PHYSICS
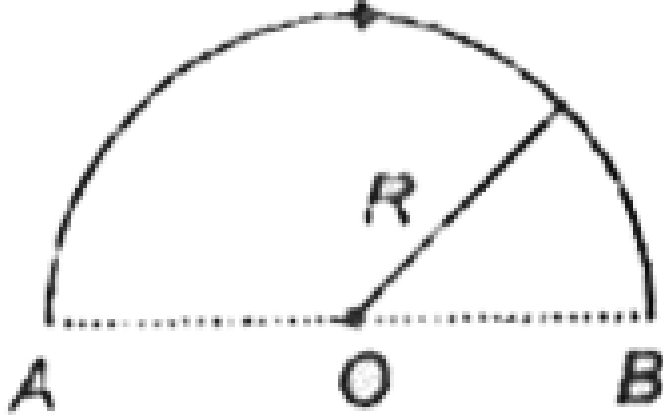
AAKASH INSTITUTE ENGLISH

MOTION IN STRAIGHT LINE

Example

1. What is the state of a person sitting in a moving bus w.r.t. a person standing at the bus stand and why?

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2. A person walks along a semicircular path from A to B as shown in the figure given below.

Calculate the distance and displacement traversed by the person.

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3. If distance coverd by a particle is zero , what can be its displacement ?

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4. Displacement of a person moving from A to B along a semicircular path

of radius R is 100 m. What is the distance travelled by him ?

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5. Draw the position-time graph of a stationary object.

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6. Draw the x-t graph of an object in uniform motion.

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7. An object was at x = 50 m at t = 0, then it starts moving uniformly towards origin at time t = 5 s. It is at origin. Draw the position versus time (x-t) graph for the object under this situation.

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8. Ram covers a distance of 100 km with variable speed. During the first half of his journey his speed was 20 km/h and during the rest of his journey his speed was 40 km/h. Calculate the average speed of Ram during the whole course of his motion.

9. What is the significance of average velocity or average speed?

10. Distinguish between average speed and average velocity.

11. What is the difference between average velocity and instantaneous velocity?

12. The displacement x of an object is given as a function of time

$$x = 2t + 3t^2$$

Calculate the instantaneous velocity of the object at t = 2 s

13. Draw the position-time graph of an object moving with positive

accceleration.

14. The velocity of an object changes from 50 m/s to 60 m/s in 20

seconds. What is the average acceleration of the object over that

interval?

15. Draw the velocity-time graph of an object whose speed is increasing at

uniform rate but moving with negative acceleration.

16. The position of a particle along the x-axis is given by the equation, $x = t^3 - 6t^2 + 9t$, where t is measured in seconds and x in meters.

(a) Find the velocity at time t

(b) What is the velocity at t = 2 s, at = t = 4 s?

(c) What is the time instant, when particle is at rest?

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17. A particle is moving along x-axis such that its velocity varies with time according to $v = (3m/s^2)t - (2m/s^3)t^2$. Find the velocity at t = 1 s and average velocity of the particle for the interval t = 0 to t = 5 s.

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18. An object moves along x-axis such that its position varies with time according to the relation $x = 50t - 5t^2$

Here, x is in meters and time is in seconds. Find the displacement and distance travelled for the time interval t = 0 to t = 6 s.

19. The position of a particle varies with time according to the relation $x = 3t^2 + 5t^3 + 7t$, where x is in m and t is in s. Find

(i) Displacement during time interval t = 1 s to t = 3 s.

(ii) Average velocity during time interval 0 - 5 s.

(iii) Instantaneous velocity at t = 0 and t = 5 s.

(iv) Average acceleration during time interval 0 - 5 s.

(v) Acceleration at t = 0 and t = 5 s.

20. The position of a particle moving on a straight line is proportional to the cube of the time elapsed. How does the acceleration of the particle depend on time elapsed?

21. The position of a particle is represented by the following equation.

$$x = 3t^3 + 7t^2 + 5t + 8$$

where x is in metres and t in seconds. Find the acceleration of the particle

at t = 1 s.

Strategy : $v = \dfrac{dx}{dt}$ and $a = \dfrac{dv}{dt}$

22. The acceleration a of a particle starting from rest varies with time

according to relation, $a = \alpha t + \beta$. Find the velocity of the particle at

time instant t.

Strategy : $a = \dfrac{dv}{dt}$

23. The motion of a body is given by the equation $\dfrac{dv}{dt} = 4 - 2v$, where v is the speed in m/s and t in second. If the body was at rest at t = 0, then find

(i) The magnitude of initial acceleration

(ii) Speed of body as a function of time

24. The position of an object moving on a straight line is defined by the relation $x = t^3 - 2t^2 - 4t$, where x is expressed in meter and t in second. Determine

(a) the average velocity during the interval of 1 second to 4 second.

(b) the velocity at t = 1 s and t = 4 s,

(c) the average acceleration during the interval of 1 second to 4 second.

(d) the acceleration at t = 4 s and t = 1 s.

25. A car was movig at a rate of $18kmh^{-1}$. When the brakes were applied, it comes to rest in a distance of 100 m. Calculate the retardation produced by the brakes.

26. The velocity of an object is changing with time and relation is given by the following equation.

$$v = 2t + 3t^2$$

Calculate the position of the object from the origin at t = 2 s.

Assume particle to be at origin at t = 0

27. An object is thrwon vertically upwards with a velocity of 60 m/s. After what time it strike the ground ? Use $g = 10m/s^2$.

28. A stone is thrwon vertically upwards. On its way is passes point A with a speed v and passes point B, 30 m higher than A with speed $\frac{v}{2}$. Find (i) The speed v (ii) The maximum height reached by the stone above point B.

29. A falling stone takes 0.25s to fall across a window which is 1 m high. From how far above the top of the window was the stone dropped (take $g = 10m/s^2$)?

30. An object is thrown vertically upward with some speed. It crosses 2 points p, q which are separated by (h) metre. If t_p is the time between p and highest point and coming back and t_q is the time between q and highest point and coming back, relate acceleration due to gravity t_p, t_q and h.

31. A balloon starts rising from the ground with a constant acceleration of $1.25m/s^2$. After 8 s, a stone is released from the balloon. Find the time taken by the stone to reach the ground. (Take $g = 10m/s^2$)

32. Is it possible, that a body is moving with negative acceleration still speeding up? Given reason for your answer.

33. A particle starts moving from position of rest under a constant acceleration. If it travels a distance x in t second, what distance will it travel in next t second?

34. Engine of a train that is moving with unifrom acceleration passes a pole with speed u while the last compartment passes the pole with speed 'v'. The middle point of the train passes the given pole with speed:

35. A particle starts with an initial velocity 2.0 m/s along the positive x-direction and it accelerations uniformly at the rate of $0.40 m/s^2$

(a) Find the distance travelled by it in the first three seconds.

(b) How much time does it take to reach the velocity 9.0 m/s?

(c) How much distance will it cover in reaching the velocity 9.0 m/s?

36. A passenger is standing d meters away from a bus. The bus beings to move with constant acceleration a. To catch the bus, the passenger runs at a constant speed v towards the bus, What must be the minimum speed of the passenger so that he may catch the bus?

37. A particle, moving with uniform acceleration along a straight line ABC, crosses point A at t = 0 with a velocity 12 m/s. B is 40 m from A and C is 64 m from A. The particle passes B at t = 4 s.

(a) At what time, will the particle be C?

(b) What is its velocity at C?

38. Consider the previous problem

(a) When does the particle reach A again?

(b) Locate the point where the particle reverses its direction of motion.

(c) Find the distance travelled by the particle in the first 15 seconds.

39. A particle having initial velocity 4 m/s moves with a constant acceleration $1m/s^2$ for a time interval of 10 second in straight line. Find the displacement of the particle in the last second and the distance travelled in 10 second.

40. A particle travels a distance of 20 m in the 7th seconds and 24 m in 9th second. How much distance shall it travel in the 15th second?

41. Two trains having lengths 120 m and 100 m running in the opposite directions with velocities 40 km/h and 50 km/h. In what time they will completely cross each other?

42. In the given x - t graph. Find the position of an object at t = 3 second
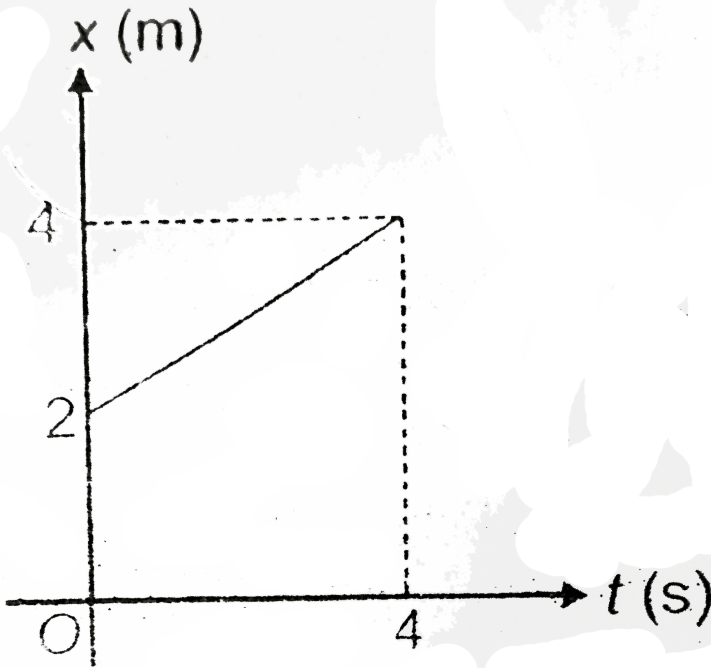
43. The velocity - time graph for linear motion of an object is as shown. Find

(a) The distance travelled and

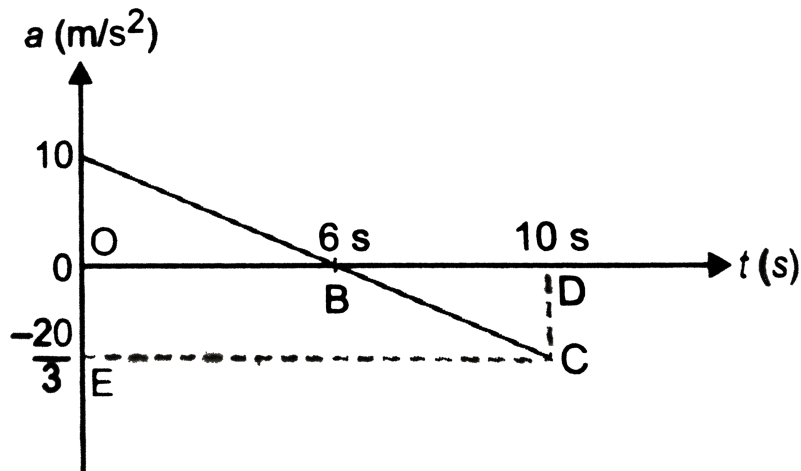**(b)** Displacement for the interval between 5 s and 40 s.
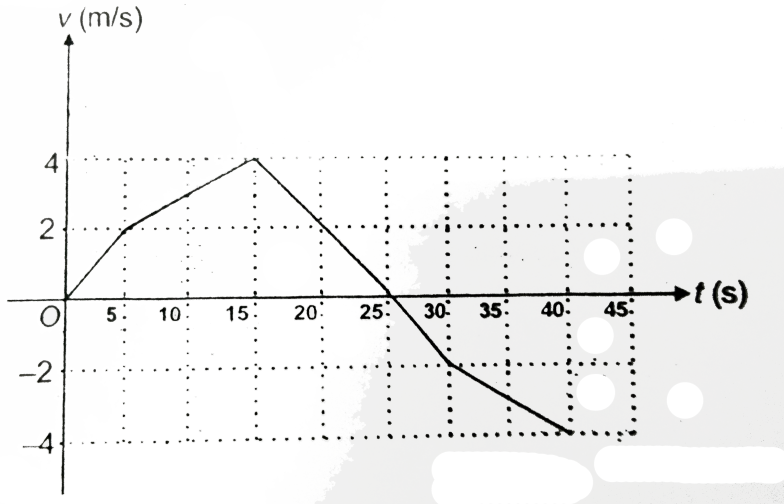
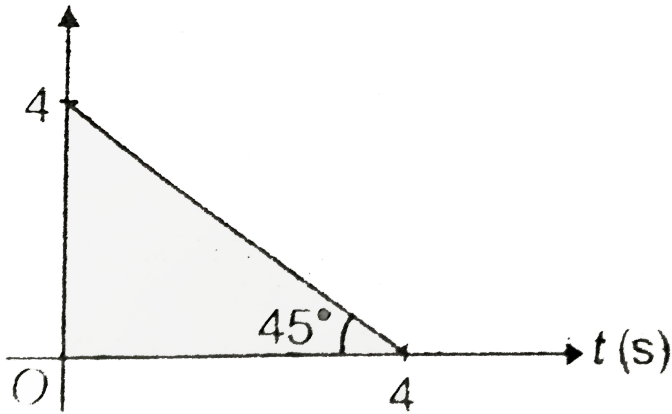**44.** The acceleration time graph of a particle is shown in the Fig. 2 (CF). 11.

