Chapter 2: Linear Motion

Section 2-2: Constant velocity means moving at a steady speed in the same direction

1. A particle moves from x_1 = 30 cm to x_2 = – 40 cm. The displacement of this particle is

A. 30 cm

B. 40 cm

C. 70 cm

D. –70 cm

E. –40 cm

Ans: D Section: 2-2 Type: Numerical

2. A particle moves from x_1 = –50 cm to x_2 = 30 cm. The displacement of this particle is

A. –50 cm

B. 30 cm

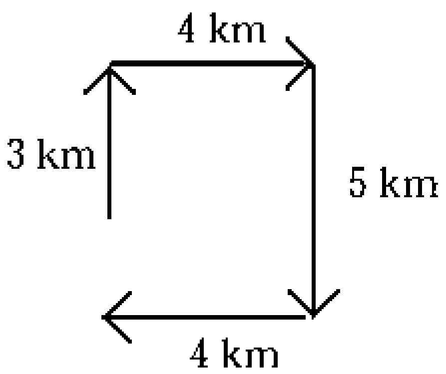
C. 80 cm

D. –30 cm

E. –80 cm

Ans: C Section: 2-2 Type: Numerical

3. Four successive displacements of 3 km, 4 km, 5 km, and 4 km are at right angles to each other as shown in the diagram.



The magnitude of the resultant displacement is

A. 2 km

B. 16 km

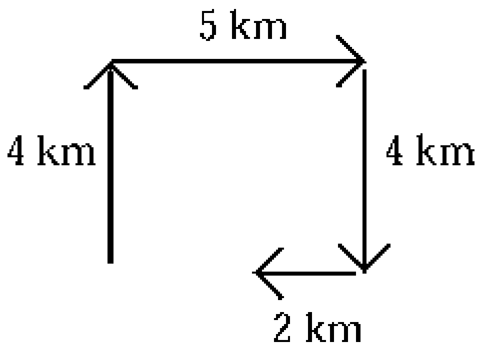
C. 3 km

D. 5 km

E. None of these are correction

Ans: A Section: 2-2 Type: Numerical

4. Four successive displacements of 4 km, 5 km, 4 km, and 2 km are at right angles to each other as shown in the diagram.



The magnitude of the resultant displacement is

A. 4 km

B. 15 km

C. 3 km

D. 5 km

E. None of these are correct

Ans: C Section: 2-2 Type: Numerical

5. A particle moves from x_0 = 30 cm to x = –40 cm in 5 s. The average velocity of the particle during this time interval is

A. 2 cm/s.

B. –2 cm/s.

C. 14 cm/s.

D. –14 cm/s.

E. –140 cm/s.

Ans: D Section: 2-2 Type: Numerical

6. You drive for 30 min at 100 km/h and then stop for 15 min. You then drive for 45 min at 80 km/h. Your average speed for the entire trip is

A. 73 km/h

B. 83 km/h.

C. 88 km/h.

D. 90 km/h.

E. 97 km/h.

Ans: A Section: 2-2 Type: Numerical

7. You drive for 30 min for 30 km East and then another 30 min for 40 km North. Your average speed for the entire trip is

A. 40 km/h.
B. 50 km/h.
C. 60 km/h.
D. 70 km/h.
E. 80 km/h.

Ans: D Section: 2-2 Type: Numerical

8. You drive for 30 min for 30 km East and then another 30 min for 40 km North. The magnitude of your average velocity for the entire trip is

A. 40 km/h.
B. 50 km/h.
C. 60 km/h.
D. 70 km/h.
E. 80 km/h.

Ans: B Section: 2-2 Type: Numerical

9. The displacement of an object for a round trip between two locations

A. is always greater than zero.
B. is always less than zero.
C. is zero
D. can be greater than or less than but not equal to zero.
E. can have any value.

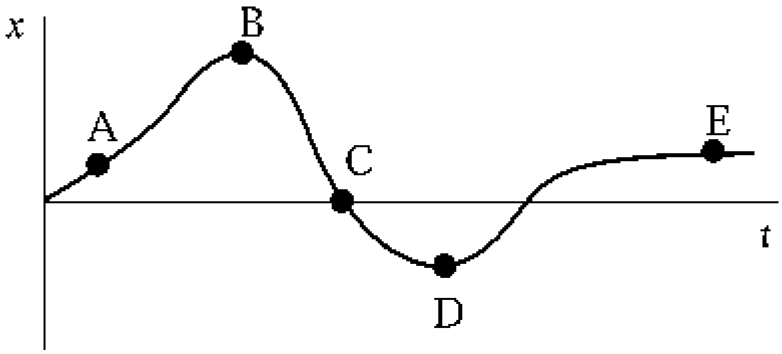
Ans: C Section: 2-2 Type: Conceptual

10. The displacement of an object during any time interval is always ________ the distance it travels during that same time interval.

A. great than or equal to
B. less than or equal to
C. equal to
D. greater than
E. much greater than

Ans: B Section: 2-2 Type: Conceptual

11. An object, located at the origin when *t* = 0, moves along the *x* axis as shown in the diagram.



At which point is the object farthest from its starting point?

A. A

B. B

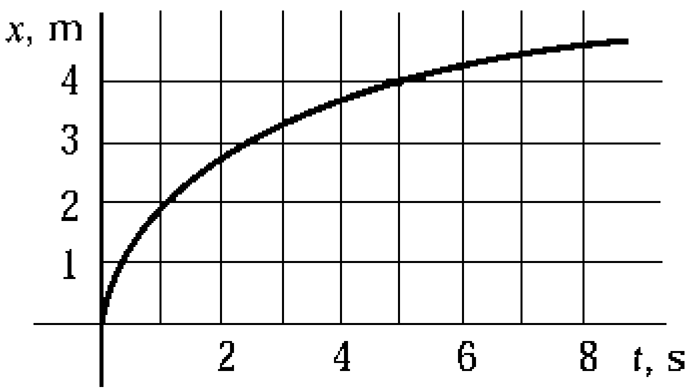
C. C

D. D

E. E

Ans: B Section: 2-2 Type: Conceptual

12. The graph shows how the position of a particle depends on time.



Which choice is closest to the average speed of the particle in the time interval between 0 and 6 s?

A. 0.40 m/s

B. 0.67 m/s

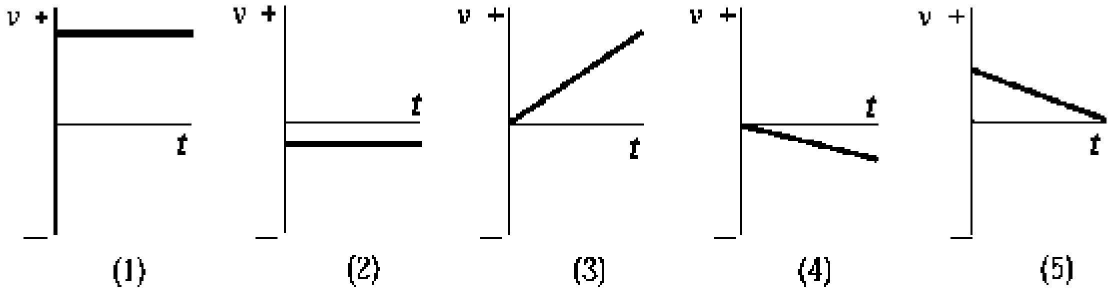
C. 0.75 m/s

D. 1.50 m/s

E. 2.22 m/s

Ans: B Section: 2-2 Type: Numerical

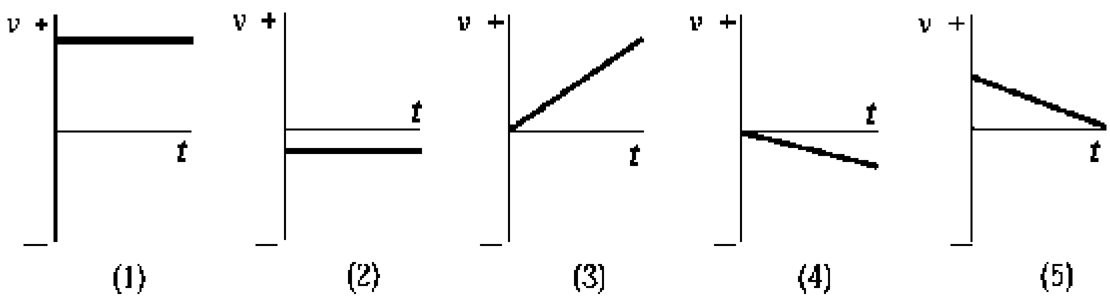
13. Which graph of *v* versus *t* best describes the motion of a particle whose velocity is constant and negative?



