1. Describe in words the motion plotted in the figure.

The object starts with a constant velocity in the positive direction. At about \( t = 17 \) s, when the object is at 5.35 meter position, it begins to gain speed—it has a positive acceleration. At about \( t = 27 \) s, when the object is about the 12 m position, it begins to slow down—it has a negative acceleration. The object instantaneously stops at about \( t = 37 \) s, reaching its maximum distance from the origin of 20 m. The object then reverses direction, gaining speed while moving backwards. At about \( t = 47 \) s, when the object

2. A particle moves along the x-axis with a displacement versus time as shown in the figure. Sketch roughly curves of velocity versus time and acceleration versus time for this motion.

Answers

See graphs on answer page.

3. Describe in words the motion of the object graphed in the figure.

4. The position of a rabbit along a straight tunnel as a function of time is plotted in the figure. What is its instantaneous velocity?
   (a) What is its instantaneous velocity at \( t = 10.0 \) s?
   (b) What is its instantaneous velocity at \( t = 30.0 \) s?
   (c) What is its average velocity between \( t = 0 \) and \( t = 5.0 \) s?
   (d) What is its average velocity between \( t = 25.0 \) s and \( t = 30.0 \) s?
   (e) What is its average velocity between \( t = 40.0 \) s and \( t = 50.0 \) s?

Answers

(a) .284 m/s
(b) 1 m/s +/- .5 m/s
(c) .294 m/s
(d) 1.4 m/s
(e) -.8 m/s
Graphing Motion (a)

Use the figure to answer the following questions:
(a) During what time periods, if any, is the object's velocity constant?
(b) At what time is its velocity the greatest?
(c) At what time, if any, is the velocity zero?
(d) Does the object run in one direction or in both along its tunnel during the time shown?

Answers
(a) 0-15 sec
(b) 25-30 sec
(c) 3 sec
(d) both directions

A high-performance automobile can accelerate approximately as shown in the velocity-time graph shown. (The jumps in the curve represent shifting of the gears.)
(a) Estimate the average acceleration of the car in second gear and in fourth gear.
(b) Estimate how far the car traveled while in fourth gear.

Answers
(a) 0.13 m;
(b) 0.50 m

In a forward punch in karate, the fist begins at rest at the waist and is brought rapidly forward until the arm is fully extended. The speed \( v(t) \) of the fist is given in the figure for someone skilled in karate.
(a) How far has the fist moved at time \( t = 50 \) ms?
(b) How far has the fist moved when the speed of the fist is maximum?

Answers
(a) 0.13 m;
(b) 0.50 m

A graph of \( x \) versus \( t \) for a particle in straight-line motion is shown in the figure.
(a) What is the average velocity of the particle between \( t = 0.50 \) s and \( t = 4.5 \) s?
(b) What is the instantaneous velocity of the particle at \( t = 4.5 \) s?
(c) What is the average acceleration of the particle between \( t = 0.50 \) s and \( t = 4.5 \) s?
(d) What is the instantaneous acceleration of the particle at \( t = 4.5 \) s?

Answers
(a) 2.5 m/s;
(b) 8.0 m/s;
(c) 1.0 m/s²;
(d) 0
A graph of acceleration \( a \) versus \( t \) time for a particle as it moves along an x axis is shown in the figure. At \( t = 0 \) the coordinate of the particle is 4.0 m and the velocity \( v \) is 2.0 m/s. What is the velocity of the particle at \( t = 2.0 \) s?

The figure gives the acceleration \( a \) versus time \( t \) for a particle moving along an x axis. At \( t = -2.0 \) s, the particle's velocity is 7.0 m/s. What is its velocity at \( t = 6.0 \) s?

A particle starts from the origin at \( t = 0 \) and moves along the positive x axis. A graph of the velocity of the particle as a function of the time is shown in the figure.

(a) What is the displacement of the particle at \( t = 5.0 \) s?
(b) What is the velocity of the particle at \( t = 5.0 \) s?
(c) What is the acceleration of the particle at \( t = 5.0 \) s?
(d) What is the average velocity of the particle between \( t = 1.0 \) s and \( t = 5.0 \) s?
(e) What is the average acceleration of the particle between \( t = 1.0 \) s and \( t = 5.0 \) s?