At time $t = 0s$ velocity of the particle is $8ms^{-1}$. Its velocity $t = 10s$ is.

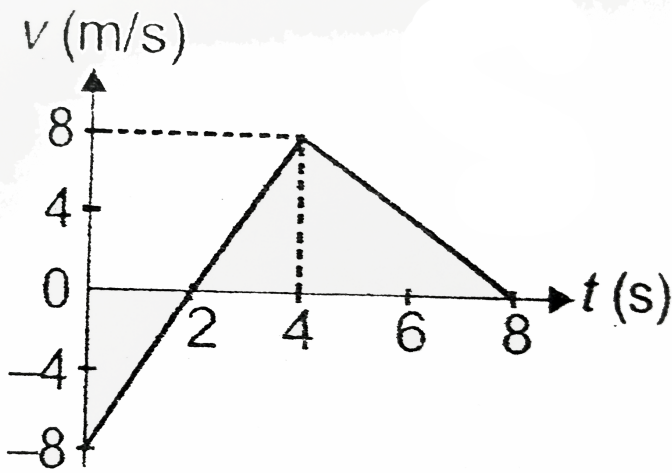**45.** The velocity-time graph is given below

v (m/s)

4

45°

O

4

t (s)

Draw the acceleration-time graph and position-time graph, given that at t

= 0, particle is at origin.

**46.** The v-t graph for a particle moving along x-axis is shown in the figure,

find

(a) Average velocity in the interval 0 to 8 s.

(b) Average speed in the interval 0 to 8 s.

(c) Average acceleration in the interval 0 to 4 s.

(d) Instantaneous acceleration at t = 2.5 s.

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47. The acceleration-time graph of a particle moving along x-axis is shown

in the figure. If the particle starts with velocity 3 m/s at t = 0, find the

velocity of particle at t = 4 s.
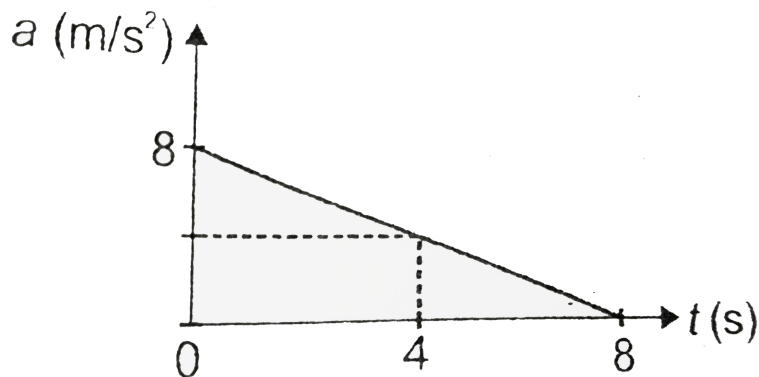
48. A particle starts from rest and accelerates constantly with $2m/s^2$ for 10 s and then retards uniformly with same rate till it comes to rest. Draw the x-t, v-t and a-t graphs.

49. An object starts from rest from the point A to rest at point B on the same straight line at a distance d. It moves over the first part of the

distance with an acceleration $\alpha m/s^2$ and for the remainder the retardation $\beta m/s^2$. Find the time taken to complete the journey.

50. A boat can be rowed in still water at a speed u. The boat is moving downstream in a river in which water flows at a speed v. There is raft floating in water and therefore moving along with water at speed v. Let the boat overtakes the raft at the moment t = 0.

The distance between the boat and raft at a later instant of time t is

A. $(u+v)t$

B. ut

C. vt

D. $(u-v)t$

Answer: 2

51. A boat can be rowed in still water at a speed u. The boat is moving downstream in a river in which water flows at a speed v. There is raft floating in water and therefore moving along with water at speed v. Let the boat overtakes the raft at the moment t = 0.

Let the boat turns back at time $t = t_0$ and starts moving towards the raft. The separation between the raft and boat after a time interval t' measured from the moment of turning back is

A. $ut_0 - ut'$

B. $ut_0 - (u + v)t'$

C. $ut_0 - vt'$

D. $ut_0 - ut' + vt'$

Answer: 1

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52. A boat can be rowed in still water at a speed u. The boat is moving downstream in a river in which water flows at a speed v. There is raft floating in water and therefore moving along with water at speed v. Let the boat overtakes the raft at the moment t = 0. Let the boat turns back at time t = t_0 and starts moving towards the raft.

After how much time, measured from the moment of turning back the boat will cross the raft again ?

Option 1 t_0

Option 2 $\dfrac{ut_0}{u + v}$

Option 3 $\dfrac{vt_0}{u + v}$

Option 4 $\dfrac{(v + v)t_0}{u - v}$

   A. t_0

   B. $\dfrac{ut_0}{u + v}$

   C. $\dfrac{vt_0}{u + v}$

   D. $\dfrac{(v + v)t_0}{u - v}$

Answer: 1

53. A boat can be rowed in still water at a speed u. The boat is moving downstream in a river in which water flows at a speed v. There is raft floating in water and therefore moving along with water at speed v. Let the boat overtakes the raft at the moment t = 0.

Let the boat turns back at time $t = t_0$ and starts moving towards the raft. The separation between the raft and boat after a time interval t' measured from the moment of turning back is

A. $\dfrac{x}{t_0}$

B. $\dfrac{2x}{t_0}$

C. $\dfrac{x}{2t_0}$

D. $\dfrac{x}{4t_0}$

Answer: 3

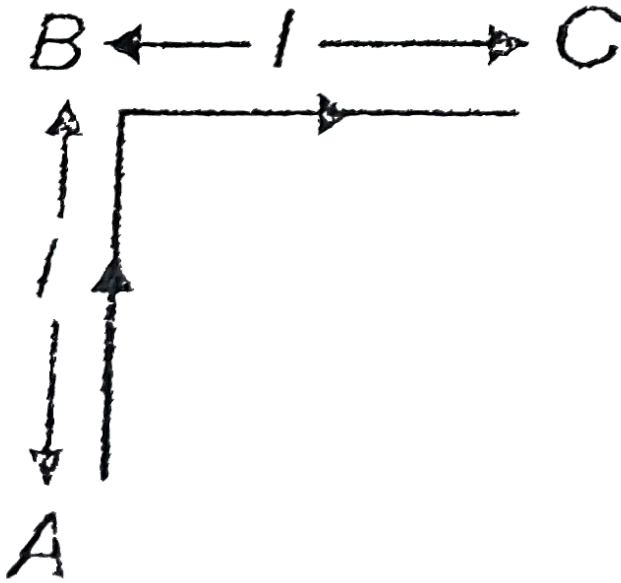**1.** What is required to specify the position of an object?

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2. A say that B is in motion. But C says that B is at rest. Is this possible ?

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3. A particle travels along the path ABC, as shown in the figure given below, AB = BC = l, calculate the path length and displacement of the

particle

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4. What is the ratio of displacement to the path length traversed by an object, if the object comes back to its initial position?

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5. A boy moves 400 m towards north, 300 m towards west and again 400 m towards south. Calculate the displacement of the boy from the initial position.

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6. Explain with the help of an example, if the displacement of a particle is zero, then it is not necessary that the distance traversed by it is also zero.

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7. Is displacement a scalar or a vector quantity?

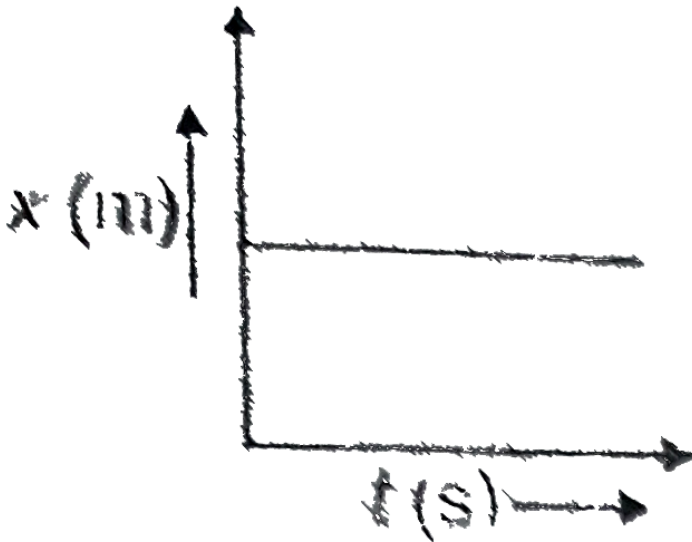▶ Watch Video Solution

8. What is the S.I. unit of displacement ?

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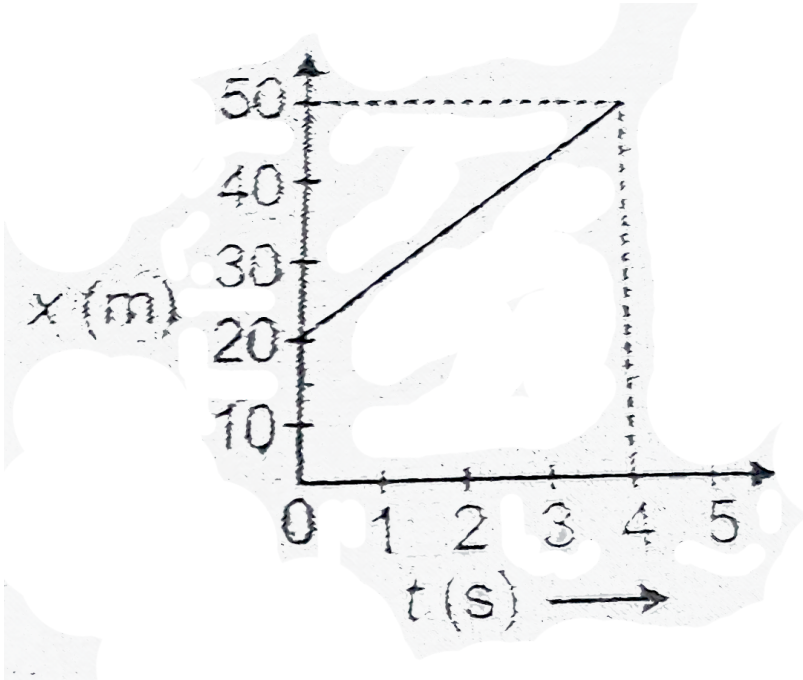**9.** What is the slope of x-t graph of a stationary object?