A. 1
B. 2
C. 3
D. 4
E. 5

Ans: B Section: 2-2 Type: Conceptual

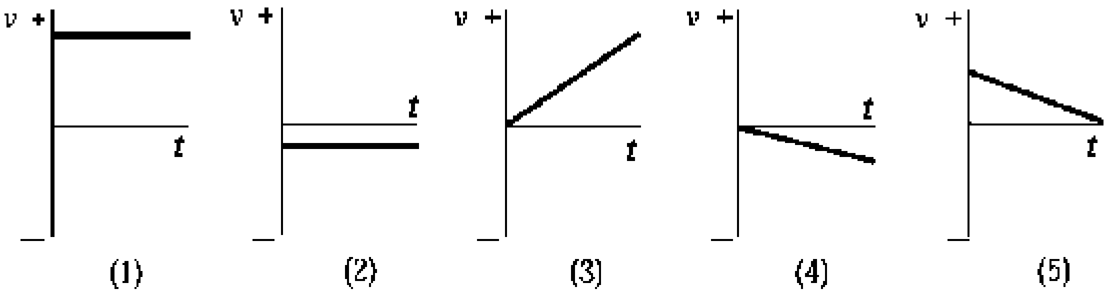
14. In which graph of *v* versus *t* does the particle end up closest to its starting point?



A. 1
B. 2
C. 3
D. 4
E. 5

Ans: D Section: 2-2 Type: Conceptual

15. In which graph of *v* versus *t* does the particle end up farthest from its starting point?



A. 1
B. 2
C. 3
D. 4
E. 5
Ans: A Section: 2-2 Type: Conceptual

16. If the speed of particle A is twice that of particle B, the distance particle B travels in a given interval of time as compared with particle A is
A. twice as great
B. half as great
C. the same
D. four times as great
E. one-fourth as great
Ans: B Section: 2-2 Type: Conceptual

Section 2-3: Solving straight-line motion problems: constant velocity

17. Assume that the Deschutes River has straight and parallel banks and that the current is 0.75 m/s. Drifting down the river, you fall out of your boat and immediately grab a piling of the Warm Springs Bridge. You hold on for 40 s and then swim after the boat with a speed relative to the water of 0.95 m/s. The distance of the boat downstream from the bridge when you catch it is
A. 67 m.
B. 90 m.
C. 78 m.
D. 54 m.
E. 120 m.
Ans: D Section: 2-3 Type: Numerical

18. You are traveling in your car at 82 km/h (23 m/s) when an emergency arises. If your car is 4 m long, how many car lengths do you travel during the 0.7 s of reaction time (i.e., the time interval between seeing the emergency and hitting the brake with your foot)?

A. 2
B. 4
C. 6
D. 8
E. 10

Ans: B Section: 2-3 Type: Numerical

19. A river 1.00 mile wide flows with a constant speed of 1.00 mi/h. A woman leaves from a point on the river bank. The woman rows a boat 1.00 mi directly upstream and returns to the starting point. Her speed in still water is 2.00 mi/h. The travel time for the woman is

A. 2.00 h.
B. 1.15 h.
C. 1.00 h.
D. 1.33 h.
E. 0.67 h.

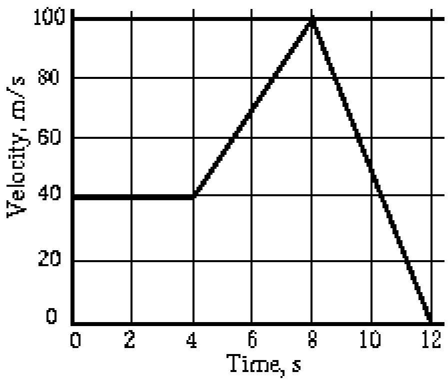
Ans: D Section: 2-3 Type: Numerical

20. A river 1.00 mile wide flows with a constant speed of 1.00 mi/h. A man can row a boat at 2.00 mi/h. He crosses the river in a direction that puts him directly across the river from the starting point, and then he returns in a direction that puts him back at the starting point in the shortest time possible. The travel time for the man is

A. 2.00 h.
B. 1.15 h.
C. 1.00 h
D. 1.33 h.
E. 0.67 h.

Ans: B Section: 2-3 Type: Numerical

21. The graph shows the velocity of a particle as a function of time.



In the 12 s shown, the particle travels

A. 0 m.

B. 1200 m.

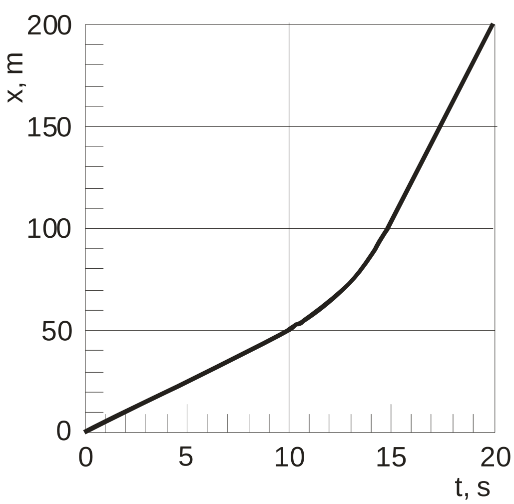
C. 640 m.

D. 440 m.

E. 200 m.

Ans: C Section: 2-3 Type: Numerical

22. The distance traveled by a car in the x-direction is shown. When the car changes speed for t = 10 s to 15 s, it does so uniformly.



The speed of the car at 5 s is

A. 5 m/s

B. 7.5 m/s

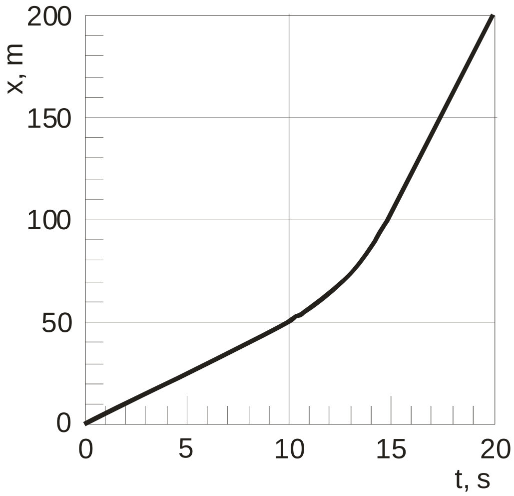
C. 10 m/s

D. 12.5 m/s

E. 15 m/s

Ans: Section: 2-3 Type: Numerical

23. The distance traveled by a car in the x-direction is shown. When the car changes speed for t = 10 s to 15 s, it does so uniformly.



The speed of the car at 17.5 s is.

A. 5 m/s

B. 10 m/s

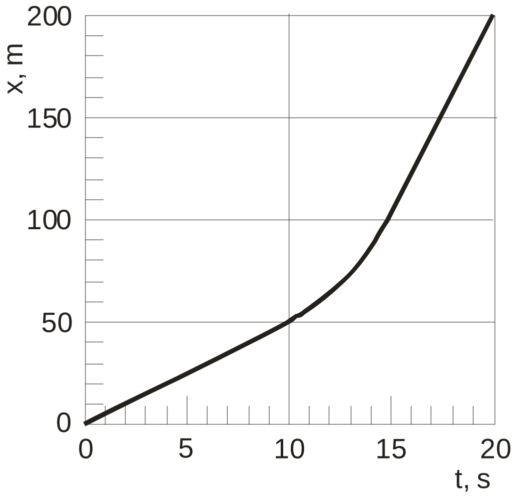
C. 15 m/s

D. 20 m/s

E. 25 m/s

Ans: D Section: 2-3 Type: Numerical

24. The distance traveled by a car in the x-direction is shown. When the car changes speed for t = 10 s to 15 s, it does so uniformly.