Sketch the velocity-time graphs for the following motions.
(a) a city bus moving with a constant velocity
(b) a wheelbarrow speeding up at a uniform rate moving in the positive direction
(c) a tiger speeding up at a uniform rate moving in the negative direction
(d) an iguana slowing down at a uniform rate moving in the positive direction
(e) a camel slowing down at a uniform rate moving in the negative direction

Sketch a velocity-time graph for a shuttle train which runs between cities A and C with an intermediate stop at city B. All cities are on the same line.

Answers

(a) slope is zero
(b) slope is positive
(c) slope is negative
(d) slope is negative
(e) slope is positive

Answers
The graph shows the position of a radio controlled plane.
(a) Construct a table showing the average velocity of the plane during each 10 second interval over the entire 100 seconds.
(b) Plot a velocity-time graph using the table you constructed in part a.

![Velocity-Time Graph](image)

**Answers**

(a) 10 m/s
(b) 0 m/s
(c) -20 m/s
(d) -10 m/s
(e) -20 m/s

You drive on Interstate 10 from San Antonio to Houston, half the time at 55 km/h and the other half at 90 km/h. On the way back you travel half the distance at 55 km/h and the other half at 90 km/h.
(a) What is your average speed from San Antonio to Houston?
(b) What is your average speed from Houston back to San Antonio?
(c) What is your average speed for the entire trip?
(d) What is your average velocity for the entire trip?
(e) Sketch x versus t for (a), assuming the motion is all in the positive x direction. Indicate how the average velocity can be found on the sketch.

**Answer**

(a) 73 km/h;
(b) 68 km/h;
(c) 70 km/h;
(d) 0

You are to drive to an interview in another town, at a distance of 300 km on an expressway. The interview is at 11:15 A.M. You plan to drive at 100 km/h, so you leave at 8:00 A.M. to allow some extra time. You drive at that speed for the first 100 km, but then construction work forces you to slow to 40 km/h for 40 km. What would be the least speed needed for the rest of the trip to arrive in time for the interview?

**Answer**

128 km/h

In one test to study neck injury in rear-end collisions, a volunteer was strapped to a seat that was then moved abruptly to simulate a collision by a rear car moving at 10.5 km/h. The figure gives the accelerations of the volunteer's torso and head during the collision, which began at time t = 0. The torso acceleration was delayed by 40 ms because during that time interval the seat back had to compress against the volunteer. The head acceleration was delayed by an additional 70 ms.
(a) At maximum head acceleration, what is the speed of the head and
(b) At maximum head acceleration, what is the speed of the torso?

**Answers**

(a) 2.25 m/s;
(b) 3.90 m/s
Comparing Motions of Two or More Bodies (d)

When a soccer ball is kicked toward a player and the player deflects the ball by "heading" it, the acceleration of the head during the collision can be significant. The figure gives the measured acceleration $a(t)$ of a soccer player's head for a bare head and a helmeted head, starting from rest.

(a) What is the velocity of the bare head at $t = 7.0$ ms
(b) What is the velocity of the helmeted head at $t = 7.0$ m/s
(c) What is the difference in the speed acquired by the bare head and the speed acquired by the helmeted head at $t = 7.0$ ms?

**Answers**

(a) 0
(b) 0.56 m/s

The figure shows the velocity of an object is plotted against time.

(a) What is the acceleration at $t = 1.4$ seconds?
(b) What is the acceleration at $t = 2.4$ seconds?
(c) What is the acceleration at $t = 3.4$ seconds?

**Answers**

(a) $-5.71 \text{ m/s}^2$
(b) $-1.82 \text{ m/s}^2$
(c) 0 m/s²

An object moves at the speed shown in the graph found in the figure. Calculate the object's acceleration at $t = 4$ seconds.

**Answers**

-10 m/s²
Chapter 3: Acceleration

Assignment

Instantaneous Acceleration (e)

22  An object moves at the speed shown in the graph found in the figure.
    (a) Use the graph to determine the instantaneous acceleration at 2 second.
    (b) Use the graph to determine the instantaneous acceleration at 4 seconds.
    (c) Use the graph to determine the instantaneous acceleration at 7 seconds.
    (d) Use the graph to determine the instantaneous acceleration at 9 seconds.

