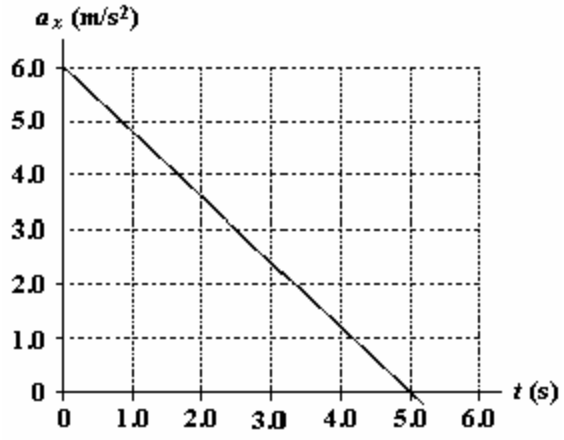
Webreview 2.1 Linear Motion - Practice Test

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

____ 1. The velocity of a particle moving along the x axis is given for $t > 0$ by $v_x = (32.0t - 2.00t^3)$ m/s, where t is in s. What is the acceleration of the particle when (after $t = 0$) it achieves its maximum displacement in the positive x direction?
a. -64.0 m/s^2
b. zero
c. 128 m/s^2
d. 32.0 m/s^2
e. -32.0 m/s^2

____ 2. The position of a particle as it moves along the x axis is given by $x = 15e^{-2t}$ m, where t is in s. What is the acceleration of the particle at $t = 1.0$ s?
a. 22 m/s
b. 60 m/s
c. 8.1 m/s
d. 15 m/s
e. 35 m/s

____ 3. At $t = 0$, a particle is located at $x = 25$ m and has a velocity of 15 m/s in the positive x direction. The acceleration of the particle varies with time as shown in the diagram. What is the velocity of the particle at $t = 5.0$ s?



a. +15 m/s
b. −15 m/s
c. +30 m/s
d. 0
e. −1.2 m/s

____ 4. A proton moving along the x axis has an initial velocity of 4.0×10^6 m/s and a constant acceleration of 6.0×10^{12} m/s^2. What is the velocity of the proton after it has traveled a distance of 80 cm?
a. 5.1×10^6 m/s
b. 6.3×10^6 m/s
c. 4.8×10^6 m/s
d. 3.9×10^6 m/s
e. 2.9×10^6 m/s

____ 5. An automobile manufacturer claims that its product will, starting from rest, travel 0.40 km in 9.0 s. What is the magnitude of the constant acceleration required to do this?
a. 9.9 m/s^2
b. 8.9 m/s^2
c. 6.6 m/s^2
d. 5.6 m/s^2
e. 4.6 m/s^2

____ 6. A rocket, initially at rest, is fired vertically with an upward acceleration of 10 m/s^2. At an altitude of 0.50 km, the engine of the rocket cuts off. What is the maximum altitude it achieves?
a. 1.9 km
b. 1.3 km
c. 1.6 km
d. 1.0 km
e. 2.1 km

____ 7. An object is thrown vertically and has an upward velocity of 18 m/s when it reaches one fourth of its maximum height above its launch point. What is the initial (launch) speed of the object?
a. 35 m/s
b. 25 m/s
c. 30 m/s
d. 21 m/s
e. 17 m/s

____ 8. An object is thrown downward with an initial ($t = 0$) speed of 10 m/s from a height of 60 m above the ground. At the same instant ($t = 0$), a second object is propelled vertically upward from ground level with a speed of 40 m/s. At what height above the ground will the two objects pass each other?
a. 53 m
b. 41 m
c. 57 m
d. 46 m
e. 37 m

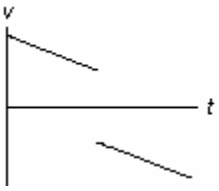
____ 9. The position of a particle moving along the *y* axis has a position given by

$$y = 0.20\text{m} + \left(8.0\,\frac{\text{m}}{\text{s}}\right)t - \left(10\,\frac{\text{m}}{\text{s}^2}\right)t^2$$

Is there any time interval during which the particle is not moving?
a. Yes, from 0.60 s to 1.00 s.
b. Yes, from 0.795 s to 0.805 s.
c. Yes, at the time $t = 0.80$ s.
d. No, the velocity is never zero.
e. No, an instant is not the same as a time interval.