The speed of the car at 5 s is ____ speed at 20 s.

A. less than the

B. equal to the

C. greater than the

D. unable to tell

E. depends on what happens when it is accelerating between 10 and 15 s.

Ans: A Section: 2-3 Type: Conceptual

25. If the position of an object is plotted vertically on a graph and the time is plotted horizontally, the instantaneous velocity at a particular time is

A. the height of the curve at that time.

B. the total length of the curve.

C. the slope of the tangent to the curve at that time.

D. the area under the curve from zero to that time.

E. impossible to determine from this type of plot.

Ans: C Section: 2-3 Type: Conceptual

26. If an object is moving at uniform speed in a straight line, its instantaneous velocity halfway through any time interval is

A. greater than its average velocity.

B. less than its average velocity.

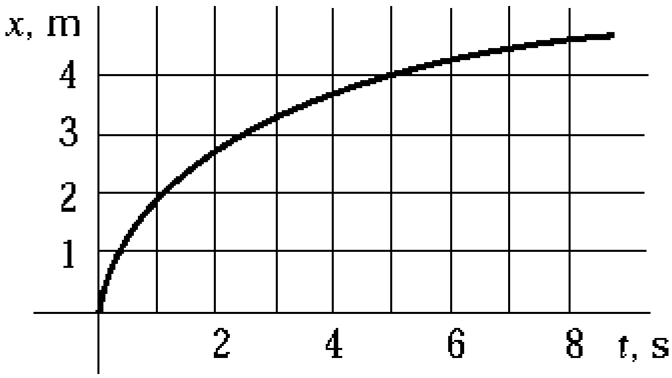
C. the same as its average velocity.

D. half of its average velocity.

E. twice its average velocity.

Ans: C Section: 2-3 Type: Conceptual

27. The graph shows how the position of a particle depends on time.



Which choice is closest to the instantaneous speed of the particle at *t* = 3 s?

A. 0.40 m/s
B. 0.67 m/s
C. 0.75 m/s
D. 1.50 m/s
E. 2.22 m/s

Ans: A Section: 2-3 Type: Conceptual

28. On a graph that shows position on the vertical axis and time on the horizontal axis, a straight line with a positive slope represents

A. a constant positive acceleration.
B. a constant negative acceleration.
C. zero velocity.
D. a constant positive velocity.
E. a constant negative velocity.

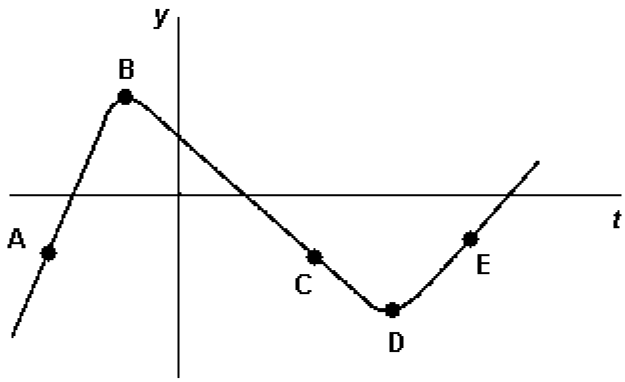
Ans: D Section: 2-3 Type: Conceptual

29. On a graph that shows position on the vertical axis and time on the horizontal axis, a straight line with a negative slope represents

A. a constant positive acceleration.
B. a constant negative acceleration.
C. zero velocity.
D. a constant positive velocity.
E. a constant negative velocity.

Ans: E Section: 2-3 Type: Conceptual

30. The graph shows the displacement of a particle along the *y* axis as a function of time.



The points at which the velocity is the same are

A. A and C.

B. A and E.

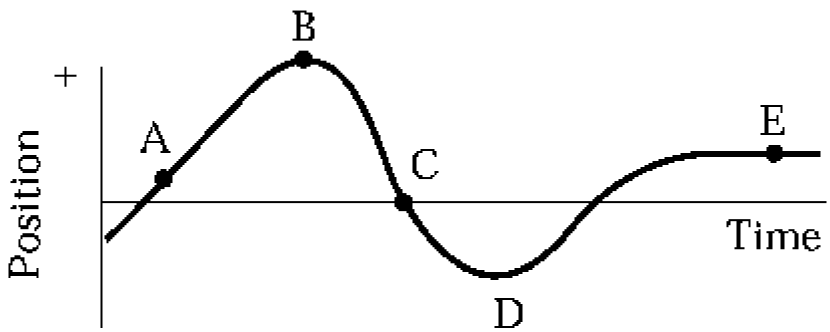
C. B and D.

D. A, C, and E.

E. B, C, and D.

Ans: C Section: 2-3 Type: Conceptual

31. An object moves along the *x* axis as shown in the diagram.



At which point or points is the object instantaneously at rest?

A. A and E

B. B, D, and E

C. C only

D. E only

E. None of these are correct

Ans: B Section: 2-3 Type: Conceptual

32. A Ford truck enters a highway and travels at a uniform speed of 50 mph. Half an hour later a Jaguar enters the highway at the same junction and heads in the same direction at 55 mph. How long after the Ford entered the highway does the Jaguar catch up with the truck?

A. 5.0 hrs

B. 6.0 hrs

C. 1.0 hrs

D. 1.6 hrs

E. 5.5 hrs

Ans: E Section: 2-3 Type: Numerical

33. An airplane flies 600 miles with a tail wind in 2.0 hrs. If it takes 2.5 hrs to cover the same distance against the headwind, then what is the speed of the plane in still air?

A. 270 mph

B. 300 mph

C. 240 mph

D. 330 mph

E. 250 mph

Ans: A Section: 2-3 Type: Conceptual

34. It takes the Mars rover 4.5 minutes to send information via a radio signal traveling at the speed of light back to Mission Control on Earth. How far away is the rover?

A. 8.1×10^{10} km

B. 1.35×10^{9} m

C. 8.10×10^{10} m

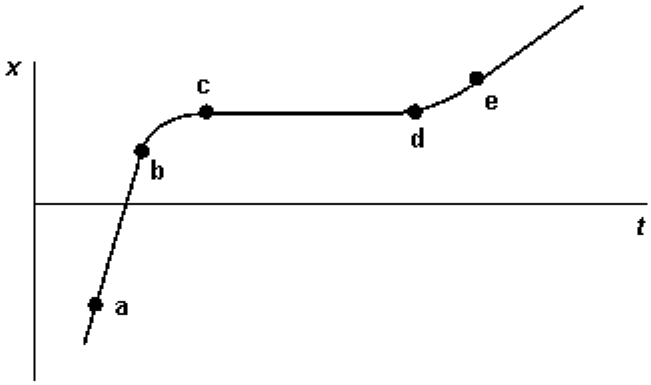
D. 1.35×10^{9} km

E. 1.62×10^{11} m

Ans: C Section: 2-3 Type: Conceptual

Section 2-4: Velocity is the rate of change of position, and acceleration is the rate of change of velocity

35. The graph represents the displacement of a particle along the *x* axis as a function of time.



The interval in which the velocity of this particle is negative is

A. a–b

B. b–c

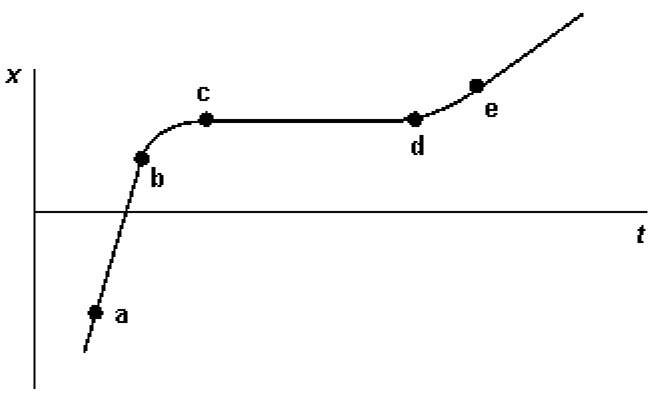
C. d–e

D. c–d

E. none of these are correct.

Ans: E Section: 2-4 Type: Conceptual

36. The graph represents the displacement of a particle along the *x* axis as a function of time.



Which point has the highest instantaneous velocity?