10. The position-time graph of an object is given below. What is the velocity of the object?

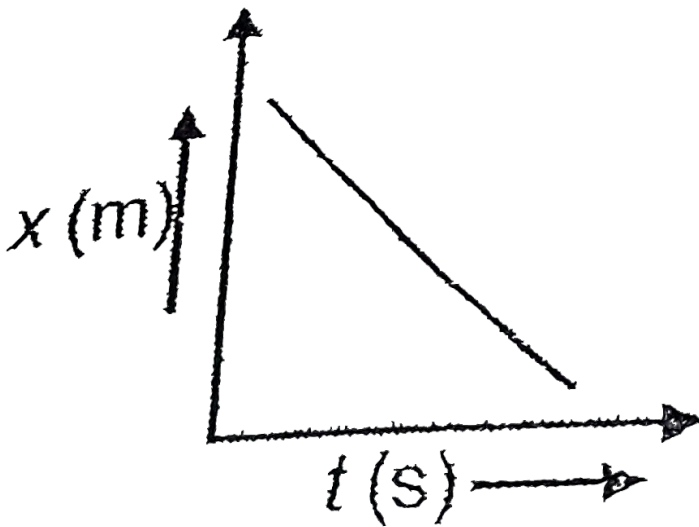**11.** The position-time graph of an object is given below. What is the velocity of the object?

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12. The x-t graph of an object is a straight line inclined to time-axis. What does this statement indicate ?
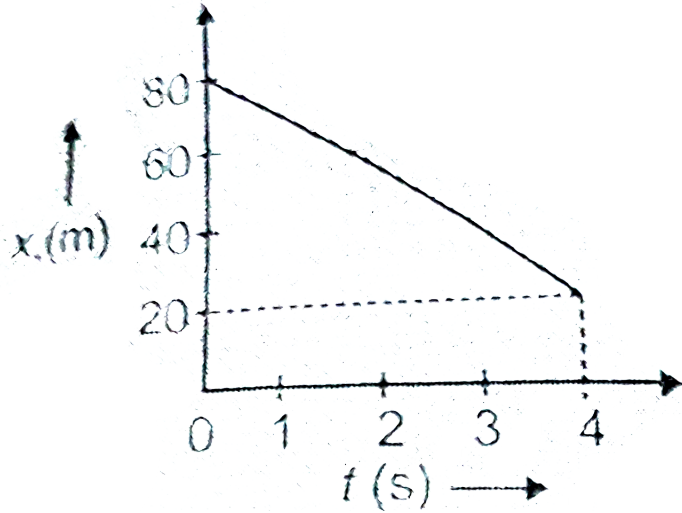
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13. The position-time (x-t) graph of an object in uniform motion is shown below, the velocity of object is

(i) Positive

(ii) Negative

(iii) Zero

(iv) None of these

14. The position-time (x-t) graph of an object in uniform motion is shown below. Calculate the velocity with which the object is moving.

15. What is the average velocity of the object during its course of motion, if its initial and final positions are same?

16. If the displacement of an object during its motion is 100 m in a time interval of 20 s, then calculate the average velocity of the object with which it was moving through out his journey.

17. An object travels 20 m in 4 s and then another 20 m in 10 s. What is the average speed of the object?

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18. SI unit of velocity is

(i) m/s

(ii) m/s^2

(iii) m

(iv) s

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19. Under what conditions (s) is the magnitude of average velocity of an object equal to its average speed ?

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20. A boy swims in a 100 m long pool. He covers 60 m with a velocity of 20 m/s and covers the rest of the distance with a velocity of 10 m/s. Calculate the average velocity of the boy.

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21. If the object is moving with uniform velocity in a given interval of time, then the average speed and instantaneous velocity are equal, why?

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22. A particle moves with a uniform velocity of 50 m/s for 20 min. What is the velocity of particle at t = 2 min ?

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23. The displacement s of an object is given as a function of time t

$$s = 5t^2 + 9t$$

Calculate the instantaneous velocity of object at t = 0.

24. The displacement s of an object is given as a function of time t by the following equation $s = 2t + 5t^2 + 3t^3$. Calculate the instantaneous velocity of the object at t = 1 s.

25. If the velocity of an object is increasing and changing at a uniform rate then the acceleration of the object is

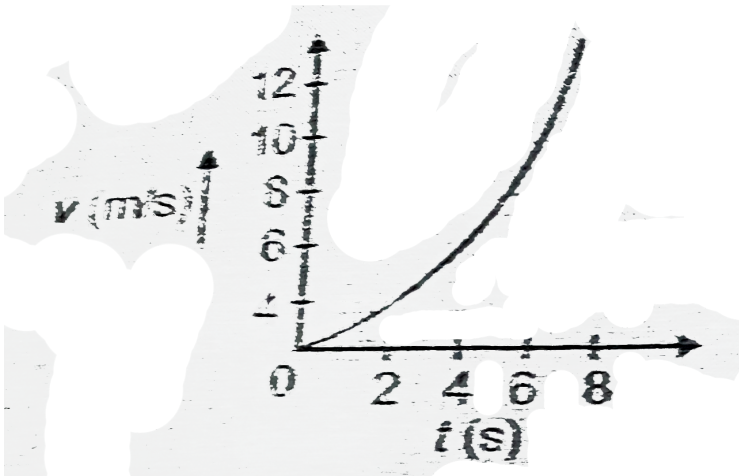(i) Positive   (ii) Zero

  (iii) Negative   (iv) Not defined

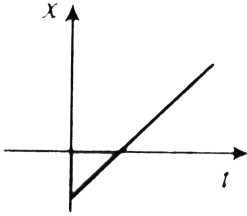**26.** Draw the position-time graph of a stationary object.

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27. The velocity-time graph of an object is given below. Calculate the average acceleration of the object in the time interval of 4 s to 6 s.
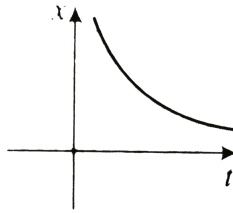

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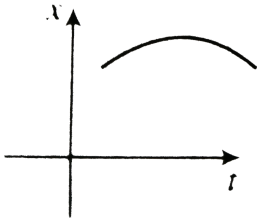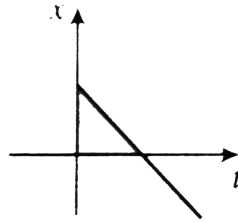
28. Study the following graph:

(i)

(ii)

(iii)

(iv)

The particle has negative acceletation.

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29. Draw the shape of the velocity-time graph for a body moving with (a) uniform velocity, (b) uniform acceleration.

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30. Draw the velocity-time graph of an object whose speed is increasing at uniform rate but moving with negative acceleration.

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31. A body starting from rest has an acceleration of $5m/s^2$. Calculate the distance travelled by it in 4th second.

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32. How can you determine the displacement and the acceleration of an object from its velocity-time graph?

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33. The relation between the acceleration and time for an object is given below. Calculate the velocity with which the object is moving at t = 1 s.

$a = 3t - 4t^2$

34. If the relation between acceleration and time for an object is given by

$a = 2t + 4t^2$

Calculate the position of object from the origin at t = 4 s. Assume the object to be at rest at $t = 0$.

35. A football is kicked into the air vertically upwards. What is its (a) acceleration and (b) velocity at the highest point ?

36. A ball is thrown vertically upward with a velocity of 20 m/s. Calculate the maximum height attain by the ball.

37. A ball is thrown straight up. What is its velocity and acceleration at the top?

38. A stone is dropped from the top of a tower. If it hits the ground after 10 seconds, what is the height of the tower?

39. A train of length 120 m travels at a speed of 57 km/h. In what time it will pass a man who is walking at 3 km/h in the opposite direction?

40. Two objects A and B are walking with speed 6 km/h and 10 km/h respectively in the same direction. Find the relative displacement of B w.r.t. A after 4 hours.

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Assignment Section A

1. The numerical ratio of displacement to the distance covered is always a) always equal to one b) always less than one c) always greater than one d) equal to or more than one

    A. Always greater than 1

    B. Always equal to 1

    C. Always than 1

    D. Equal to or less than 1

Answer: D

2. Distance is a _____ quantity

    A. Scalar

    B. Vector

    C. Derived

    D. Linear

Answer: A

3. A particle moves along a circular path of radius R. The distance and displacement of a particle after one completer revolution is

    A. $0, 2\pi r$

    B. $2\pi r, 0$

C. $0, \pi r$

D. $\pi r, 0$

Answer: B

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4. A particle starts from the origin, goes along x-axis to the point (10 m, 0) and then returns along. The same line to the point (-10 m, 0). The distance and displacement of the particle during the trip are

A. 20 m, 0

B. 30 m, 10 m

C. 30 m, - 10 m

D. 20 m, 10 m

Answer: C

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5. If the displacement of a particle is zero, then distance covered by it

A. Must be zero

B. Must not be zero

C. Must be unity

D. May not be zero

Answer: C

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6. What is the S.I. unit of displacement ?

A. Length

B. Velocity

C. Energy

D. Acceleration

Answer: A

7. A person starts walking and comes back to its initial position after 2 h, then which of the following quantity is zero?

    A. Path length

    B. Average speed

    C. Displacement

    D. Time

Answer: C

8. Which of the following quantities can never be negative?

A. Acceleration

B. Displacement

C. Distance travelled

D. Work

Answer: C

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9. A car is moving on a straight road covers one third of the distance with a speed of 20 km/h and the rest with a speed of 60 km/h. The average speed of the car is

A. 40 km/h

B. 50 km/h

C. 36 km/h

D. 55 km/h

Answer: C

10. A car travels half of the distance with constant velocity 40 km/h and another half with a constant velocity of 60 km/h along a straight line. The average velocity of the car is

    A. 24 km/h

    B. 48 km/h

    C. 60 km/h

    D. 40 km/h

Answer: B

11. SI unit of acceleration is

A. m

B. m/s

C. m/s^2

D. s

Answer: C

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12. A particle goes from A to B in 10s with uniform acceleration. Its velocity at A and B are 5 m/s and 25 m/s. Its acceleration (in m/s^2) is

A. 0.5

B. 2.5

C. 2

D. 3

Answer: C

13. A trolley moves down a slope from rest with constant acceleration. In the first second of its motion it travels 1.6 m. Its acceleration (in m/s^2) is

A. 3.2

B. 1.6

C. 0.8

D. 2.4

Answer: A

14. A car moving with a constant speed on a straight track takes a band in a curve with the same speed. Due to this

A. The magnitude of its velocity is changed

B. Its acceleration is zero

C. Its velocity is not changed

D. Its velocity is changed

Answer: D

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15. The slope of velocity-time graph for uniform motion of an object is

A. Unity

B. Zero

C. Infinite

D. More than unity but has some finite value

Answer: B

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16. The position-time graph of an object is a straight line parallel to time axis. This implies that the object is