Answers

(a) +6 m/s$^2$
(b) +1.5 m/s$^2$
(c) -2.75 m/s$^2$
(d) -8.33 m/s$^2$

23  An object moves at the speed shown in the graph found in the figure.
    (a) Use the graph to determine the instantaneous acceleration at 2 second.
    (b) Use the graph to determine the instantaneous acceleration at 4 seconds.
    (c) Use the graph to determine the instantaneous acceleration at 7 seconds.
    (d) Use the graph to determine the instantaneous acceleration at 9 seconds.

Answers

(a) 3.75 m/s$^2$
(b) 5 m/s$^2$
(c) 4.27 m/s$^2$
(d) 2.67 m/s$^2$

24  The figure shows the velocity of an object is plotted against time. What is the average acceleration of the object during the interval from 2 seconds to 6 seconds.

Answers

4.5 m/s$^2$
For the graph found in the figure, determine the acceleration between 2 and 5 seconds.

**Answers**

3.67 m/s²

As a shuttle bus comes to a normal stop, it slows from 9.00 m/s to 0.00 m/s in 5.00 s. Find the average acceleration of the bus.

**Answers**

-1.80 m/s²

When the shuttle bus comes to a sudden stop to avoid hitting a dog, it slows from 9.00 m/s to 0.00 m/s in 1.50 s. Find the average acceleration of the bus.

**Answers**

-6.00 m/s²

A car traveling initially at 7.0 m/s accelerates to a velocity of 12.0 m/s in 2.0 s. What is the average acceleration of the car?

**Answers**

+2.5 m/s²

Turner's treadmill starts with a velocity of -1.2 m/s and speeds up at regular intervals during a half-hour workout. After 25 min, the treadmill has a velocity of -6.5 m/s. What is the average acceleration of the treadmill during this period?

**Answers**

-3.53 x 10⁻³ m/s²
As a runaway scientific balloon ascends at 19.6 m/s, one of its instrument packages breaks free of a harness and free-falls. The figure gives the vertical velocity of the package versus time, from before it breaks free to when it reaches the ground.

(a) Draw a picture of what is happening to the package as it rises with the balloon
(b) At what time does the package reach the maximum height?
(c) How far does the package travel at 19.6 m/s?
(d) What is the acceleration of the package?
(e) What is the velocity of the package at 8 second?
(f) What is the path length of the package?
(g) What is the displacement of the package?
(h) What maximum height above the break free point does it rise?
(i) How high is the break-free point above the ground?

The figure shows the motion of a moving object.
(a) Find the acceleration of the object during the first 5 seconds of travel.
(b) Find the acceleration of the object during the second 5 seconds of travel.
(c) Find the acceleration of the object between the tenth and the fifteenth second of travel.
(d) Find the acceleration of the object between the twentieth and twenty-fifth second of travel.

(a) 6.0 m/s²
(b) 0 m/s²
(c) -2 m/s²
(d) -4 m/s²
Slope of Velocity-Time Graphs (g)

The figure shows a velocity-time graph of a toy train.
(a) During which time interval or intervals is the train’s speed constant?
(b) During which interval or intervals is the train’s acceleration positive?
(c) During which interval or intervals is the train’s acceleration less than zero?
(d) During which time interval is the train’s acceleration most negative?

Answers
(a) 5 to 15
   20 to 25
(b) 0 to 5 s
(c) 15 to 20 s
   25 to 40 s
(d) 15 to 20 s

With an average acceleration of -0.50 m/s², how long will it take a cyclist to bring a bicycle with an initial velocity of +13.5 m/s to a complete stop?

Answers
27 s

To qualify for the finals in a racing event, a race car must achieve an average speed of 250 km/h on a track with a total length of 1600 m.
(a) If a particular car covers the first half of the track at an average speed of 230 km/h, what minimum average speed must it have in the second half of the event to qualify?
(b) Show how you would solve this problem using a graph.