A. a

B. b

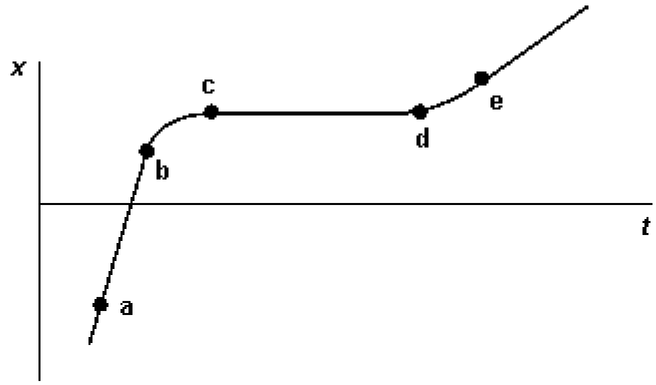
C. c

D. d

E. e

Ans: A Section: 2-4 Type: Conceptual

37. **The graph represents the displacement of a particle along the *x* axis as a function of time.**



Which interval has the highest magnitude in acceleration?

A. a-b

B. b-c

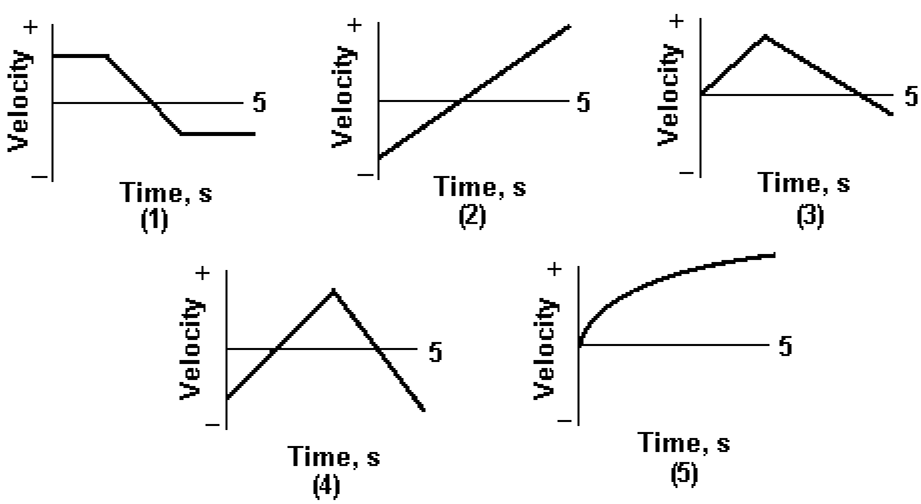
C. c-d

D. d-e

E. they have equal acceleration

Ans: B **Section: 2-4** **Type: Conceptual**

38. In which graph is the particle the farthest from the origin at *t* = 5 s?



A. 1

B. 2

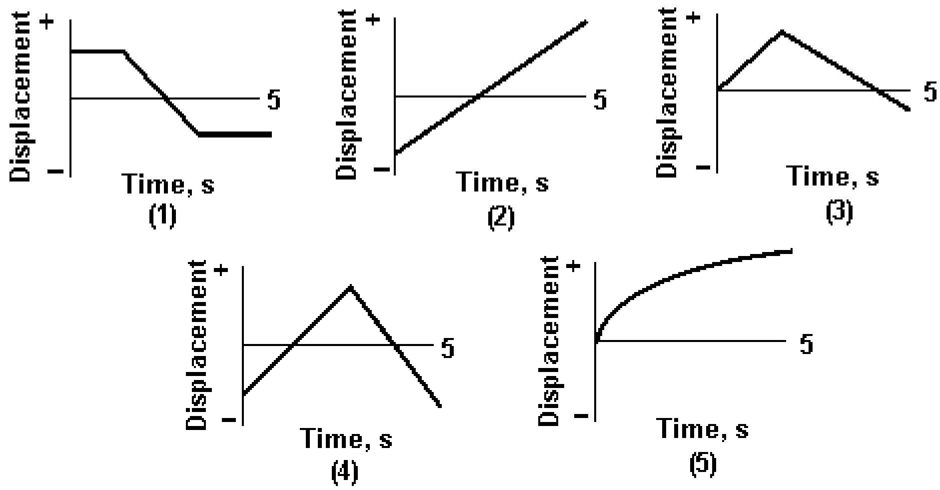
C. 3

D. 4

E. 5

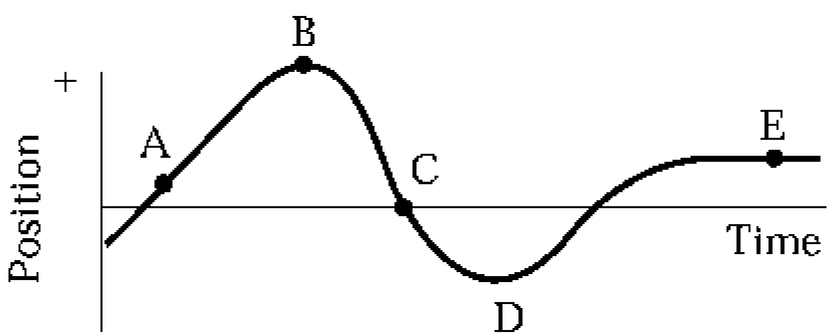
Ans: E **Section: 2-4** **Type: Conceptual**

39. In which graph is the particle the closest to the origin at *t* = 5 s?



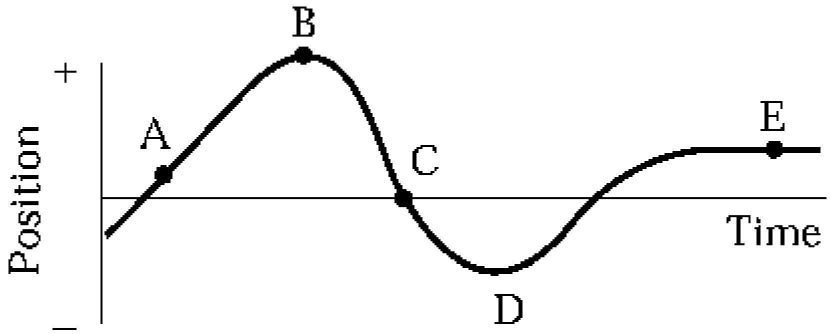
A. 1
B. 2
C. 3
D. 4
E. 5
Ans: C **Section: 2-4** **Type: Conceptual**

40. An object moves along the *x* axis as shown in the diagram.



At which point or points is the magnitude of its velocity a minimum?
A. A and E
B. B, D, and E
C. C only
D. E only
E. None of these are correct
Ans: B **Section: 2-4** **Type: Conceptual**

41. An object moves along the *x*-axis as shown in the diagram.



At which point or points is the object's instantaneous velocity zero?

