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Chapter 02

1. A change in a physical quantity w having initial value w_i and final value w_f is given by which of the following?

   a. $w_i - w_f$

   b. $w_f - w_i$

   c. $(w_f + w_i)/2$

   d. none of the above

   ANSWER: b
   POINTS: 1
   DIFFICULTY: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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2. Displacement is which of the following types of quantities?

   a. vector

   b. scalar

   c. magnitude

   d. dimensional

   ANSWER: a
   POINTS: 1
   DIFFICULTY: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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3. A truck moves 80.0 m east, then moves 140.0 m west, and finally moves east again a distance of 80.0 m. If east is chosen as the positive direction, what is the truck's resultant displacement?
   a. 20.0 m
   b. –20.0 m
   c. 300.0 m
   d. –300.0 m
   e. 140.0 m

   ANSWER: a
   POINTS: 1
   DIFFICULTY: 2
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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4. Which of the following is not a vector quantity?
   a. temperature
   b. velocity
   c. acceleration
   d. displacement

   ANSWER: a
   POINTS: 1
   DIFFICULTY: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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5. In one-dimensional motion, the average speed of an object that moves from one place to another and then back to its original place has which of the following properties?
   a. It is positive.
   b. It is negative.
   c. It is zero.
   d. It can be positive, negative, or zero.

   ANSWER: a
   POINTS: 1
   DIFFICULTY: 2
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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6. In one-dimensional motion where the direction is indicated by a plus or minus sign, the average velocity of an object has which of the following properties?
   a. It is positive.
   b. It is negative.
   c. It is zero.
   d. It can be positive, negative, or zero.

   ANSWER: d
   POINTS: 1
   DIFFICULTY: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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7. An object moves 10 m east in 30 s and then returns to its starting point taking an additional 50 s. If west is chosen as the positive direction, what is the sign associated with the average velocity of the object?
   a. +
   b. −
   c. 0 (no sign)
   d. any of the above

   ANSWER: c
   POINTS: 1
   DIFFICULTY: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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8. An object moves 10.0 m east in 10.0 s and then returns to its starting point taking an additional 40.0 s. If west is chosen as the positive direction, what is the average speed of the object?
   a. 0.4 m/s
   b. –0.4 m/s
   c. 10.0 m/s
   d. 0 m/s
   e. –10.0

   ANSWER: a
   POINTS: 1
   DIFFICULTY: 2
   QUESTION TYPE: Multiple Choice
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   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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9. A bird, accelerating from rest at a constant rate, experiences a displacement of 22 m in 10 s. What is the average velocity?
   a. 1.2 m/s
   b. 2.2 m/s
   c. 2.4 m/s
   d. 0 m/s
   e. 0.5 m/s

   ANSWER: b
   POINTS: 1
   DIFFICULTY: 1
   QUESTION TYPE: Multiple Choice
   HAS VARIABLES: False
   TOPICS: 2.1 Displacement, Velocity, and Acceleration
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10. A cheetah can run at approximately 100 km/h and a gazelle at 80.0 km/h. If both animals are running at full speed, with the gazelle 50.0 m ahead, how long before the cheetah catches its prey?
    a. 9.0 s
    b. 14 s
    c. 18 s
    d. 4.5 s
    e. 21 s

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleratio
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11. A cheetah can maintain its maximum speed of 96.0 km/hr for 26.0 seconds. What minimum distance must a gazelle running 85.0 km/hr be ahead of the cheetah to escape?
    a. 96 m
    b. 79 m
    c. 40 m
    d. 73 m
    e. 67 m

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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12. Jeff throws a ball straight up. For which situation is the vertical velocity zero?
    a. on the way up
    b. at the top
    c. on the way back down
    d. none of the above

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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13. A railroad train travels forward along a straight track at 90.0 m/s for 1 000 m and then travels at 70.0 m/s for the next 1 000 m. What is the average velocity?
    a. 79.3 m/s
    b. 78.8 m/s
    c. 83.8 m/s
    d. 75.8 m/s
    e. 81.5 m/s

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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14. The distance of the Earth from the Sun is 93 000 000 miles. If there are 3.15×10^7 s in one year, find the speed of the Earth in its orbit about the Sun.
    a. 9.28 miles/s
    b. 18.6 miles/s
    c. 27.9 miles/s
    d. 37.2 miles/s

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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15. A ball is thrown vertically upwards at 19.0 m/s. For its complete trip (up and back down to the starting position), its average velocity is:
    a. 19.0 m/s.
    b. 9.5 m/s.
    c. 4.8 m/s.
    d. 14.3 m/s
    e. not given.