    A. Moving with uniform acceleration

    B. Moving with uniform velocity

    C. Moving with non-uniform velocity

    D. Stationary

Answer: D

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17. The position-time graph of a moving particle is a straight line inclined with time axis and passing through origin, therefore

    A. Its acceleration is a non-zero constant

    B. Its velocity is constant

    C. Its displacement is constant

D. Both its velocity and acceleration are changing

Answer: B

18. The displacement-time graph for two particles A and B are straight lines inclined at angles of $30°$ and $60°$ with the time axis. The ratio of velocities of $V_A : V_B$ is
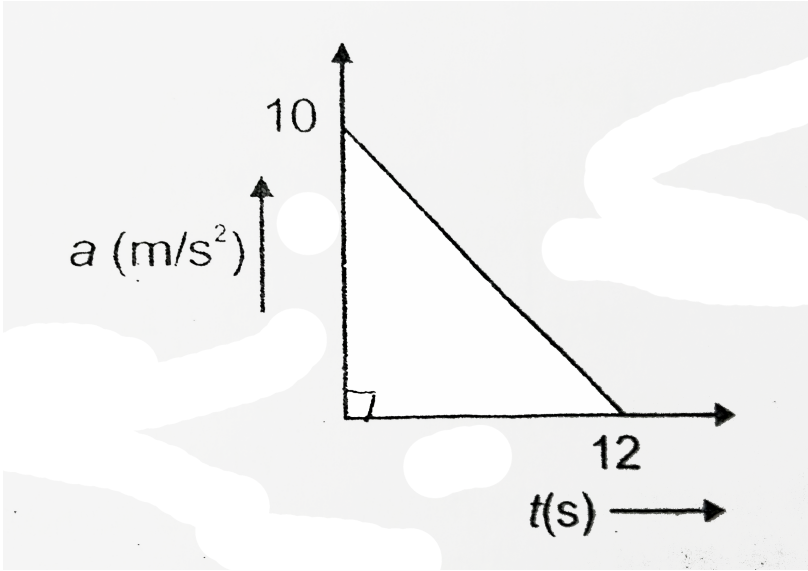
A. $1 : \sqrt{3}$

B. $1 : 3$

C. $\sqrt{3} : 1$

D. $3 : 1$

Answer: B

19. A particle starting from rest undergoes a rectilinear motion with acceleration a. The variation of a with time t is shown below. The maximum velocity attained by the particle during its motion is

A. 120 m/s

B. 60 m/s

C. 22 m/s

D. 80 m/s

Answer: B

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20. The displacement-time graph of two moving objects A and B are shown in the figure given below. Which of the following is incorrect?
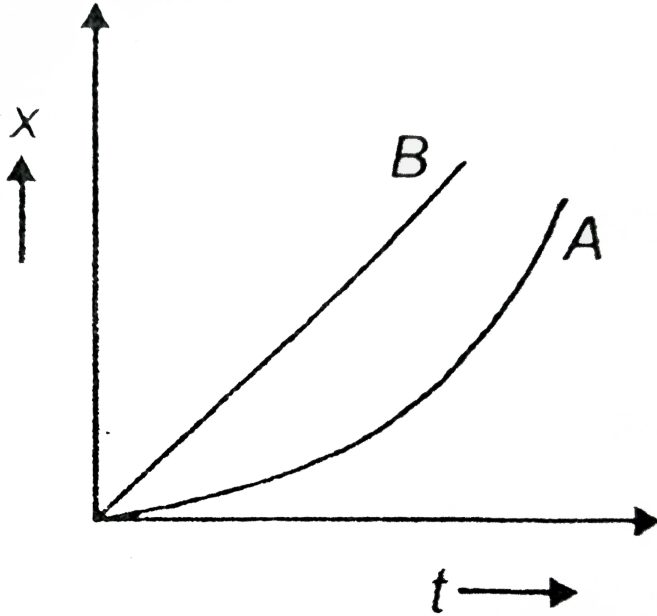
A. B is moving with constant velocity

B. A is moving with increasing speed

C. B is moving with non-zero constant acceleration

D. Acceleration of A may be constant

Answer: C

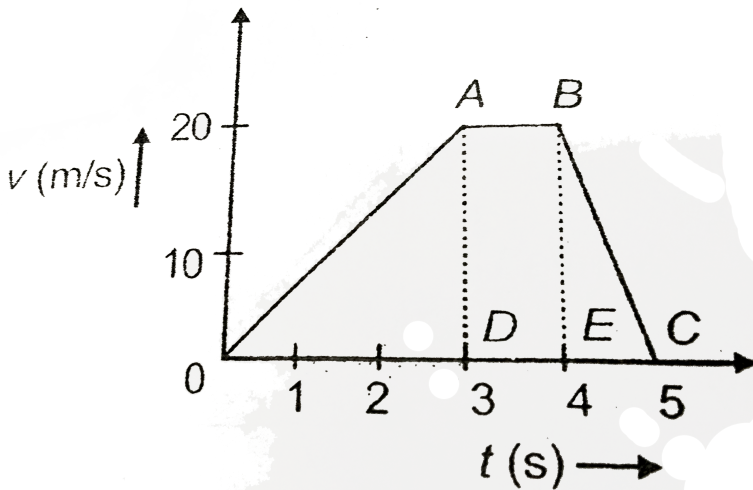**21.** The displacement-time graph of moving particle is shown below
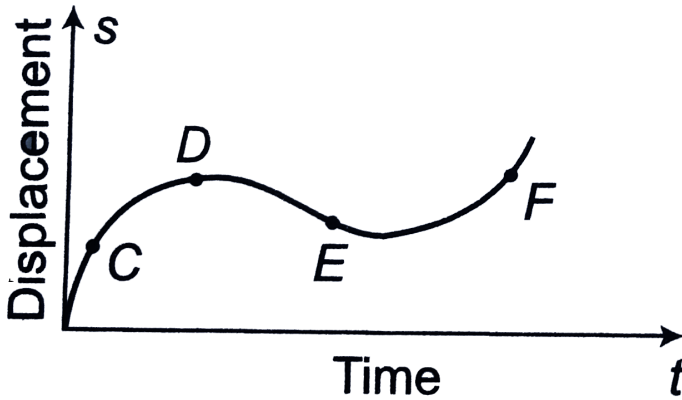
The instantaneous velocity of the particle is negative at the point

A. A

B. B

C. C

D. D

Answer: C

22. The variation of velocity of a particle moving along a straight line is as shown in the figure given below. The distance travelled by the particle in 5 s is

A. 60 m

B. 30 m

C. 40 m

D. 50 m

Answer: A

---

23. A body moving with uniform retardation covers 3 km before its speed is reduced to half of its initial value. It comes to rest in another distance of
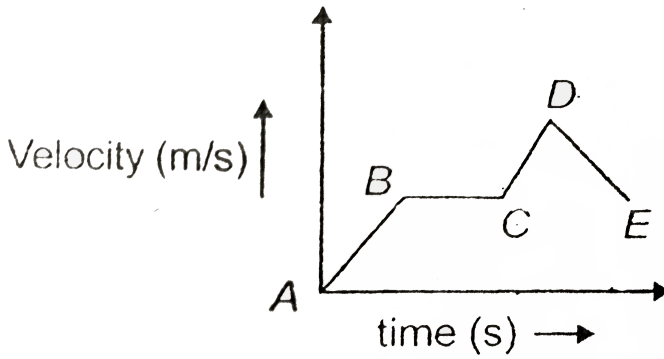
A. 1 km

B. 2 km

C. 3 km

D. $\dfrac{1}{2}$ km

Answer: A

24. The velocity-time graph of an object is shown below. The part of the graph showing zero acceleration is
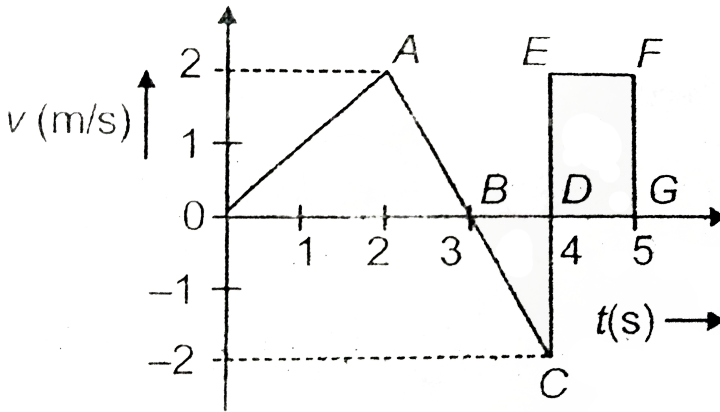

A. AB

B. BC

C. CD

D. DE

Answer: B

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25. The velocity-time graph of a particle moving along a straight line is shown in the figure-given below

The displacement of the particle in 5 second is
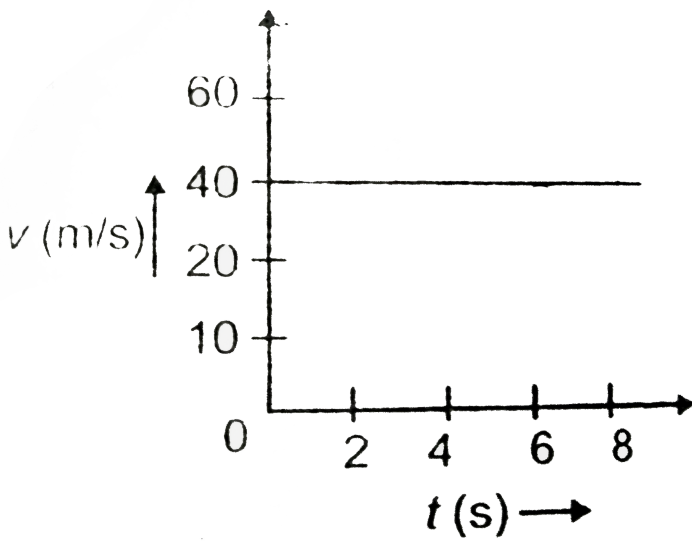
0.5 m

1 m

2 m

4 m

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26. The velocity-time graph of an object is shown below. The acceleration of the object is

A. $40m/s^2$

B. $20m/s^2$

C. Zero

D. $8m/s^2$

Answer: C

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27. The ratio of velocity of two objects A and B is $1:3$. It the position-time graph of object A is inclined to time axis at $30°$, then the position-time graph of object B is inclined to time axis at

A. $0°$

B. $90°$

C. $30°$

D. $60°$

   A. $0°$

   B. $90°$

   C. $30°$

   D. $60°$

Answer: D

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28. If the upward direction is taken as positive then, which of the following correctly shows the magnitude of acceleration due to gravity with its direction?