A. A and E

B. B, D, and E

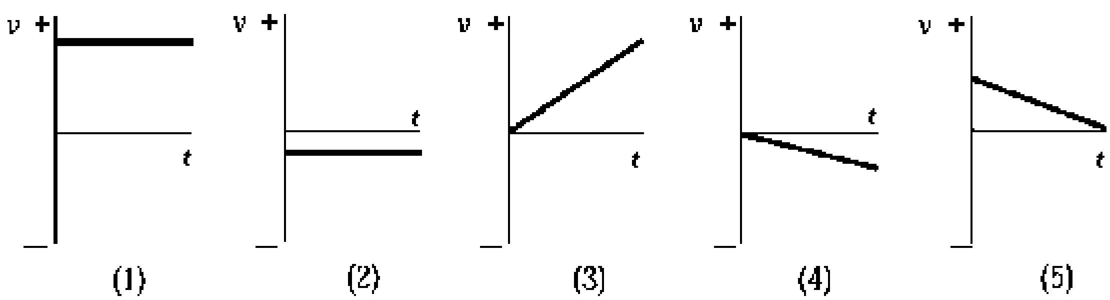
C. C only

D. E only

E. None of these are correct

Ans: B Section: 2-4 Type: Conceptual

42. Which graph of *v* versus *t* best describes the motion of a particle with positive velocity and negative acceleration?



A. 1

B. 2

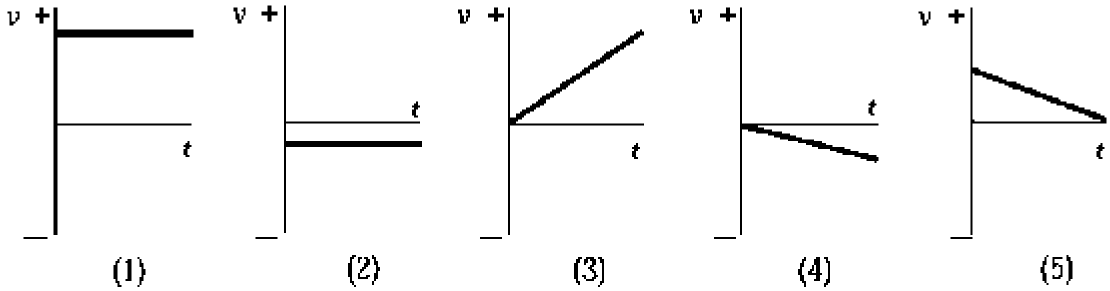
C. 3

D. 4

E. 5

Ans: E Section: 2-4 Type: Conceptual

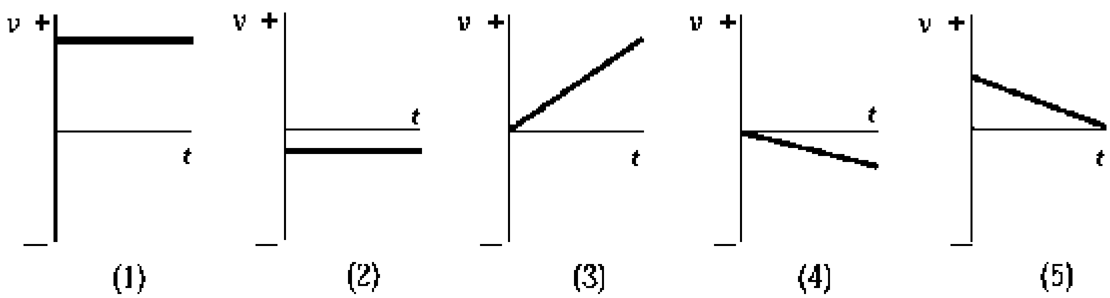
43. Which graph of *v* versus *t* best describes the motion of a particle with negative velocity and negative acceleration?



A. 1
B. 2
C. 3
D. 4
E. 5

Ans: D **Section: 2-4** **Type: Conceptual**

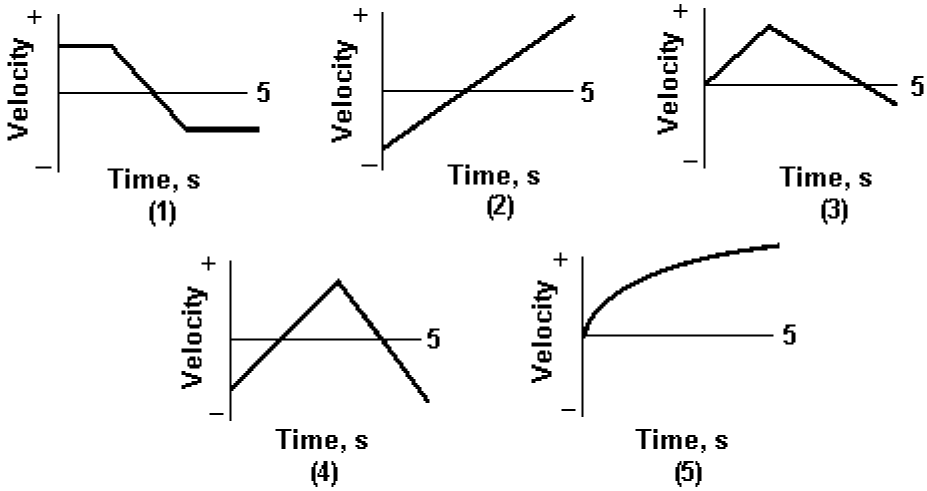
44. In which graph of *v* versus *t* is the magnitude of the particle's acceleration the greatest?



A. 1
B. 2
C. 3
D. 4
E. 5

Ans: C **Section: 2-4** **Type: Conceptual**

45. In which graph does the particle have no acceleration at *t* = 5 s?



A. 1

B. 2

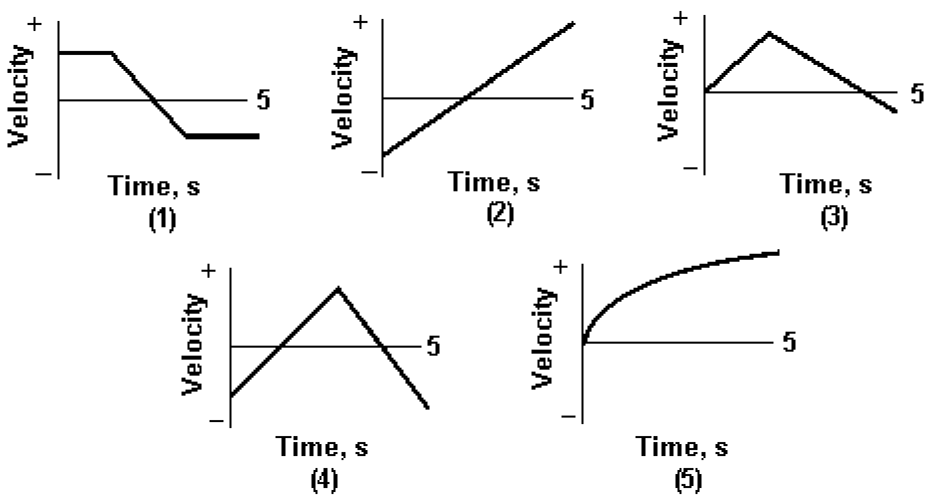
C. 3

D. 4

E. 5

Ans: A **Section: 2-4** **Type: Conceptual**

46. In which graph does the particle have a constant acceleration for the entire 5 s?



A. 1

B. 2

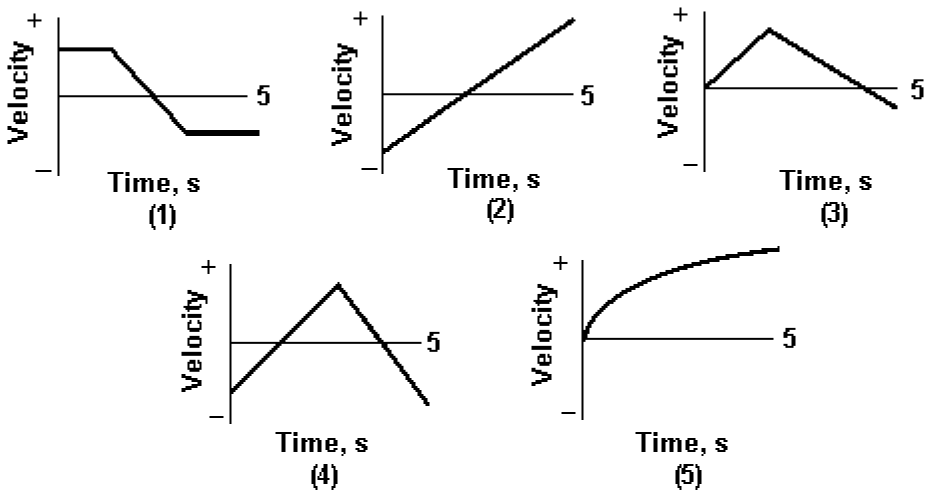
C. 3

D. 4

E. 5

Ans: B **Section: 2-4** **Type: Conceptual**

47. In which graph does the particle never have a constant acceleration?



A. 1
B. 2
C. 3
D. 4
E. 5
Ans: E Section: 2-4 Type: Conceptual

48. An object is at *x* = –3 m and has a velocity of 4 m/s. It is observed to be slowing down. Its acceleration is
A. positive.
B. negative.
C. zero.
D. negative until the object stops and then positive.
E. impossible to determine based on the information provided.
Ans: B Section: 2-4 Type: Conceptual