Answer
280 km/h

A tortoise can run with a speed of 10.0 cm/s, and a hare can run exactly 20 times as fast. In a race, they both start at the same time, but the hare stops to rest for 2.00 min. The tortoise wins by 20.0 cm.
(a) Draw a position time graph for both the tortoise and the hare. Put both critters on the same axis.
(b) How long does the race take?
(c) What is the length of the race?
(d) Solve the problem using algebra.

Answer
(a) 126 s
(b) 1260 cm

Runner A is initially 6.0 km west of a flagpole and is running with a constant velocity of 9.0 km/h due east. Runner B is initially 5.0 km east of the flagpole and is running with a constant velocity of 8.0 km/h due west.
(a) Draw a position time graph for the runners
(b) How far are the runners from the flagpole when their paths cross?
(c) Solve the problem by algebra.

Answer
0.2 km
west of the flagpole

In the figure shown the velocity of an object is plotted against time. What is the average acceleration between 1 and 3 seconds?

Answers
-3.75 m/s²
Instantaneous Acceleration (i)

For the graph found in the figure, determine the average acceleration between 1.5 and 4.5 seconds.

Answers

An object moves at the speed shown in the graph found in the figure. Find the average acceleration between 1 and 9 seconds.

Answers

In 1994, a human-powered submarine was designed in Boca Raton, Florida. It achieved a maximum speed of 3.06 m/s. Suppose this submarine starts from rest and accelerates at 0.800 m/s$^2$ until it reaches maximum speed. The submarine then travels at constant speed for another 5.00 s. Calculate the total distance traveled by the submarine.

Answers

Nathan accelerates his skateboard along a straight path from rest to 12.5 m/s in 2.5 s.
(a) What is Nathan's acceleration?
(b) What is Nathan's displacement during this time interval?
(c) What is Nathan's average velocity during this time interval?

Answers

Use graphing to solve the following problem. At the moment car A is starting from rest and accelerating at 4.0 m/s$^2$, car B passes it moving at a constant speed of 28 m/s. How long will it take car A to catch car B?

Answers

14 seconds

The graph show the motion of an object during a 25 second time interval.
(a) What displacement did the object make between t = 0 and t = 5 seconds.
(b) What displacement did the object make between t = 5 seconds and t = 10 seconds.
(c) What displacement did the object make between t = 10 and t = 15 seconds.
(d) What displacement did the object make between t = 0 and t = 25 seconds.

Answers

21.2 m

(a) 75 m
(b) 150 m
(c) 125 m
(d) 500 m
The velocity of an automobile changes over an 8 second time period as shown in the table.
(a) Plot the velocity-time graph of the motion.
(b) Determine the distance the car travels during the first 2 seconds.
(c) What distance does the car travel during the first 4 seconds?
(d) What distance does the car travel during the entire 8 seconds?
(e) Find the slope of the line between t = 0 and t = 4 seconds. What does this slope represent?
(f) Find the slope of the line between t = 5 seconds and t = 7 seconds. What does this slope represent?

Answers

(a) linear
(b) 9 m
(c) 34 m
(d) 110 m
(e) 4 m/s²
(f) slope = 1 m/s²
constant velocity

An object is in free fall for five seconds.
(a) Compute the total distance the object has fallen at the end of each second by using the proper kinematic formulas.
(b) Use the distances calculated in part a to plot a position-time graph.
(c) Find the slope of the curve at the end of 2 seconds
(d) Find the slope of the curve at the end of 4 seconds.

Answers

(a) 49 m
(b) parabola
(c) 19.6 m/s
(d) 39 m/s

Use graphing to solve the following problem. Pressing the brake of a car caused it to slow down from 30.0 m/s to 20.0 m/s in 8.00 seconds. How far did the car travel during these 8.0 seconds?

Answers

200 m

Use the velocity-time the graph shown in the figure to determine how far an object moves during the first 4.5 seconds. Solve the problem both by counting rectangles and by using the formula for the area of a triangle.

Answers

Determine the distance traveled by the runner whose velocity-time graph is given in the figure. Consider the full 8 second interval.