A. $9.8m/s^2$

B. $-9.8m/s^2$

C. $10m/s^2$

D. $-10m/s^2$

A. $9.8m/s^2$

B. $-9.8m/s^2$

C. $10m/s^2$

D. $-10m/s^2$

Answer: B

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29. The area under acceleration-time graph represents the

A. Acceleration

B. Displacement

C. Velocity

D. Change in velocity

Answer: D

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---

30. A ball is thrown vertically upward with a velocity u from the top of a tower. If it strikes the ground with velocity 3u, the time taken by the ball to reach the ground is

A. $\dfrac{u}{g}$

B. $\dfrac{2u}{g}$

C. $\dfrac{3u}{g}$

D. $\dfrac{4u}{g}$

Answer: D

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31. The displacement of a body is given by $s = \dfrac{1}{2}gt^2$ where g is acceleration due to gravity. The velocity of the body at any time t is

A. $\dfrac{gt^3}{6}$

B. $\dfrac{gt^2}{2}$

C. gt

D. $\dfrac{gt}{2}$

Answer: C

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32. A particle moves along with X-axis. The position x of particle with respect to time t from given by $x = b_0 + b_1 t + b_2 t^2$. The acceleration of particle is

A. a_0

B. a_1

C. a_2

D. $2a_2$

Answer: D

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33. A ball of mass is thrown vertically upwards by applying a force by hand. If the hand moves while applying the force and the ball goes up to height further, find the magnitude of the force. (Take $g = 10ms^{-2}$)
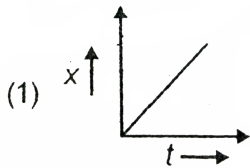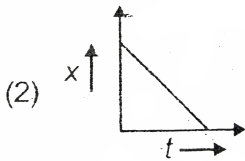
A. 500 m

B. 125 m

C. 625 m
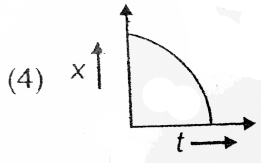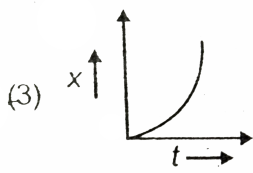
D. 425 m

Answer: C

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34. Which of the following x-t graphs represents the distance-time variation of a body released from the top of a buiding?
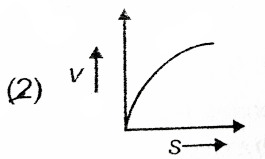

(1)

A.

(2)

B.
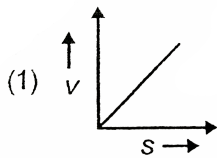
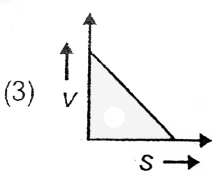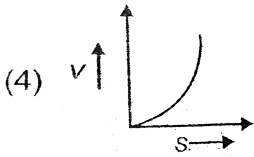(3) $x\uparrow$

C.

(4) $x\uparrow$

D.

Answer: C

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---

35. A particle starting from rest moves along a straight line with constant acceleration for this velocity displacement graph will have the form-

(1) $v\uparrow$

A.

(2) $v\uparrow$

B.

(3)

C.

(4)

D.

Answer: B

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36. A ball falls freely from rest. The ratio of the distance travelled in first, second, third and fourth second is

A. $4:3:2:1$

B. $7:5:3:1$

C. $1:2:3:4$

D. $1:3:5:7$

Answer: D

37. A ball is thrown vertically upward attains a maximum height of 45 m. The time after which velocity of the ball become equal to half the velocity of projection ? (use g = 10 m/s^2)

A. 2 s

B. 1.5 s

C. 1 s

D. 0.5 s

Answer: B

38. A car travelling with a velocity of 80 km/h slowed down to 44 km/h in 15 s. The retardation is

A. $0.67m/s^2$

B. $1m/s^2$

C. $1.25m/s^2$

D. $1.5m/s^2$

Answer: A

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39. The distance covered by a moving body is directly proportional to the square to the time. The acceleration of the body is

A. Increases

B. Remains constant

C. Is zero

D. Decreases

Answer: B

40. A person driving a car with a speed 72 km/h suddenly sees a boy crossing the road. If the distance moved by car, before the person applies brakes is 5 m, the reaction time of the person is

A. 0.5 s

B. 0.10 s

C. 10 s

D. 0.25 s

Answer: D

41. Which of the following is correct expression for the stopping distance of a vechicle? (symbols have their usual meaning)

A. $s = \dfrac{u^2}{2a}$

B. $s = \dfrac{2a}{u^2}$

C. $s = \dfrac{at^2}{2}$

D. $s = ut$

Answer: A

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42. Which of the following shows the correct expression of height d time to catch a ball dropped from the top of a tower ? (symbols have their usual meaning)

A. $t = \sqrt{\dfrac{2d}{g}}$

B. $t = \sqrt{\dfrac{g}{2d}}$

C. $t = \sqrt{\dfrac{d}{g}}$

D. $t = \sqrt{\dfrac{d}{2g}}$

Answer: A

43. A stone dropped from the top of a tower reaches the ground in 3 s. The height of the tower is

   A. 18.6 m

   B. 39.2 m

   C. 44.1 m

   D. 98 m

Answer: C

44. Two cars are moving is one a same line dimension in opposite direction with the same speed v. The relative velocity of two cars w.r.t.

each other is

A. 2 v

B. v

C. $\dfrac{v}{2}$

D. Zero

Answer: A

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45. Two objects A and B are moving in opposite directions with velocities v_A and v_B respectively, the magnitude of relative velocity of A w.r.t. B is

A. $v_A - v_B$

B. $v_A + v_B$

C. $v_B - v_A$

D. v_A / v_B

Answer: A

---

46. Two objects A and B are moving with velocities v_A and v_B respectively in the same direction. The magnitude of relative velocity of A w.r.t. B is

A. $v_A - v_B$

B. $v_A + v_B$

C. $v_B - v_A$

D. v_A / v_B

Answer: B

---

47. The relative velocity of two objects A and B is 10 m/s. If the velocity of object A is 40 m/s then the velocity with which B is moving is (assume

both objects are moving in same direction)

A. 10 m/s

B. 40 m/s

C. 30 m/s

D. 15 m/s

Answer: C

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48. Two train are moving in a straight line in the same direction with a speed of 80 km/h. The relative velocity of one trains w.r.t. each other is
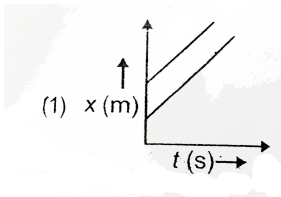
A. 80 km/h
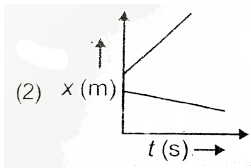
B. 40 km/h

C. Zero

D. 160 km/h

Answer: C

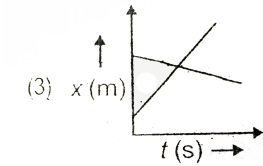**49.** Which one of the following represents displacement-time graph of two objects A and B moving with zero relative velocity?
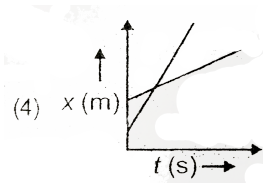
A.
(1) x (m)
t (s)→

B.
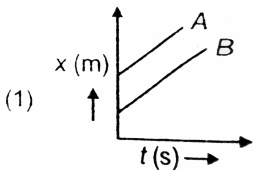(2) x (m)
t (s)→

C.
(3) x (m)
t (s) →

D.
(4) x (m)
t (s)→

Answer: A

50. Two objects A and B are moving with velocities v_A and v_B respectively along positive x-axis. If $v_A < v_B$ then, which of the following position-time graphs is correctly showing the velocity of A and B ?

A.

(1)

B.

(2)

C.

(3)

D.

(4)
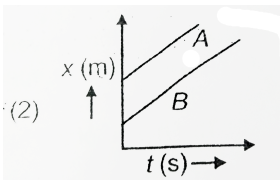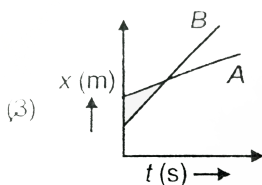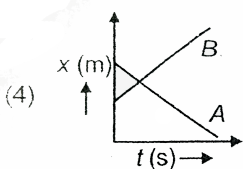
Answer: B

1. A particle starts moving from rest on a straight line. Its acceleration a verses time t is shown in the figure. The speed of the particle is maximum at the instant
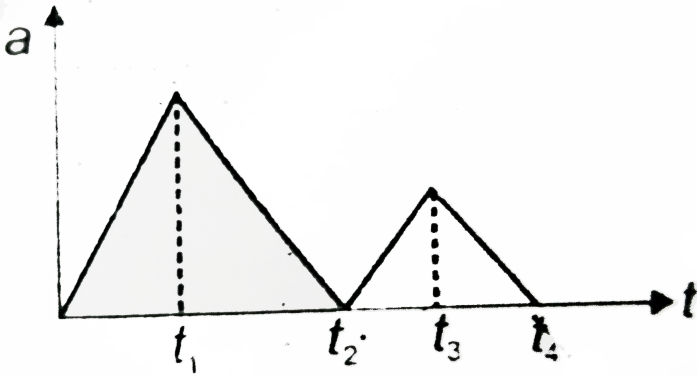
A. t_1

B. t_2

C. t_3

D. t_4

Answer: D

2. A particle travels half the distance of a straight journey with a speed 5 m/s. The remaining part of the distance is covered with speed 6 m/s for half the remaining time, and with speed 4 m/s for the other half of the remaining time. The average speed of the particle is

A. 3 m/s

B. 4 m/s

C. $\dfrac{3}{4}$ m/s

D. 5 m/s

Answer: D

3. A stone is dropped from the top of a tower and travels 24.5 m in the last second of its journey. The height of the tower is

A. 44.1 m

B. 49 m

C. 78.4 m

D. 72 m

Answer: A

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4. Two balls X and Y are thrown from top of tower one vertically upward and other vertically downward with same speed. If times taken by them to reach the ground are 6 s and 2 s respectively, then the height of the tower and initial speed of each ball are $\left(g = 10m/s^2\right)$

A. 60 m, 15 m/s

B. 80 m, 20 m/s

C. 60 m, 20 m/s

D. 45 m, 10 m/s

Answer: C

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5. A body starts from rest with an acceleration $2m/s^2$ till it attains the maximum velocity then retards to rest with $3m/s^2$. If total time taken is 10 second, then maximum speed attained is

A. 12 m/s

B. 8 m/s

C. 6 m/s

D. 4 m/s

Answer: A

6. If speed of water in river is 4 m/s and speed of swimmer with respect to water is 3 m/s, then in which direction the swimmer must swim so that he will reach directly opposite end?

A. $127°$ with direction of river flow

B. $60°$ with direction of river flow

C. $143°$ with direction of river flow

D. Swimmer will never reach directly opposite end

Answer: D

7. The reation between the time t and position x for a particle moving on x-axis is given by $t = px^2 + qx$, where p and q are constants. The relation between velocity v and acceleration a is as

A. $a \propto v^3$

B. $a \propto v^2$
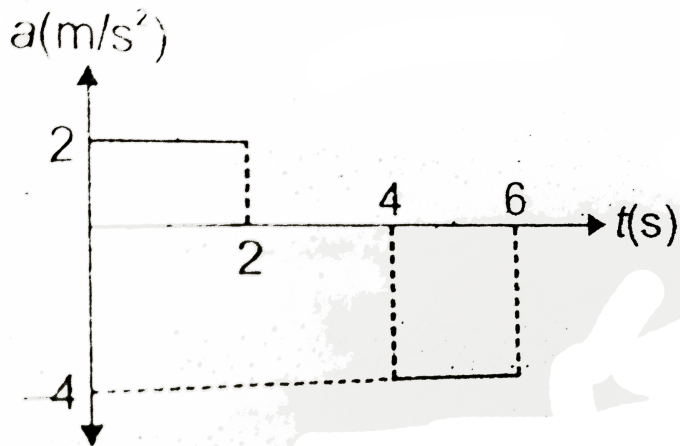
C. $a \propto v^4$

D. $a \propto v$

Answer: A

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8. A particle starts from rest. Its acceleration is varying with time as shown in the figure. When the particle comes to rest, its distance from its

starting point is

A. 20 m

B. 24 m

C. 36 m

D. 14 m

Answer: D

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9. Two particles A and B are initially $40m$ apart, A is behind B. Particle A is moving with uniform velocity of $10ms^{-1}$ towards B. Particle B starts moving away from A with constant acceleration of $2ms^{-1}$.