    ANSWER: e
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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16. Changing the positive direction in a reference frame to the opposite direction does not change the sign of which of the following quantities?
    a. velocity
    b. average velocity
    c. speed
    d. displacement

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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17. Consider the magnitude of the average speed, $v_{\text{avg, speed, mag}}$, and the magnitude of the average velocity, $v_{\text{avg, velocity, mag}}$, for the same trip. Which of the following is always true?

    a. $v_{avg,\ speed,\ mag} = v_{\text{avg, velocity, mag}}$

    b. $v_{avg,\ speed,\ mag} \geq v_{\text{avg, velocity, mag}}$

    c. $v_{avg,\ speed,\ mag} \leq v_{\text{avg, velocity, mag}}$

    d. none of the above

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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18. A European sports car dealer claims that his car will accelerate at a constant rate from rest to 100 km/h in 8.00 s. If so, what is the acceleration? (*Hint:* First convert speed to m/s.)

    a. 3.47 m/s^2

    b. 6.94 m/s^2

    c. 5.21 m/s^2

    d. 10.4 m/s^2

    e. 8.68 m/s^2

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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19. A European sports car dealer claims that his product will accelerate at a constant rate from rest to a speed of 100 km/hr in 8.00 s. What is the speed after the first 4.00 s of acceleration? (*Hint:* First convert the speed to m/s.)
    a. 27.8 m/s
    b. 41.7 m/s
    c. 20.9 m/s
    d. 13.9 m/s
    e. 6.95 m/s

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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20. The value of an object's acceleration may be characterized in equivalent words by which of the following?
    a. displacement
    b. rate of change of displacement
    c. velocity
    d. rate of change of velocity

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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21. A 50.0-g ball traveling at 22.0 m/s is bounced off a brick wall and rebounds at 21.0 m/s. A high-speed camera records this event. If the ball is in contact with the wall for 2.50 ms, what is the average acceleration of the ball during this time interval?

    a. 1.72E+4 m/s^2

    b. 3.44E+4 m/s^2

    c. 8.60E+3 m/s^2

    d. 1.72E+1 m/s^2

    e. 4.30E+1 m/s^2

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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22. The slope of the acceleration vs. time curve represents

    a. the velocity.

    b. the rate of change of acceleration.

    c. the rate of change of displacement.

    d. the area under the position vs. time curve.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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23. Starting from rest, a car accelerates down a straight road with constant acceleration a for a time t, then the direction of the acceleration is reversed, (i.e., it is $-a$), and the car comes to a stop in an additional time t, the time for the whole trip being $2t$. At what time, or times, is the average velocity of the car for the trip equal to its instantaneous velocity during the trip?
    a. There is no such time.
    b. It is at the halfway point at t.
    c. This occurs at 2 times, $0.5t$ and $1.5t$.
    d. This occurs at 2 times, $0.707t$ and $1.293t$.

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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24. In which of the following cases is the displacement's magnitude half the distance traveled?
    a. 10 steps east followed by 3 steps west
    b. 28 steps east followed by 14 steps west
    c. 6 steps east followed by 24 steps west
    d. 12 steps east followed by 4 steps west
    e. 5 steps east followed by 25 steps west

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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25. Which formula is dimensionally consistent with an expression yielding a value for velocity? (*a* is acceleration, *x* is distance, and *t* is time)

    a. v/t^2

    b. vx^2

    c. v^2/t

    d. at

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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26. If *a* is acceleration, *v* is velocity, *x* is position, and *t* is time, then which equation is not dimensionally correct?

    a. $t = x/v$

    b. $a = v^2/x$

    c. $v = a/t$

    d. $t^2 = 2x/a$

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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27. A ball is pushed downhill with an initial velocity of 3.0 m/s. The ball rolls down a hill with a constant acceleration of 1.6 m/s^2. The ball reaches the bottom of the hill in 6.0 s. What is the ball's velocity at the bottom of the hill?
    a. 10 m/s
    b. 13 m/s
    c. 16 m/s
    d. 17 m/s

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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28. An object moves at a constant velocity of 12 m/s to the southwest for an interval of 20 s. Halfway through this interval, what is the magnitude of its instantaneous velocity?
    a. It can be any value from 0 to 24 m/s.
    b. 6 m/s
    c. 12 m/s
    d. More information is needed.