Answers

90 m
Area Under Curves of Velocity-Time Graphs (j)

51. How far will a runner travel whose velocity time graph is shown in the figure?

![Velocity-Time Graph](image)

**Answers**

35 m

52. The velocity is plotted against time for an object in the figure. How far does the object move in 6 seconds?

![Velocity-Time Graph](image)

**Answers**

72 m

53. The speed of an airplane increased during a 5.0 s interval according to the data in the table.

(a) Make a speed-time graph of the motion
(b) Find the distance traveled by the airplane during the first 3.0 seconds
(c) Find the acceleration of the plane at the end of 2.0 seconds.
(d) How does the acceleration obtained in part c compare with the acceleration at the end of 3.0 seconds?

<table>
<thead>
<tr>
<th>Time (s)</th>
<th>Velocity (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>30.0</td>
</tr>
<tr>
<td>1.0</td>
<td>40.0</td>
</tr>
<tr>
<td>2.0</td>
<td>50.0</td>
</tr>
<tr>
<td>3.0</td>
<td>60.0</td>
</tr>
<tr>
<td>4.0</td>
<td>70.0</td>
</tr>
<tr>
<td>5.0</td>
<td>80.0</td>
</tr>
</tbody>
</table>

**Answers**

(a) linear
(b) 135 m
(c) 10 m/s
(d) 10 m/s

54. A race car traveling at +44 m/s is uniformly accelerated to a velocity of + 22 m/s over an 11-s interval. What is its displacement during this time?

**Answers**

3.6 x 10^2 m

55. A rocket traveling at +88 m/s is accelerated uniformly to +132 m/s over a 15 s interval. What is its displacement during this time?

**Answers**

1650 m

56. A car accelerates at a constant rate from 15 m/s to 25 m/s while it travels 125 m. How long does this motion take?

**Answers**

6.3 s
Area Under Curves of Velocity-Time Graphs (j)

The velocity of an automobile changes over an 8.0-s time period as shown in the table.

(a) Plot the velocity-time graph of the motion.
(b) Determine the displacement of the car during the first 2.0 s.
(c) What displacement does the car have during the first 4.0 s?
(d) What displacement does the car have during the entire 8.0 s?
(e) Find the slope of the line between t = 0 s and t = 4.0 s. What does this slope represent?
(f) Find the slope of the line between t = 5.0 s and t = 7.0 s. What does this slope indicate?

Answers

(a) 8.0 m
(b) 32 m
(c) 110 m
(d) 4 m/s²
(e) 0
(f) constant velocity

Determine the displacement of a plane that is uniformly accelerated from 66 m/s to 88 m/s in 12 s.

Answers

9.2 x 10² m/s

How far does a plane fly in 15 s while its velocity is changing from 145 m/s to 75 m/s at a uniform rate of acceleration?

Answers

1650 m

The velocity of an object over a 30 second time interval is shown in the figure.

(a) Find the distance the moving object travels between t = 0 s and t = 5 s.
(b) Find the distance the moving object travels between t = 5 s and t = 10 s.
(c) Find the distance the moving object travels between t = 10 s and t = 15 s.
(d) Find the distance the moving object travels between t = 0 s and t = 25 s.

Answers

(a) 75 m
(b) 150 m
(c) 125 m
(d) 500 m

A plane flies in a straight line at a constant velocity of +75 m/s. assume that it is at the reference point when the clock reads t = 0.

(a) Construct a table showing the position or displacement of the plane at the end of each second for a 10-s period.
(b) Use the data from the table to plot a position-time graph.
(c) Show that the slope of the line is the velocity of the plane.

Use at least two different sets of points along the line.
(d) Plot a velocity-time graph of the plane's motion for the first 6 s of the 10-s interval.
(e) From the velocity-time graph, find the displacement of the plane between the second and the sixth period.

Answers

Clock  Position (s) (m) 0 0 1 75 2 150 3 225 4 300 5 375 6 450 7 525 8 600 9 675 10 750
(b) 75 m/s
(d) 300 m
62. Mary jogs for 15 min. at 240 m/min., walks the next 10 min. at 90 m/min., rests for 5 min., and jogs back to where she started at -180 m/min.
   (a) Plot a velocity-time graph for Mary's exercise run.
   (b) Find the area under the curve for the first 15 min. What does this represent?
   (c) What is the total distance traveled by Mary?
   (d) What is Mary's displacement from start to finish?