The time for which there is a minimum distance between the two is .

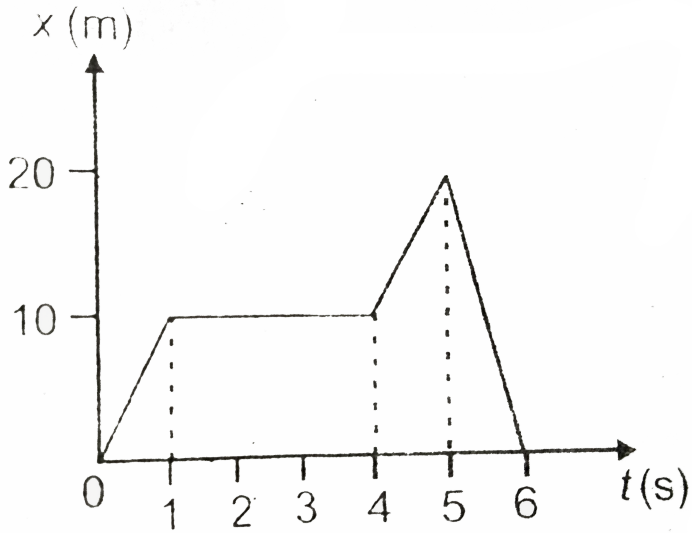A. 45 m

B. 15 m

C. 35 m

D. 30 m

Answer: B

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10. Figure shows the graph of x-coordinate of a particle moving along x-axis as a function of time. Average velocity during t = 0 to 4 s and

instantaneous velocity at t = 4.113 s respectively will be

A. 5 m/s, 10 m/s

B. 2.5 m/s, 10 m/s

C. Zero, zero

D. 10 m/s, 2.5 m/s

Answer: B

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11. A body is thrown vertically upward with velocity u. The distance travelled by it in the 7th and 8th seconds are equal. The displacement in 8th seconds is equal to (take $g = 10m/s^2$)

A. 5 m

B. 10 m

C. 2.5 m

D. $\dfrac{5}{3}m$

Answer: A

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12. A ball is thrown vertically upward with a velocity u from balloon descending with a constant velocity v. The vall will pass by the balloon after time

A. $\dfrac{u+v}{2g}$

B. $\dfrac{2u + v}{g}$

C. $\dfrac{2u + 2v}{g}$

D. $\dfrac{(u + v)}{g}$

Answer: C

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13. A constant force acts on a particle and its displacement x (in cm) is related to the time t (in s) by the equation $t = \sqrt{x} + 3$, when the velocity of the particle is zero, its displacement (in cm) is

A. Zero

B. 1

C. 2

D. 3

Answer: A

14. A particle located at x = 0 at time t = 0, starts moving along the positive x-direction with a velocity that varies as $v = p\sqrt{x}$. The displacement of the particle varies with time as (where, p is constant)

A. t^3

B. t^2

C. t

D. $t^{1/2}$

Answer: B

15. A train is moving with uniform acceleration. The two ends of the train pass through a point on the track with velocity v_1 and v_2. With what

velocity the middle point of the train would pass through the same point ?

A. $\left[\dfrac{v_1^2 + v_2^2}{2}\right]^{\frac{1}{2}}$

B. $\dfrac{\left(v_1^2 - v_2^2\right)}{2}$

C. $\dfrac{v_1 + v_2}{2}$

D. $\dfrac{v_1 - v_2}{2}$

Answer: A

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16. Which graph represents an objects at rest ?

A.

(2)

B.

(3)

C.

(4)
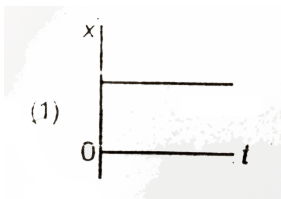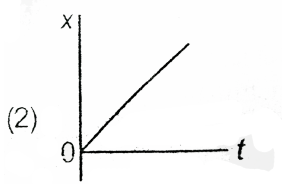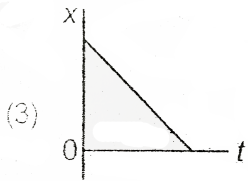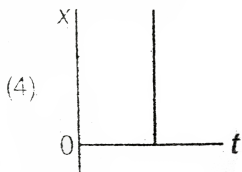
D.

Answer: A

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17. Which graph represents positive acceleration ?

(1)

A.

B.

(2)

C.

(3)

D.

(4)
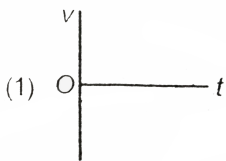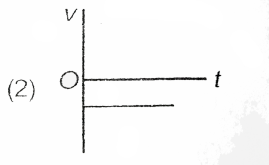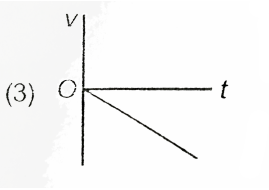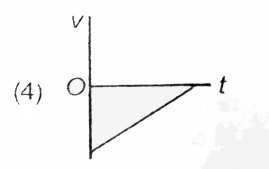
Answer: 4

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18. The acceleration-time graph of a particle moving along a straight line is as shown in. At what time the particle acquires its initial velocity?
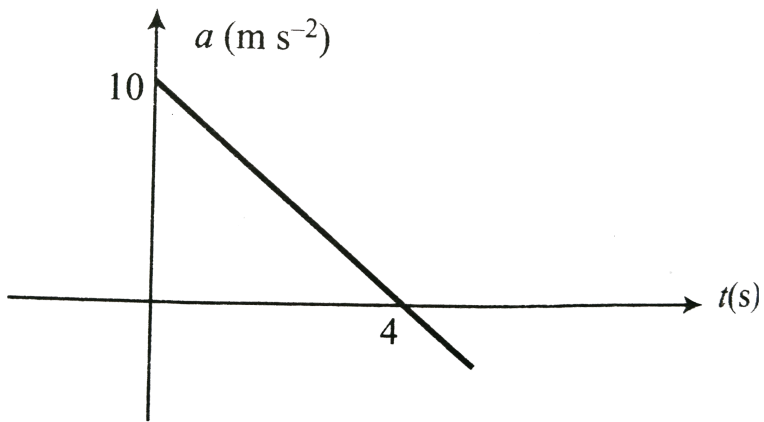
A. 12 s

B. 5 s

C. 8 s

D. 16 s

Answer: C

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19. A particle obeys the following v - t graph as shown. The average velocity over 30 s is
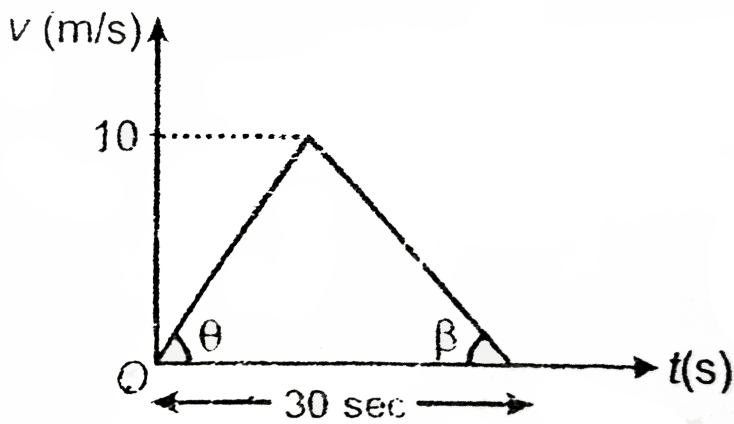
A. 10 m/s

B. 5 m/s

C. $\dfrac{15}{3} m/s$

D. Zero

Answer: B

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Assignment Section C

1. Select the correct statement. For a particle moving on a straight line

A. Average speed is equal to magnitude of average velocity

B. Average speed may be greater than magnitude of average velocity

C. Average velocity = instantaneous velocity if velocity is constant

D. Moving with constant acceleration, average velocity for given time

interval is arithmetic mean of initial and final velocity

Answer: B::C::D

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2. Formulae And Concepts For Uniformaly Accelerated Motion In A Straight

A. $u = r + at$

B. $s = \left(\dfrac{u + v}{2} \right) t$

C. $s = vt - \dfrac{1}{2} at^2$

D. $s = \dfrac{v^2 - u^2}{2a}$

Answer: A::B::C::D

3. A ball is projected vertically up with speed 20 m/s. Take $g = 10m/s^2$

A. It covers a distance of 5 m in 2nd second of its motion

B. The displacement in 2nd and 3rd second are equal

C. The distance covered in 2nd and 3rd second are equal

D. The average speed for first 4 seconds is zero

Answer: A::C

4. The motion of a particle moving along x-axis is represented by the equation $\frac{dv}{dt} = 6 - 3v$, where v is in m/s and t is in second. If the particle is at rest at t = 0 , then

A. The speed of the particle in 2 m/s when the acceleration of particle

   is zero

B. After a long time the particle moves with a constant velocity of 2

   m/s

C. The magnitude of final acceleration is $6m/s^2$

D. The speed is 0.1 m/s, when the acceleration is half of its initial value

Answer: A::B

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5. Figure shows the velocity of a particle moving on x-axis.
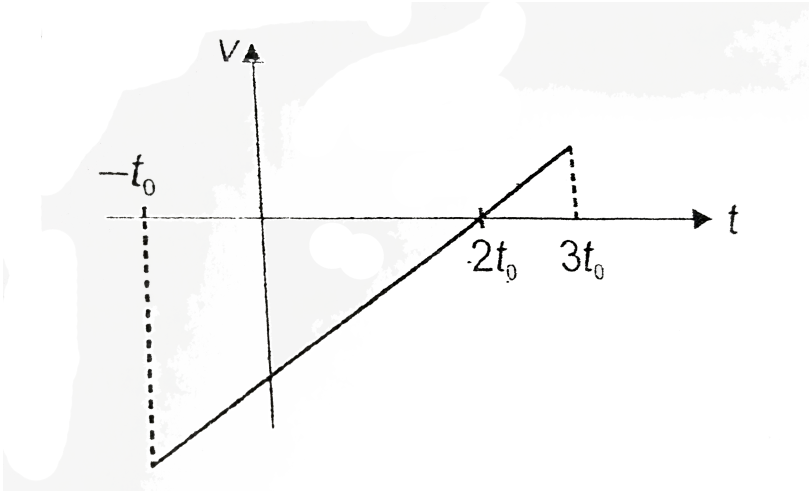
Which of the following statement is correct for the interval shown in graph?