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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29. A car is moving along a straight highway and accelerates at a constant rate while going from point A to point B. If the acceleration is positive, increasing the speed of the car, where does the position where the instantaneous speed equals the average speed occur for the interval from A to B?

    a. midway between A and B

    b. closer to A than to B

    c. closer to B than to A

    d. Any of the answers could be correct depending on the original speed.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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30. A car is moving in the positive direction along a straight highway and accelerates at a constant rate while going from point A to point B. If the acceleration is positive, increasing the speed of the car, when does the position where the average speed equals the instantaneous speed occur during the time interval from A to B? Assume the time interval is T.

    a. T/2 from the start of the interval

    b. before T/2 from the start of the interval

    c. after T/2 from the start of the interval

    d. It depends on the speed at the start of the time interval.

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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31. Suppose a particle is moving along a straight line with a speed v for a time t, then stops for a time t, and then resumes moving along the original direction with speed v for time t. What has been the average speed of the particle for the total time period $3t$?

    a. v

    b. $2v/3$

    c. $1.5v$

    d. $\sqrt{2/3}\,v$

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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32. A rock is rolled in the sand. It starts at 5.0 m/s, moves in a straight line for a distance of 6.0 m, and then stops. What is the magnitude of the average acceleration?

    a. 2.1 m/s^2

    b. 4.2 m/s^2

    c. 5.4 m/s^2

    d. 6.2 m/s^2

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.1 Displacement, Velocity, and Acceleration
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33. On a position-versus-time graph, the slope of the straight line joining two points on the plotted curve that are separated in time by the interval Δt, is which of the following quantities?
    a. average steepness
    b. average velocity
    c. instantaneous velocity
    d. average acceleration

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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34. An x vs. t graph is drawn for a ball moving in one direction. The graph starts at the origin and at $t = 5$ s the velocity of the ball is zero. We can be positive that at $t = 5$ s,
    a. the slope of the curve is non-zero.
    b. the ball has stopped.
    c. the acceleration is constant.
    d. the curve is at $x = 0$, $t = 0$.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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35. A v vs. t graph is drawn for a ball moving in one direction. The graph starts at the origin and at $t = 5$ s the acceleration of the ball is zero. We know that at $t = 5$ s,
    a. the slope of the curve is non-zero.
    b. the velocity of the ball is not changing.
    c. the curve is not crossing the time axis.
    d. the curve is at $v = 0$, $t = 0$.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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36. On a position-time graph for a particle, suppose the plot starts at some positive position and as the time goes on the curve gets steeper and steeper while curving upwards. Which of the following must be true?
    a. The speed of the particle is constant.
    b. The acceleration of the particle is constant.
    c. The speed of the particle is decreasing.
    d. The acceleration of the particle is positive.

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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37. On a velocity-time graph for a particle, suppose the plot starts at some positive velocity and then follows a straight line to zero at a later time. Which of the following must be true about a position vs. time graph for this same time interval?
    a. The curve will start at a positive position value and follow a straight line to zero at the later time.
    b. The curve will rise steeply at first and as time goes on will level out approaching its highest position value at the later time.
    c. The curve will drop steeply at first and as time goes on will approach its lowest position value at the later time
    d. The curve will start at the zero of position and follow a straight line to its highest position at the later time.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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38. An object moves along the x axis, with its position given by the function $x(t) = ½\ t^3$. Which of the following can be obtained from a graph of x vs. t?
    a. The velocity of the object at any instant in time
    b. The displacement of the object during a specified time interval
    c. The speed of the particle at any instant in time
    d. The average velocity of the object during as specified time interval
    e. All of the above

    ANSWER: e
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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39. A strobe photograph shows equally-spaced images of a car moving along a straight road. If the time intervals between images is constant, which of the following cannot be positive?
    a. the speed of the car
    b. the average velocity of the car
    c. the acceleration of the car
    d. the direction of motion of the car

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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40. A strobe photograph of a car moving along a straight road shows the interval between each successive image to be diminishing. If the direction of motion of the car is taken as positive, which of the following is/are negative?
    a. the speed of the car
    b. the average velocity of the car
    c. the average acceleration of the car
    d. all of the above

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.2 Motion Diagrams and Graphs
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41. A ball is pushed with an initial velocity of 4.0 m/s. The ball rolls down a hill with a constant acceleration of 1.7 m/s^2. The ball reaches the bottom of the hill in 7.0 s. What is the ball's velocity at the bottom of the hill?
    a. 15 m/s
    b. 13 m/s
    c. 16 m/s
    d. 19 m/s