49. An object is at *x* = –3 m and has a velocity of – 4 m/s. It is observed to be slowing down. Its acceleration is
A. positive.
B. negative.
C. zero.
D. negative until the object stops and then positive.
E. impossible to determine based on the information provided.
Ans: A Section: 2-4 Type: Conceptual

50. A graph of the motion of an object is plotted with the velocity on the vertical axis and the time on the horizontal axis. The graph is a straight line. Which of these quantities CANNOT be determined from this graph?

A. the displacement from time $t = 0$

B. the initial velocity at $t = 0$

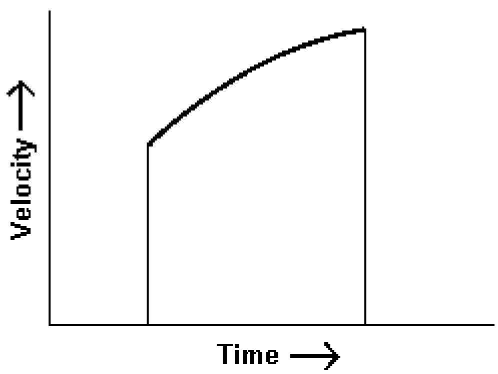
C. the acceleration of the object

D. the average velocity of the object

E. All four of the quantities can be determined from the graph.

Ans: E Section: 2-4 Type: Conceptual

51. The graph is a plot of velocity versus time for a moving object during a particular time interval.



Which of the following statements is correct?

A. The acceleration of the object is zero.

B. The acceleration of the object is constant.

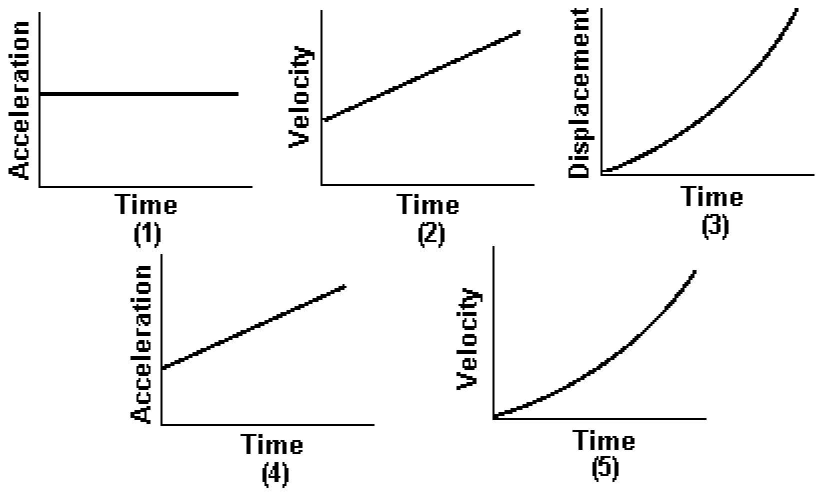
C. The acceleration of the object is positive and increasing in magnitude.

D. The acceleration of the object is negative and decreasing in magnitude.

E. The acceleration of the object is positive and decreasing in magnitude.

Ans: E Section: 2-4 Type: Conceptual

52. Two of the graphs shown are INCORRECT for a particle undergoing one-dimensional motion with constant acceleration.



They are

A. 1 and 2

B. 2 and 3

C. 3 and 4

D. 4 and 5

E. 1 and 5

Ans: D Section: 2-4 Type: Conceptual

Section 2-5: Constant acceleration means velocity changes at a steady rate

Section 2-6: Solving straight-line motion problems: constant acceleration

53. A car accelerates uniformly from rest to a speed of 20 m/s at the end of 1 min; it then accelerates uniformly to a speed of 40 m/s at the end of the next minute. During this 2-min period, the average speed of the car is

A. 7.5 m/s

B. 30 m/s

C. 15 m/s

D. 20 m/s

E. 40 m/s

Ans: D Section: 2-5 | 2-6 Type: Numerical

54. An object is moving in a straight line. At t = 0, its speed is 5.0 m/s. From t = 0 to t = 4.0 s, its acceleration is 2.5 m/s^2. From t = 4.0 s to t = 11.0 s, its speed is constant. The average speed over the entire time interval is

A. 9.5 m/s
B. 15 m/s
C. 13 m/s
D. 21 m/s
E. 8.2 m/s

Ans: C Section: 2-5 | 2-6 Type: Numerical

55. A particle that is moving along a straight line decelerates uniformly from 40 cm/s to 20 cm/s in 5.0 s and then has a constant acceleration of 20 cm/s^2 during the next 4.0 s. The average speed over the whole time interval is

A. 57 cm/s
B. 140 cm/s
C. 86 cm/s
D. 43 cm/s
E. 97 cm/s

Ans: D Section: 2-5 | 2-6 Type: Numerical

56. A particle accelerates uniformly from a speed of 30 cm/s to 40 cm/s in 5 s and thereafter moves at a constant speed of 40 cm/s for an additional 3 s. The average speed over this total time interval is

A. 35 cm/s
B. 27 cm/s
C. 0.45 cm/s
D. 37 cm/s
E. 73 cm/s

Ans: D Section: 2-5 | 2-6 Type: Numerical

57. For uniformly accelerated motion, which of the following quantities must be zero?

A. the initial velocity
B. the initial displacement
C. the rate of change of the acceleration
D. the rate of change of the velocity
E. the rate of change of the displacement

Ans: C Section: 2-5 | 2-6 Type: Conceptual

58. A particle decelerates uniformly from a speed of 30 cm/s to rest in a time interval of 5.0 s. It then has a uniform acceleration of 10 cm/s^2 for another 5.0 s. The particle moves in the same direction along a straight line. The average speed over the whole time interval is

A. 20 cm/s
B. 35 cm/s
C. 38 cm/s
D. 100 cm/s
E. 12 cm/s

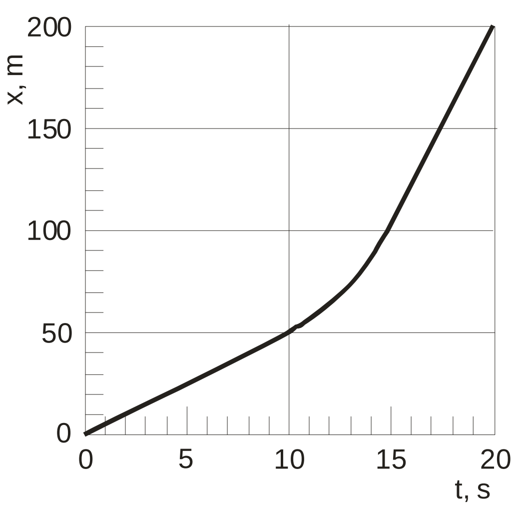
Ans: A Section: 2-5 | 2-6 Type: Numerical

59. A Triumph sports car starts at rest and accelerates uniformly to a speed of 27.0 m/s in 11.8 s. Calculate the distance the car travels during this time interval.

A. 160 m
B. 320 m
C. 1.90 km
D. 640 m
E. 350 m

Ans: A Section: 2-5 | 2-6 Type: Numerical

60. The distance traveled by a car in the x-direction is shown. When the car changes speed for t = 10 s to 15 s, it does so uniformly.