A. Speed of particle is increasing continuously

B. The particle changes its direction of motion at some point of time

C. The particle does not return to its starting point at the end of the interval

D. The acceleration of particle changes from $-ve$ to $+ve$

Answer: B::C

6. The position-time graph for two particles P and Q moving on x-axis is shown in the figure. Then
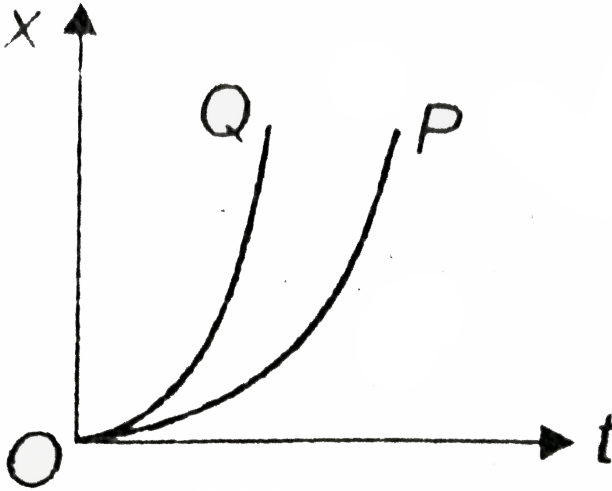
A. The separation between P and Q remains constant with time

B. The acceleration of Q is greater than that of P

C. The relative velocity of Q w.r.t. P is increasing with time

D. The relative velocity of Q w.r.t. P is decreasing with time

Answer: B::C

7. The velocity versus time graph of two particles moving along x-axis varies are shown in the following two plots. Then
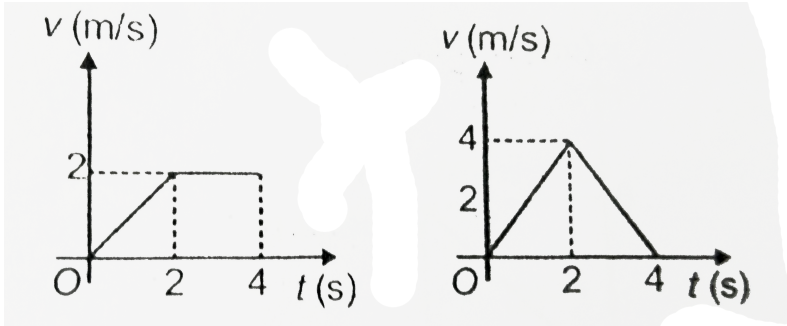
A. Maximum separation between two particles is 2 m

B. Maximum separation between two particles is 3 m

C. Maximum separation between occurs after at t = 2 s

D. Maximum separation between occurs after at t = 3 s.

Answer: B::D

1. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope with change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

The velocity-time graph for two objects P and Q are shown. The ratio of

their respective acceleration is

A. 1

B. $\sqrt{3}$

C. $\dfrac{1}{\sqrt{3}}$

D. None of these

Answer: B

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2. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope will change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

For the given velocity-time graph the displacement of the object between t = 2 s to t = 4 s is

A. 6 m

B. 10 m

C. 18 m
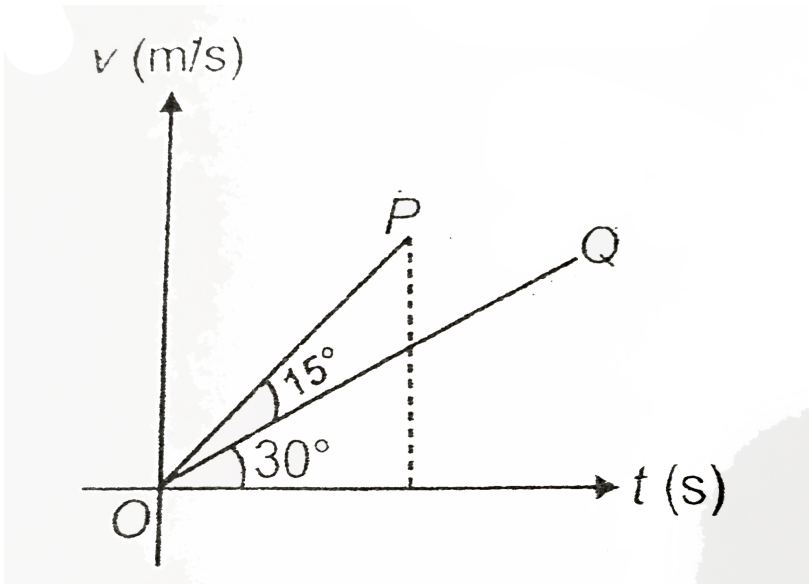
D. 2 m

Answer: A

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3. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope will change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

For the given velocity-time graph the possibly correct acceleration-time

relationship is

A. Acceleration is constant

B. Acceleration is increasing with time

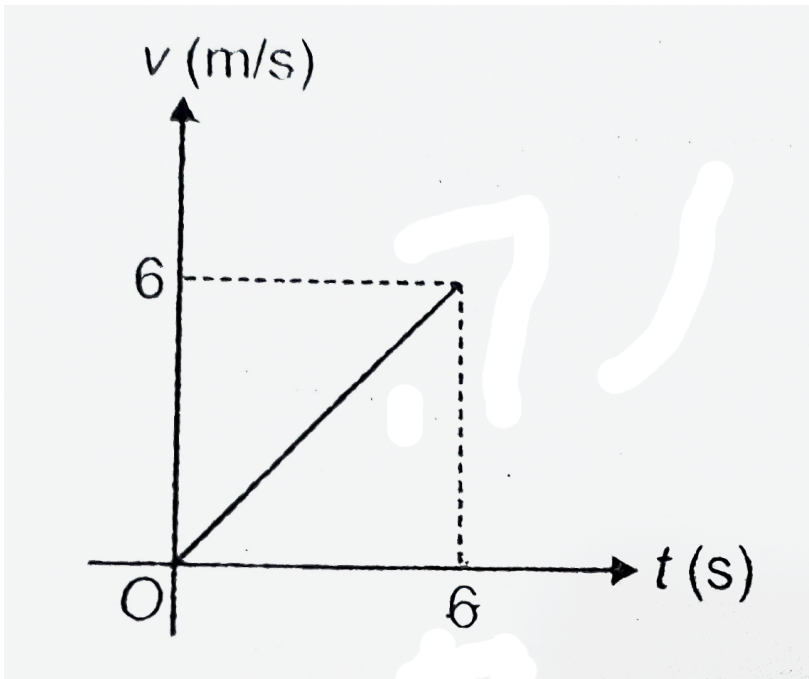C. Acceleration is decreasing with time

D. None of these

Answer: B

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4. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope with change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

A car starts from rest with a constant acceleration a_1 for some time and attains a velocity v_0. Then it immediately retards at a constant rate a_2 to rest. The total time to journey is t_0 Identify the correct velocity-time graph

A.
(1)
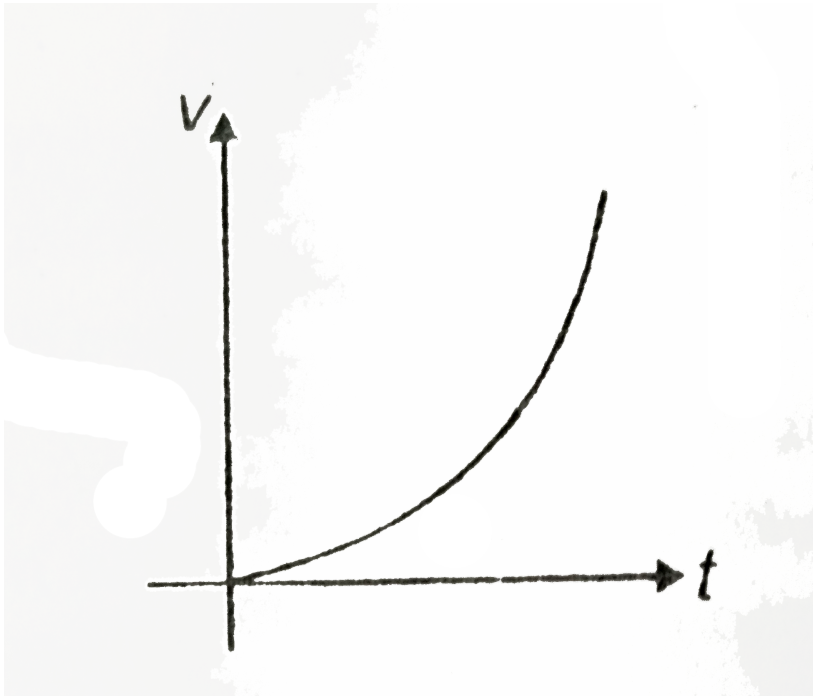
B.
(2)

(3)
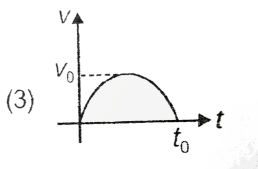
C.

D. (4). None of these

Answer: A

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5. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope with change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

For the above situation let t_1 be the time of accelerated motion and t_2 be the time or retarded motion, then the correct relation is

A. $a_1 t_2 = a_2 t_1$

B. $a_1 t_1 = a_2 t_2$

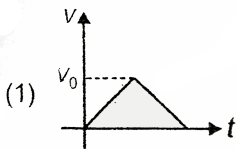C. $a_1 t_1^2 = a_2 t_2^2$

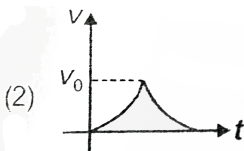D. $a_1 t_2^2 = a_2 t_1^2$

Answer: B

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6. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope will change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

The correct relation between v_0, a_1, a_2 and t_0 is

A. $v_0 = \left(\dfrac{a_1 a_2}{a_1 + a_2} \right) t_0^2$

B. $v_0 = \left(\dfrac{a_1 a_2}{a_1 + a_2} \right) t_0$

C. $v_0 = \left(\dfrac{a_1 + a_2}{2} \right) t_0$

D. $v_0 = \sqrt{a_1 a_2 t_0}$

Answer: B

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7. Graphs are very useful to represent a physical situation. Various quantities can be easily represented on graphs and other quantites can be determined from the graph. For example the slope of velocity-time graph represents instantaneous acceleration. For a motion with constant acceleration slope of velocity-time graph is constant. If acceleration is changing with time, slope with change and thus velocity-time graph will be a non-linear curve. Further the area of velocity-time graph gives displacement.

The average velocity of the car for the entire trip is

A. v_0

B. $\dfrac{v_0}{2}$

C. $\dfrac{v_0}{3}$

D. $\dfrac{v_0}{4}$

Answer: B

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8. A car starts moving on a straight road. It makes the entire journey in three parts. The total time of journey is 25 s. For first part it accelerates at a constant rate $5m/s^2$. For second part it moves with a constant speed. For the third part it retards at constant rate $5m/s^2$ to come to rest. The correct velocity-time graph is

(1)

A.

(2)

B.

(3)

C.

(4)

D.
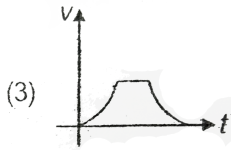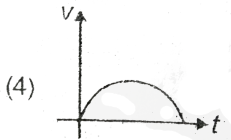
Answer: B

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9. A car starts moving on a straight road. It makes the entire journey in three parts. The total time of journey is 25 s. For first part it accelerates at a constant rate $5m/s^2$. For second part it moves with a constant speed. For the third part it retards at constant rate $5m/s^2$ to come to rest. Let t_1 be the time for first part, t_2 be the time for 2nd part then correct relation is

A. $t_2 = 25 - t_1$

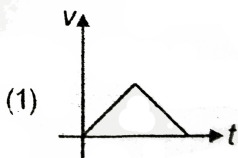B. $t_2 = 25 - 2t_1$

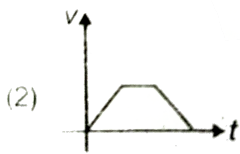C. $2t_1 = 25 - t_2$

D. None of these

Answer: B

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10. A car starts moving on a straight road. It makes the entire journey in three parts. The total time of journey is 25 s. For first part it accelerates at a constant rate $5m/s^2$. For second part it moves with a constant speed. For the third part it retards at constant rate $5m/s^2$ to come to rest.