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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42. A cart is given an initial velocity of 5.0 m/s and experiences a constant acceleration of 2.4 m/s^2. What is the magnitude of the cart's displacement during the first 5.0 s of its motion?
    a. 35 m
    b. 85 m
    c. 55 m
    d. 11 m
    e. 17 m

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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43. A vehicle designed to operate on a drag strip accelerates from zero to 34 m/s while undergoing a straight-line path displacement of 48 m. What is the vehicle's acceleration if its value may be assumed to be constant?

    a. 9 m/s^2

    b. 6.0 m/s^2

    c. 12 m/s^2

    d. 18 m/s^2

    e. 24 m/s^2

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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44. When a drag strip vehicle reaches a velocity of 65.0 m/s, it begins a negative acceleration by releasing a drag chute and applying its brakes. While reducing its velocity back to zero, its acceleration along a straight-line path is a constant $-7.10\ m/s^2$. What displacement does it undergo during this deceleration period?

    a. 595 m

    b. 4.58 m

    c. 2 110 m

    d. 298 m

    e. 9.15 m

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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45. A bird, accelerating from rest at a constant rate, experiences a displacement of 25 m in 15 s. What is the final velocity after 15 s?

    a. 2.5 m/s

    b. 1.7 m/s

    c. 3.3 m/s

    d. 3.8 m/s

    e. zero

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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46. A bird, accelerating from rest at a constant rate, experiences a displacement of 25 m in 12 s. What is its acceleration?

    a. 0.18 m/s^2

    b. 0.35 m/s^2

    c. 0.44 m/s^2

    d. 0.26 m/s^2

    e. 0.53 m/s^2

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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47. A European sports car dealer claims that his product will accelerate at a constant rate from rest to a speed of 100 km/h in 6.00 s. What distance will the sports car travel during the 6.00-s acceleration period? (*Hint:* First convert speed to m/s.)
    a. 41.7 m
    b. 58.3 m
    c. 83.3 m
    d. 167 m
    e. 125 m

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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48. An automobile driver puts on the brakes and decelerates from 35.0 m/s to zero in 11.0 s. What distance does the car travel?
    a. 193 m
    b. 97 m
    c. 241 m
    d. 290 m
    e. 145 m

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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49. A drag racer starts from rest and accelerates at 8.0 m/s^2 for the entire distance of 300 m. What is the velocity of the race car at the end of the run?
    a. 83 m/s
    b. 69 m/s
    c. 52 m/s
    d. 35 m/s
    e. 59 m/s

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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50. A Cessna aircraft has a lift-off speed of 135 km/h. What minimum constant acceleration does this require if the aircraft is to be airborne after a take-off run of 260 m?
    a. 2.70 m/s^2
    b. 1.35 m/s^2
    c. 3.38 m/s^2
    d. 5.41 m/s^2
    e. 2.03 m/s^2

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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51. If the displacement of an object is given in SI units by $\Delta x = -3t + 4t^2$, at $t = 2$ s its velocity and acceleration are, respectively:
    a. positive, positive.
    b. positive, negative.
    c. negative, negative.
    d. negative, positive

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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52. In the case of constant acceleration, the average velocity equals the instantaneous velocity:
    a. at the beginning of the time interval.
    b. at the end of the time interval.
    c. half-way through the time interval.
    d. three-fourths of the way through the time interval.

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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53. Two students are working on the same constant-acceleration problem involving a car undergoing constant acceleration, having started from rest and after a certain time having traveled a distance of 108 m. The students are to find the average velocity. Both students are required to show their work and round any intermediate answers as well as the final answer properly to 3 significant figures. Each rounded answer is to be used in the next step of calculation as they proceed. For the final answer, Student A uses the formula $v_{avg} = (x_f - x_i)/(tf - t_i)$ getting the result 7.26 m/s, and Student B uses the formula $v_{avg} = (v_0 + v)/2$ getting the result 7.29 m/s. Assuming neither student makes a mistake, which student has the better answer?
    a. Student A
    b. Student B
    c. Under significant figure rounding, both answers are equally as good.
    d. The described result cannot happen; this is physics after all.