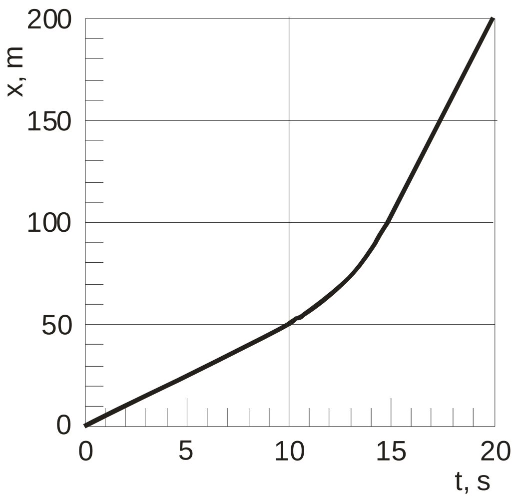


The acceleration of the car between 10 s and 15 s is

A. 1 m/s^2
B. 2 m/s^2
C. 3 m/s^2
D. 4 m/s^2
E. 5 m/s^2

Ans: C Section: 2-5 | 2-6 Type: Numerical

61. The distance traveled by a car in the x-direction is shown. When the car changes speed for t = 10 s to 15 s, it does so uniformly.



The acceleration of the car at 5 s is ____ acceleration at 20 s.

A. less than the

B. equal to the

C. greater than the

D. unable to tell

E. depends on what happens when it is accelerating between 10 and 15 s

Ans: B Section: 2-5 | 2-6 Type: Conceptual

62. On a graph that shows position on the vertical axis and time on the horizontal axis, a parabolic curve that opens upward represents

A. a constant positive acceleration

B. a constant negative acceleration.

C. no acceleration.

D. a positive followed by a negative acceleration.

E. a negative followed by a positive acceleration.

Ans: A Section: 2-5 | 2-6 Type: Conceptual

63. On a graph that shows position on the vertical axis and time on the horizontal axis, a parabolic curve that opens downward represents

A. a constant positive acceleration.

B. a constant negative acceleration.

C. no acceleration.

D. a positive followed by a negative acceleration.

E. a negative followed by a positive acceleration.

Ans: B Section: 2-5 | 2-6 Type: Conceptual

64. A vehicle is traveling in the +x direction to x = 100 m. It then reverses direction. At the instant when it changes direction, the acceleration of the vehicle is

A. positive.

B. negative.

C. zero.

D. positive then negative.

E. negative then positive.

Ans: B Section: 2-5 | 2-6 Type: Conceptual

65. A vehicle is traveling in the -x direction to x = 100 m. It then reverses direction. At the instant when it changes direction, the acceleration of the vehicle is

A. positive.

B. negative.

C. zero.

D. positive then negative.

E. negative then positive.

Ans: A Section: 2-5 | 2-6 Type: Conceptual

66. On a graph that shows velocity on the vertical axis and time on the horizontal axis, zero acceleration is represented by

A. a straight line with a positive slope.

B. a straight line with a negative slope.

C. a straight line with zero slope.

D. either a positive, negative, or zero slope.

E. None of these are correct.

Ans: D Section: 2-5 | 2-6 Type: Conceptual

67. On a graph that shows velocity on the vertical axis and time on the horizontal axis, constant acceleration is represented by

A. a straight line with a positive slope.

B. a straight line with a negative slope.

C. a straight line with zero slope.

D. either a positive, negative, or zero slope.

E. None of these are correct.

Ans: D Section: 2-5 | 2-6 Type: Conceptual

68. On a graph that shows velocity on the vertical axis and time on the horizontal axis, the area under the curve represents

A. Average acceleration.

B. Average velocity.

C. displacement.

D. average speed.

E. no useful physical quantity.

Ans: C Section: 2-5 | 2-6 Type: Conceptual

69. On a graph that shows position on the vertical axis and time on the horizontal axis, the area under the curve represents

A. average acceleration.

B. average velocity.

C. displacement.

D. average speed.

E. nothing of physical significance.

Ans: E Section: 2-5 | 2-6 Type: Conceptual

70. A car and a truck, starting from rest, have the same acceleration, but the truck accelerates for twice the length of time. Compared with the car, the truck will travel

A. twice as far.

B. three times as far

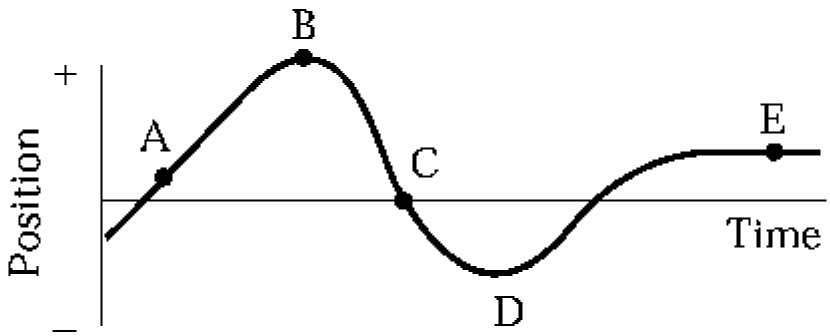
C. 1.4 times as far

D. four times as far

E. one-half as far

Ans: D Section: 2-5 | 2-6 Type: Conceptual

71. An object moves along the horizontal axis as shown on the diagram.



At which point or points is its acceleration zero?

A. A and E

B. B, D, and E

C. C only

D. E only

E. B and D

Ans: A **Section: 2-5 | 2-6** **Type: Conceptual**

72. A Lamborghini sports car can accelerate from zero to 60 mph in 4 seconds. It can decelerate from 60 mph to rest in 120 ft. What is the ratio of average acceleration over average deceleration? (1 mile = 5280 ft)

A. 1.74×10^{-5}

B. 1.47

C. 0.682

D. 0.0114

E. 0.688

Ans: C **Section: 2-5 | 2-6** **Type: Numerical**

73. If we assume that a spaceship could accelerate from rest at a constant rate of 9.81 m/s^2, then how long would it take to reach 1% of the speed of light? (Assume the speed of light = 3.0×10^8 m/s)

A. 1.8 days

B. 2.5 days

C. 3.1×10^4 s

D. 3.1×10^6 s

E. 7.1 days

Ans: B **Section: 2-5 | 2-6** **Type: Numerical**

74. If we assume that a spaceship could accelerate from rest up to 1% of the speed of light at a constant rate of 9.81 m/s^2, how many times the radius of our Solar System (i.e., the distance from the Sun to Pluto = 5.9×10^9 km) would the spaceship have traveled?

A. 78

B. 7.8×10^{-2}

C. 2.6×10^{-10}

D. 2.6×10^{-7}

E. 7.8×10^{-1}

Ans: B Section: 2-5 | 2-6 Type: Numerical

75. A common statistic in car tests is the standing (starting from rest) quarter-mile performance. A modern sports car can achieve a terminal speed (speed at the end of the quarter-mile) of 120 mph (193 km/h). How does the average acceleration compare to *g*? (0.25 mile = 402 m)

A. 0.36 *g*

B. 2.8 *g*

C. 0.067 *g*

D. 15.0 *g*

E. 0.73 *g*

Ans: A Section: 2-5 | 2-6 Type: Numerical

76. A racecar starts from rest and accelerates at a constant rate and reaches a speed of 160 km/h (100 mph) in 6.0 seconds. It continues at this speed for another 5 seconds. What is the car's average speed during the first 11 seconds?

A. 34.3 m/s

B. 29.3 m/s

C. 22.2 m/s

D. 32.3 m/s

E. 44.4 m/s

Ans: D Section: 2-5 | 2-6 Type: Numerical

77. A car is traveling at 120 km/h (75 mph). When applied the braking system can stop the car with a deceleration rate of 9.0 m/s^2. The typical reaction time for an alert driver is 0.5 s versus 2 s for a sleepy driver. Assuming a typical car length of 5 m, calculate the number of additional car lengths it takes the sleepy driver to stop compared to the alert driver.