____ 10. Two identical balls are at rest side by side at the bottom of a hill. Some time after ball A is kicked up the hill, ball B is given a kick up the hill. Ball A is headed downhill when it passes ball B headed up the hill. At the instant when ball A passes ball B,
a. it has the same position and velocity as ball B.
b. it has the same position and acceleration as ball B.
c. it has the same velocity and acceleration as ball B.
d. it has the same displacement and velocity as ball B.
e. it has the same position, displacement and velocity as ball B.

____ 11. The graph below shows the velocity versus time graph for a ball. Which explanation best fits the motion of the ball as shown by the graph?



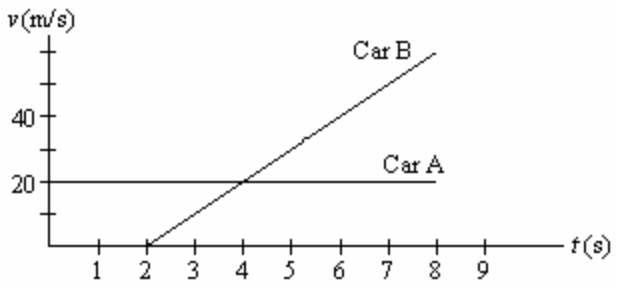
a. The ball is falling, is caught, and is thrown down with greater velocity.
b. The ball is rolling, stops, and then continues rolling.
c. The ball is rising, hits the ceiling, and falls down.
d. The ball is falling, hits the floor, and bounces up.
e. The ball is rising, is caught, and then is thrown down.

____ 12. A juggler throws two balls to the same height so that one is at the halfway point going up when the other is at the halfway point coming down. At that point:
a. Their velocities and accelerations are equal.
b. Their velocities are equal but their accelerations are equal and opposite.
c. Their accelerations are equal but their velocities are equal and opposite.
d. Their velocities and accelerations are both equal and opposite.
e. Their velocities are equal to their accelerations.

____ 13. The equation that solves a problem is $6.4\text{ m} = 20\text{ m} + 3.0\,\frac{\text{m}}{\text{s}}(2.0\text{ s}) - 4.9\,\frac{\text{m}}{\text{s}^2}(2.0\text{ s})^2$. The problem is:

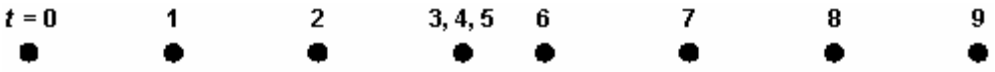
a. How far above its initial position does a rock travel in 2.0 s when thrown up from a point 40 m above the ground?
b. How far below its initial position does a rock travel in 2.0 s when thrown up from a point 40 m above the ground?
c. What is the position relative to the ground of a rock thrown up at 3.0 m/s from a roof 20 m above the ground 2.0 s after it is released?
d. What is the change in position relative to the ground of a rock thrown up at 3.0 m/s from a roof 20 m above the ground 2.0 s after it is released?
e. What is the position relative to the ground of a rock thrown up at 3.0 m/s from a roof 20 m above the ground if its maximum height is 33.6 m?

____ 14. Driver A is cruising along enjoying the fall colors. Driver B starts her car at the instant he passes her. Their velocities are shown as functions of time in the graph below. At what instants in time on the graph are drivers A and B side by side?



a. 0 s, 2 s
b. 0 s, 4 s
c. 2 s, 4 s
d. 2 s, 6 s
e. 4 s, 6 s

____ 15. The small circles in the diagram below represent the positions along the *x* axis of a body at equal time intervals. Assume the body moves in a straight line.



This diagram is most likely to describe

a. a swimmer swimming laps.
b. an exercise on a rowing machine.
c. a person on a treadmill.
d. a tennis ball during a volley.
e. a runner who tripped, fell, rose, and continued racing.

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Answer Section

MULTIPLE CHOICE

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