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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54. A speeding car traveling at a constant velocity of 24 m/s passes a police care initially at rest beside the roadway. If the police car with constant acceleration of 3.0 m/s^2 immediately pursues the speeding car, how far down the road does it draw even with the speeding car?
    a. 190 m
    b. 290 m
    c. 380 m
    d. 770 m

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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55. A speeding car traveling at a constant velocity of v passes a police car initially at rest beside the roadway. If the police car with constant acceleration of a immediately pursues the speeding car, how long is it before the police car is directly behind the speeding car?

    a. v/a

    b. $2v/a$

    c. $v/2a$

    d. v^2/a

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
    NOTES: Revised item
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56. Amanda is standing at the edge of a cliff. She throws a rock vertically upward at speed v_0, while at the same time throws a second rock vertically downward at the same speed. How long after the rock thrown downward hits the ground does the rock thrown upwards hit?

    a. $2v_0/g$

    b. v_0/g

    c. $\sqrt{2v_0g}$

    d. $\frac{{v_0}^2}{g}$

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
    NOTES: New item
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57. A baseball player throws a ball straight up into the air. At a height of 3.00 m above the release point, the ball is moving at 1.25 m/s. What was the ball's initial speed?
    a. 7.56 m/s
    b. 7.77 m/s
    c. 57.2 m/s
    d. 60.4 m/s

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
    NOTES: New item
    DATE CREATED: 11/2/2023 3:34 AM
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58. Starting from rest, a car accelerates down a straight road with constant acceleration a_1 for a time t_1, then the acceleration is changed to a different constant value a_2 for an additional time t_2. The total elapsed time is $t_1 + t_2$. Can the equations of kinematics be used to find the total distance traveled?
    a. No, because this is not a case of constant acceleration.
    b. Yes, use $(a_1 + a_2)/2$ as the average acceleration and the total time in the calculation.
    c. Yes, use $a_1 + a_2$ as the acceleration and the average time $(t_1 + t_2)/2$ in the calculation.
    d. Yes, break the problem up into 2 problems, one with the conditions for the first time interval and the other with the conditions for the second time interval, noting that for the second time interval the initial velocity is that from the end of the first time interval. When done, add the distances from each of the time intervals.

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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59. A ball rolls down an incline, starting from rest. If the total time it takes to reach the end of the incline is T, how much time has elapsed when it is halfway down the incline?
    a. 0.5 T
    b. < 0.5 T
    c. > 0.5 T
    d. More information is needed.

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.3 One-Dimensional Motion with Constant Acceleration
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60. An object is dropped from a height. Once it is moving, which of the following statements is true, at least at one point?
    a. Its velocity is more than its acceleration.
    b. Its velocity is less than its acceleration.
    c. Its velocity is the same as its acceleration.
    d. Its velocity is never equal to its acceleration.

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely Falling Bodies
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61. A rock is thrown straight down with an initial velocity of 14.3 m/s from a cliff. What is the rock's displacement after 2.0 s? (Acceleration due to gravity is 9.80 m/s^2.)
    a. 81 m
    b. 48 m
    c. 38 m
    d. 22 m
    e. 31 m

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
    DATE CREATED: 11/2/2023 3:40 AM
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62. A rock is thrown straight up with an initial velocity of 25.0 m/s. What maximum height will the rock reach before starting to fall downward? (Take acceleration due to gravity as 9.80 m/s^2.)
    a. 39.9 m
    b. 15.9 m
    c. 63.8 m
    d. 31.9 m
    e. 47.8 m

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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63. A rock is thrown straight up with an initial velocity of 17.6 m/s. What time interval elapses between the rock's being thrown and its return to the original launch point? (Acceleration due to gravity is 9.80 m/s^2.)
    a. 3.60 s
    b. 1.80 s
    c. 2.70 s
    d. 3.06 s
    e. 3.96 s

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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64. Two objects of different mass are released simultaneously from the top of a 20-m tower and fall to the ground. If air resistance is negligible, which statement best applies?
    a. The greater mass hits the ground first.
    b. Both objects hit the ground together.
    c. The smaller mass hits the ground first.
    d. No conclusion can be made with the information given.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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65. A baseball catcher throws a ball vertically upward and catches it in the same spot when it returns to his mitt. At what point in the ball's path does it experience zero velocity and non-zero acceleration at the same time?
    a. midway on the way up
    b. at the top of its trajectory
    c. the instant it leaves the catcher's hand
    d. the instant before it arrives in the catcher's mitt

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 1
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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66. A baseball is released at rest from the top of the Washington Monument. It hits the ground after falling for 5.85 s. What was the height from which the ball was dropped? (g = 9.80 m/s^2 and assume air resistance is negligible)
    a. 1.88×10^2 m
    b. 1.68×10^2 m
    c. 1.38×10^2 m
    d. 3.36×10^2 m