A. 13

B. 3.0

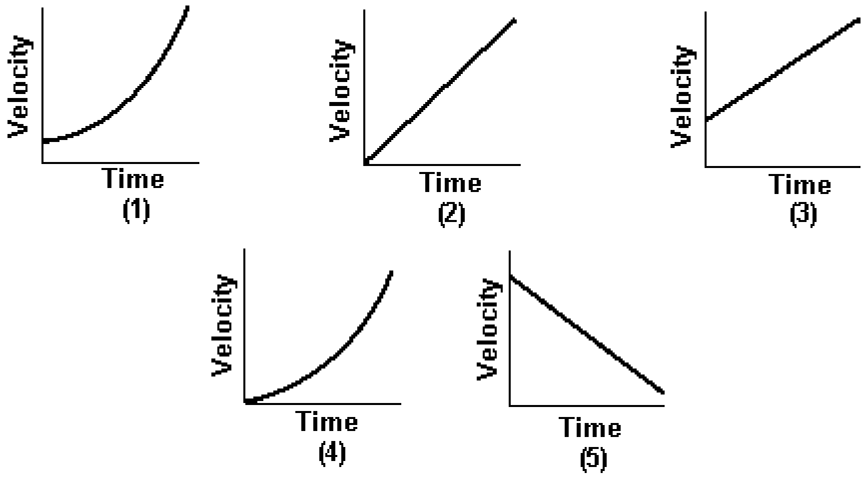
C. 10

D. 16

E. 26

Ans: C Section: 2-5 | 2-6 Type: Numerical

78. A car accelerates uniformly from a velocity of 10 km/h to 30 km/h in one minute.



Which graph best describes the motion of the car?

A. 1

B. 2

C. 3

D. 4

E. 5

Ans: C Section: 2-5 | 2-6 Type: Conceptual

2-7: Objects falling freely near Earth's surface have constant acceleration

2-8: Solving straight-line motion problems: free fall

79. An object is dropped from rest near the surface of Earth. If the time interval during which it falls is cut in half, the distance it falls will

A. double

B. decrease by one-half

C. increase by a factor of four

D. decrease by a factor of four

E. not change

Ans: D Section: 2-7 | 2-8 Type: Conceptual

80. An object is dropped from rest near the surface of Earth. If the time interval during which it falls is doubled, the distance it falls will

A. double

B. decrease by one-half

C. increase by a factor of four

D. decrease by a factor of four

E. not change

Ans: C Section: 2-7 | 2-8 Type: Conceptual

81. A projectile is fired vertically upward with a speed of 62 m/s. In the absence of air resistance, the maximum height the projectile attains is

A. 25 km

B. 98 m

C. 200 m

D. 19 km

E. 3 m

Ans: C Section: 2-7 | 2-8 Type: Numerical

82. A ball is dropped from the top of a building. In the absence of air resistance, the ball will hit the ground with a speed of 49 m/s. The height of the building is

A. 25 m

B. 5 m

C. 240 m

D. 120 m

E. 10 m

Ans: D Section: 2-7 | 2-8 Type: Numerical

83. An object falling near the surface of Earth has a constant acceleration of 9.8 m/s^2. This means that the

A. object falls 9.8 m during the first second of its motion.

B. object falls 9.8 m during each second of its motion.

C. speed of the object increases by 9.8 m/s during each second of its motion.

D. acceleration of the object increases by 9.8 m/s^2 during each second of its motion.

E. force of gravity on the object must be 9.8 SI units.

Ans: C Section: 2-7 | 2-8 Type: Conceptual

84. A ball is thrown upward from an 80-ft tower with an initial vertical speed of 40 ft/s. If air resistance is ignored, the ball's speed when it reaches the ground will be

A. 67 ft/s

B. 1.3×10^2 ft/s

C. 1.2×10^2 ft/s

D. 49 ft/s

E. 82 ft/s

Ans: E Section: 2-7 | 2-8 Type: Numerical

85. A balloon is ascending at a rate of 16 ft/s at a height of 32 ft above the ground when a package is dropped. The time taken, in the absence of air resistance, for the package to reach the ground is

A. 1.0 s

B. 1.5 s

C. 2.0 s

D. 2.5 s

E. 3.0 s

Ans: C Section: 2-7 | 2-8 Type: Numerical

86. An object is thrown upward with a velocity of 32 ft/s from a stationary balloon which is 48 ft above the ground. If air resistance is ignored, the total time until the object impacts the ground is

A. 1.0 s

B. 2.0s

C. 3.0 s

D. 4.0 s

E. 6.0 s

Ans: C Section: 2-7 | 2-8 Type: Numerical

87. A particle initially at rest undergoes rectilinear (i.e., straight line) motion with an acceleration that is constant in magnitude and direction. The velocity of the particle

A. is constant in magnitude and direction.

B. is constant in direction only.

C. is constant in magnitude only.

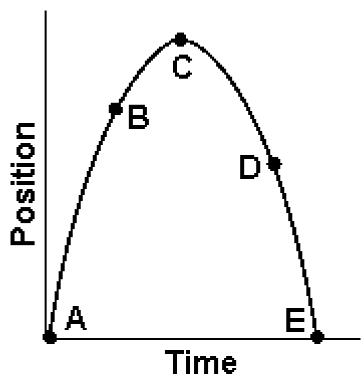
D. can change in magnitude and direction.

E. is described by none of these.

Ans: B Section: 2-7 | 2-8 Type: Conceptual

88. Only one of the following statements is correct. The correct statement is:
A. Average velocity is not a vector quantity.
B. The average velocity can always be expressed as one-half the sum of the initial and final velocities.
C. An accelerating body always changes its direction of motion.
D. The instantaneous velocity is equal to the time rate of change of the displacement.
E. A body undergoing constant acceleration changes its velocity by larger increments in succeeding equal time intervals.
Ans: D Section: 2-7 | 2-8 Type: Conceptual

89. A ball has been thrown vertically upward. The graph shows the ball's position as a function of time.



Which one of the following statements best describes the motion of the ball?
A. The velocity of the ball is the same at points A, B, C, D, and E.
B. The acceleration of the ball is 9.8 m/s^2 at points A, B, D, and E and zero at point C.
C. The acceleration of the ball is –9.8 m/s^2 at points A, B, D, and E and zero at point C.
D. The ball is the same distance above the ground at points B and D.
E. The velocity of the ball changes continuously during its flight.
Ans: E Section: 2-7 | 2-8 Type: Conceptual

90. A hammer and feather are dropped from the same height above the lunar surface. Which object hits the ground first?
A. the hammer
B. neither because they both float in space
C. the feather
D. both at the same time
E. none of the above
Ans: D Section: 2-7 | 2-8 Type: Conceptual

Chapter 2: Linear Motion

91. A baseball is thrown vertically up to a height of 30 m on Earth. If the same ball is thrown up on the moon with the same initial speed how much further will it travel up? (Assume $g_{moon} = g_{earth}/6$)

A. 5.0 m

B. 25 m

C. 12 m

D. 180 m

E. 150 m

Ans: E Section: 2-7 | 2-8 Type: Conceptual

92. Two baseballs are thrown vertically up from the ground at the same speed, one on Earth, and one on Mars. The baseball on Earth reaches a maximum height of 25 m. Which ball hits the ground first and by what time difference? ($g_{Mars} = 0.38\, g_{Earth}$)

A. Mars by 7.4 s

B. Earth by 7.4 s

C. Earth by 3.7 s

D. Mars by 3.7 s

E. Earth by 2.7 s

Ans: B Section: 2-7 | 2-8 Type: Conceptual

93. A sandbag is released from a rising air balloon and hits the ground 7 seconds later. From what height was the sandbag dropped from if at the moment of release the balloon was traveling upward at 3 m/s.

A. 219 m

B. 240 m

C. 459 m

D. 261 m

E. 55 m

Ans: A Section: 2-7 | 2-8 Type: Conceptual