   **Answers**
   
   (a)
   (b) 3600 m
   (c) 9000 m
   (d) 0 m

63. A plane flies in a straight line with a constant velocity of \( +5.0 \times 10^1 \) m/s.
   (a) Construct a table showing the position or total displacement of the plane at the end of each second for a ten second period.
   (b) Use the data from the table to plot a position-time graph.
   (c) Show that the slope of the line on the position-time graph gives the velocity of the plane. Use at least two different sets of points along the graph.
   (d) Plot a velocity-time graph of the plane's motion for the first 6 seconds of the ten second interval.
   (e) Using the velocity-time graph find the displacement of the plane between the seventh and tenth seconds.

   **Answers**
   
   (a)
   (b) straight line
   (c) about 50 m/s
   (d) horizontal straight line
   (e) 150 m

64. A car moves along a straight road at a constant velocity of 40 m/s south:
   (a) Plot its position-time graph for a ten-second interval.
   (b) Find the slope of the curve using two different points along the line.
   (c) Plot a velocity-time graph for the car. What does the area under the curve of the graph represent?
   (d) Calculate the area under the curve of the graph between the fifth and sixth seconds. What does this area represent?

   **Answers**
   
   (a) a straight line
   (b) \( \Delta y/\Delta x = 40 \) m/s
   (c) Horizontal straight line. The area under the curve is \( v \times t \) and thus represents the total distance.
   (d) 40 m, the distance traveled during one second.

65. Look at the figure.
   (a) What kind of motion does this graph represent?
   (b) What does the area under the curve of the graph represent?

   **Answers**
   
   (a) The graph represents motion with a positive increasing velocity.
   (b) The area under the curve represents the change in displacement.

66. An object in free fall drops at a rate of -9.8 m/s\(^2\)
   (a) Make a table of the velocities of an object at the end of each second for the first 5 seconds of free-fall from rest.
   (b) Use the data in your table to plot a velocity-time graph.
   (c) What does the total area under the curve represent?
   (d) Calculate that value.

   **Answers**
   
   (a)
   (b) graph diagonal line
   (c) displacement
   (d) 122.5 meters
Chapter 3: Acceleration

Area Under Curves of Velocity-Time Graphs (j)

A car moves along a straight road at a constant velocity of +75 km/h for 4.0 h, stops for 2.0 h, and then drives in the reverse direction at the original speed for 3.0 h.

(a) Plot a velocity-time graph for the car.
(b) Find the area under the curve for the first 4 h. What does this represent?
(c) Explain how to use the graph to find the distance the car is from its starting point at the end of 9.0 h.
(d) Draw the position-time graph of the car's movement.

Answers

(a) sketch graph
(b) Area is 300 km
(c) 75 km

A person drives a car at a constant +25 m/s for 15.0 min. The car runs out of gas so the driver carrying an empty gas can walks at +1.5 m/s for 25 minutes to the nearest gas station. After 10 minutes needed to fill the can, the driver walks back to the car at a slower rate of -1.2 m/s. The car is then driven home at -20 m/s.

(a) Draw a velocity time graph for the driver (use seconds as your time unit)
(b) How long does it take the drive to walk back to the car.
(c) At what time does he arrive back at the car (minutes)
(d) How long does it take the driver to drive back home from where he filled the car.
(e) At what time does he arrive home.
(f) Draw a position-time graph from the areas under the curves of the velocity-time graph

Answers

Hard

(a)
(b) 31.25 min
    or 1,875 seconds
(c) 81.25 minutes
(d) 18.75 min or 1,125 s
(e) 100 min
(f)

The velocity-versus-time graph for a shuttle bus moving along a straight path is shown in the figure. Is the shuttle bus always moving in the same direction? Explain and refer to the time intervals shown on the graph.