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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67. A rock, released at rest from the top of a tower, hits the ground after 3.5 s. What is the speed of the rock as it hits the ground? (g = 9.8 m/s^2 and air resistance is negligible)
    a. 34 m/s
    b. 17 m/s
    c. 44 m/s
    d. 24 m/s

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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68. Omar throws a rock down with speed 12.5 m/s from the top of a tower. The rock hits the ground after 1.50 s. What is the height of the tower? (air resistance is negligible)
    a. 24.0 m
    b. 21.0 m
    c. 30.0 m
    d. 54.0 m
    e. 45.0 m

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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69. Gwen releases a rock at rest from the top of a 40-m tower. If $g = 9.8$ m/s^2 and air resistance is negligible, what is the speed of the rock as it hits the ground?
    a. 28 m/s
    b. 14 m/s
    c. 20 m/s
    d. 40 m/s
    e. 780 m/s

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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70. John throws a rock down with speed 11 m/s from the top of a 25-m . If $g = 9.8$ m/s^2 and air resistance is negligible, what is the rock's speed just as it hits the ground?
    a. 19 m/s
    b. 25 m/s
    c. 610 m/s
    d. 22 m/s
    e. 12 m/s

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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71. Human reaction time is usually about 0.18 s. If your lab partner holds a ruler between your finger and thumb and releases it without warning, how far can you expect the ruler to fall before you catch it? The nearest value is
    a. 32 cm.
    b. 88 cm.
    c. 1.6 cm.
    d. 180 cm.
    e. 16 cm.

    ANSWER: e
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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72. At the top of a cliff 100 m high, Raoul throws a rock upward with velocity 15.0 m/s. How much later should he drop a second rock from rest so both rocks arrive simultaneously at the bottom of the cliff?
    a. 8.08 s
    b. 3.31 s
    c. 5.02 s
    d. 1.78 s
    e. 0.89 s

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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73. Maria throws two stones from the top edge of a building with a speed of 22 m/s. She throws one straight down and the other straight up. The first one hits the street in a time t_1. How much later is it before the second stone hits?

    a. 5.5 s

    b. 4.5 s

    c. 3.5 s

    d. 6.5 s

    e. Not enough information is given to work this problem.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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74. Mt. Everest is more than 8 000 m high. How fast would an object be moving if it could free fall to sea level after being released from an 8 000-m elevation? (Ignore air resistance.)

    a. 396 m/s

    b. 120 m/s

    c. 1 200 m/s

    d. 12 000 m/s

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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75. A basketball player can jump 1.6 m off the hardwood floor. With what upward velocity did he leave the floor?
    a. 5.8 m/s
    b. 2.8 m/s
    c. 5.4 m/s
    d. 5.6 m/s
    e. 11 m/s

    ANSWER: d
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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76. A water , launched from the ground, rises vertically with acceleration of 25 m/s^2 for 2.0 s when it runs out of "fuel." Disregarding air resistance, how high will the rocket rise?
    a. 305 m
    b. 356 m
    c. 178 m
    d. 130 m
    e. 50 m

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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77. A parachutist jumps out of an airplane and accelerates with gravity to a maximum velocity of 68.6 m/s in 7.00 seconds. She then pulls the parachute cord and after a 4.00-second constant deceleration, descends at 10.5 m/s for 60.0 seconds, reaching the ground. From what height did the parachutist jump?
    a. 1.03E+3 m
    b. 7.88E+2 m
    c. 1.19E+3 m
    d. 1.66E+3 m
    e. 1.43E+3 m

    ANSWER: a
    POINTS: 1
    DIFFICULTY: 3
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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78. A ball is thrown vertically upwards at 24.5 m/s. For its complete trip (up and back down to the starting position), its average speed is
    a. 18.4 m/s.
    b. 12.3 m/s.
    c. 24.5 m/s.
    d. 6.1 m/s.
    e. not given.

    ANSWER: b
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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79. A ball of relatively low density is thrown upwards. Because of air resistance the acceleration while traveling upwards is $-10.8\ m/s^2$. On its trip downward the resistance is in the opposite direction, and the resulting acceleration is $-8.8\ m/s^2$. When the ball reaches the level from which it was thrown, how does its speed compare to that with which it was thrown?
    a. It is greater than the original speed upward.
    b. It is the same as the original speed upward.
    c. It is less than the original speed upward.
    d. Without knowing the original speed, this problem cannot be solved.

    ANSWER: c
    POINTS: 1
    DIFFICULTY: 2
    QUESTION TYPE: Multiple Choice
    HAS VARIABLES: False
    TOPICS: 2.4 Freely-Falling Objects
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