Answers

No; the bus is moving in the positive direction for 30 s to 210 s (when velocity is positive) and in the negative direction from 275 s to 600 s (when the velocity is negative).
Chapter 3: Acceleration

Assignment

Area Under Curves of Velocity-Time Graphs (j)

70 The figure shows the position-time graph (cm) and the velocity-time graph (m/s) of a karate expert using a fist to break wooden boards during a 14 ms interval.
(a) Use the velocity-time graph to describe the motion of the expert's fist during the first 10 ms.
(b) Estimate the slope of the velocity-time graph to determine the acceleration of the fist when it suddenly stops.
(c) Express the acceleration as a multiple of the gravitational acceleration, $g = 9.80 \text{ m/s}^2$.
(d) Estimate the area under the velocity-time curve to find the displacement of the fist in the first 6 ms. Compare with the position-time graph.

Answers

(a) The fist moves downward at about -13 m/s for about 5 m/s, then comes to a halt
(b) $5.2 \times 10^3 \text{ m/s}^2$
(c) acceleration is about 530 g's
(d) -8 cm; this agrees with the position-time graph, which shows a net displacement of -8 cm.

71 As two trains move along a track, their conductors suddenly notice that they are headed toward each other. The figure gives their velocities $v$ as functions of time $t$ as the conductors slow the trains. The slowing processes begin when the trains are 200 m apart. What is their separation when both trains have stopped?

Answers

72 How far does the runner whose velocity-time graph is shown in the figure travel in 16 s?

Answers

100 m

73 The figure shows a motion map and a position time graph of the car's motion. Draw its velocity time graph.

Answers

74 A man walks to the corner to mail a letter. Sketch two graphs showing his velocity and positions plotted against time.

Answers

40 m
John rode his bicycle as fast as he could from his house through town and up Hemlock hill to Tom's house which is at the crest of the hill. He then rode back as fast as he could along the same route. Sketch a position-time graph of his motion. From this graph sketch a velocity-time graph.

Answers

A velocity-time graph of a toy train is shown in the figure. Describe, in words, the velocity of the toy train between 0 and 40 seconds.

Answers

Starting from rest, it accelerates from rest to 10 m/s in the first 5 seconds. It remains at this speed for 10 s, before slowing to 4 m/s over the next 5 seconds. It eventually decelerates and comes to rest in the last 15 seconds.

The position time graph of a moving object is shown. (a) Draw a velocity-time graph to accompany the position time graph shown above. (b) Draw an acceleration-time graph to accompany the position time graph shown above.

Answers

The figure shows a motion map and a position time graph of the car’s motion. Draw its velocity time graph

Answers

Use the intervals marked on the graph in the figure to describe the motion of the object.

Answers

The position time graph of a moving object is shown. (a) Draw a velocity-time graph to accompany the position time graph shown above. (b) Draw an acceleration-time graph to accompany the position time graph shown above.

Answers
Assignment

Chapter 3: Acceleration

Transposing Position-Time, Velocity-Time and Acceleration-Time Graphs (k)

81 Draw a position-time and an acceleration time graph for the motion of the particle shown on the velocity-time graph in the figure.

Answers

See answer book for graph

82 A car driving along a highway at a constant speed of 55 mph slows down to 25 mph as it enters a small village. In the center of town it is stopped by a traffic light. When the light changes he continues through the town. At the town boundary it speeds up to 65 mph and continues on his way. Sketch graphs, one above the other of the car's position, velocity, and acceleration, plotted against time.

Answers

83 As a runaway scientific balloon ascends at 19.6 m/s, one of its instrument packages breaks free of a harness and free-falls. The figure gives the vertical velocity of the package versus time, from before it breaks free to when it reaches the ground.

(a) Draw a picture of the package as it is released and fall
(b) What is the acceleration of the package?
(c) What is the velocity at 4 s, 5s, 6s, 7s and 8s?
(d) What is displacement of the package as it rises and before it is released.
(e) What maximum height above the breakfree point does it rise?
(f) How far does the package fall from its high point to the ground?
(g) How high is the break-free point above the ground?

Answers
good summary problem.

(a) see picture
(b) -9.8 m/s²
(c) 0 m/s, 9.8 m/s
19.6 m/s, 29.4 m/s, 39.2 m/s
(d) 39.2 m
(e) 19.6 m
(f) 78.4 m
g) 58.8 m