If the average speed for entire journey is 20 m/s, time period of first part of journey is

A. 5 s

B. 20 s

C. 15 s

D. 10 s

Answer: A

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11. A rocket is fired upwards such that its engine takes 10 s to explods fully. Its velocity- time graph is as shown in the figure. Acceleration due to gravity is $10m/s^2$.
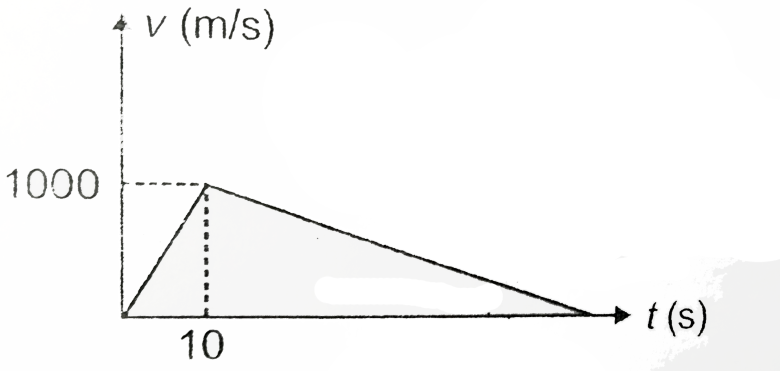
The total time for which the rocket moves upwards is

A. 10 s

B. 100 s

C. 110 s

D. 20 s

Answer: C

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12. A rocket is fired upwards such that its engine takes 10 s to explods fully. Its velocity- time graph is as shown in the figure. Acceleration due to gravity is $10m/s^2$.
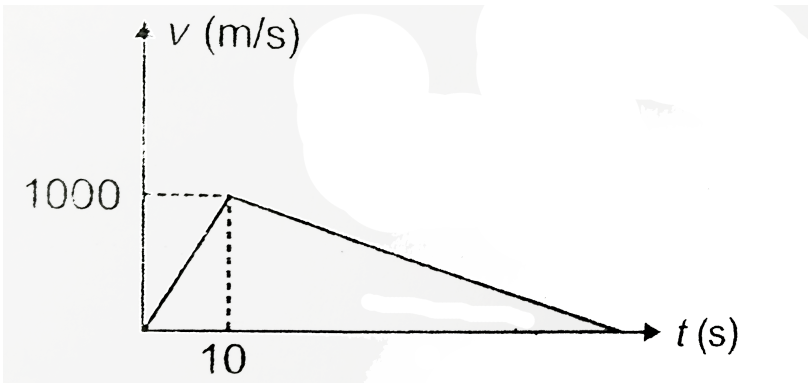
The height reached by the rocket till its engine explodes is

A. 1000 m

B. 5000 m

C. 10,000 m

D. 20,000 m

Answer: B

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13. A rocket is fired upwards such that its engine takes 10 s to explods fully. Its velocity- time graph is as shown in the figure. Acceleration due to gravity is $10m/s^2$.
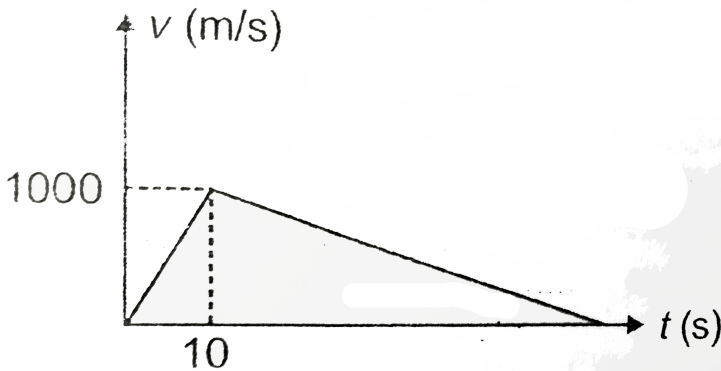
The maximum height attained by the rocket is

A. 5000 m

B. 50,000 m

C. 55,000 m

D. 100,000 m

Answer: C

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14. A car accelerates from rest at constant rate of $2ms^{-2}$ for some time.

Immediately after this, it retards at a constant rate of $4ms^{-2}$ and comes

to rest. The total time for which it remains in motion is 3 s. Taking the

moment of start of motion as t = 0, answer the following questions.

If the time of acceleration is t_1, then the speed of the car at $t = t_1$ is

A. $2t_1$

B. $4t_1$

C. $> 2t_1$

D. $< 2t_1$

Answer: A

---

15. A car accelerates from rest at constant rate of $2ms^{-2}$ for some time. Immediately after this, it retards at a constant rate of $4ms^{-2}$ and comes to rest. The total time for which it remains in motion is 3 s. Taking the moment of start of motion as t = 0, answer the following questions.

Let t be a time instant greater than t_1 but less than 3 s. The velocity at this time instant is

A. $4(t - t_1)$

B. $2t_1 + 4(t - t_1)$

C. $2t_1 - 4(t - t_1)$

D. $4t$

Answer: C

16. A car accelerates from rest at constant rate of $2ms^{-2}$ for some time. Immediately after this, it retards at a constant rate of $4ms^{-2}$ and comes to rest. The total time for which it remains in motion is 3 s. Taking the moment of start of motion as t = 0, answer the following questions.

At t = 3 s, the speed of the car is zero. The time for which it increases its speed is

A. 1 s

B. 2 s

C. 3 s

D. 1.5 s

Answer: B

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17. A car acceleration from rest at a constant rate $2m/s^2$ for some time. Then, it retards at a constant rate of $4m/s^2$ and comes to rest. If it remains motion for 3 second, then the maximum speed attained by the car is:-

A. $2ms^{-1}$

B. $3ms^{-1}$

C. $4ms^{-1}$

D. $6ms^{-1}$

Answer: C

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18. A car accelerates from rest at constant rate of $2ms^{-2}$ for some time. Immediately after this, it retards at a constant rate of $4ms^{-2}$ and comes to rest. The total time for which it remains in motion is 3 s. Taking the

moment of start of motion as t = 0, answer the following questions.

What is the distance travelled by it during the time of increasing speed ?

A. 2 m

B. 3 m

C. 4 m

D. 6 m

Answer: C

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19. A car accelerates from rest at constant rate of $2ms^{-2}$ for some time. Immediately after this, it retards at a constant rate of $4ms^{-2}$ and comes to rest. The total time for which it remains in motion is 3 s. Taking the moment of start of motion as t = 0, answer the following questions.

What is the distance travelled by it during the time of decreasing speed ?

A. 2 m

B. 3 m

C. 4 m

D. 6 m

Answer: A

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20. A car accelerates from rest at constant rate of $2ms^{-2}$ for some time.

Immediately after this, it retards at a constant rate of $4ms^{-2}$ and comes

to rest. The total time for which it remains in motion is 3 s. Taking the

moment of start of motion as t = 0, answer the following questions.

What is the average speed of the car for the journey .

a. 2 m/s

b. 3 m/s

c. 1 m/s

d. Zero

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21. The figure shows position time graph of two riders C and D. Based on the information represented by the graph, answer the following questions.

At t = 0 s

A. Rider C is ahead of rider D

B. Rider D is ahead of rider C

C. Rider C and D are at the same position

D. Not enough information is given

Answer: B

22. The figure shows position time graph of two riders C and D. Based on the information represented by the graph, answer the following questions.
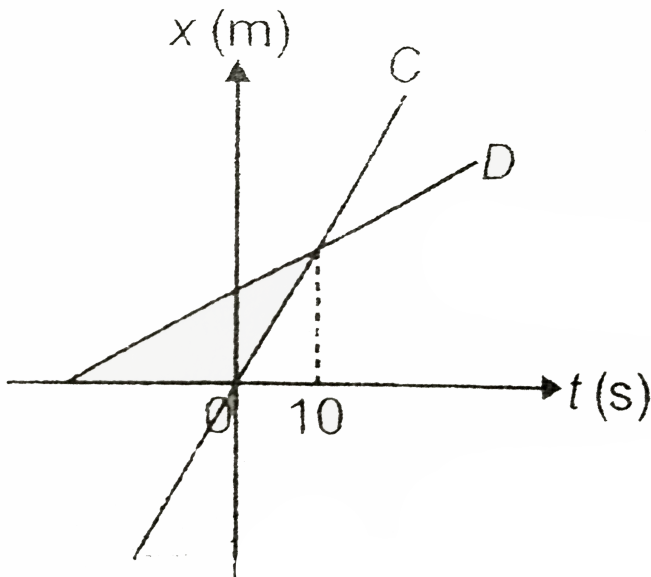
At t = 0 s

A. C is moving, and D is at rest

B. D is moving, and C is at rest

C. C and D are both moving

D. C and D are both at rest

Answer: C

23. The figure shows position time graph of two riders C and D. Based on the information represented by the graph, answer the following questions.
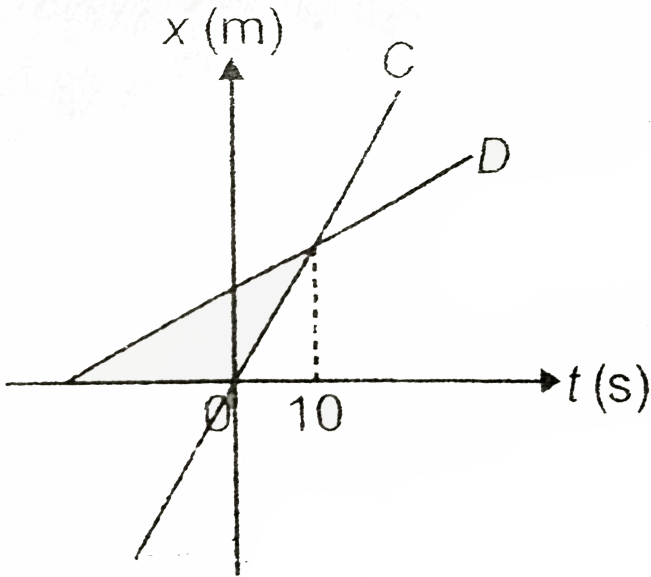
At t = 0 s

A. C has a greater velocity than D

B. D has greater velocity than C
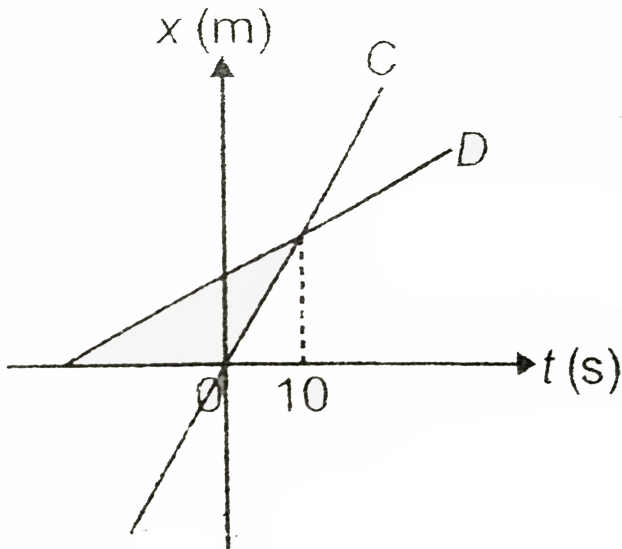
C. C and D have the same velocity

D. C is accelerating

Answer: A

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24. The figure shows position time graph of two riders C and D. Based on the information represented by the graph, answer the following questions.
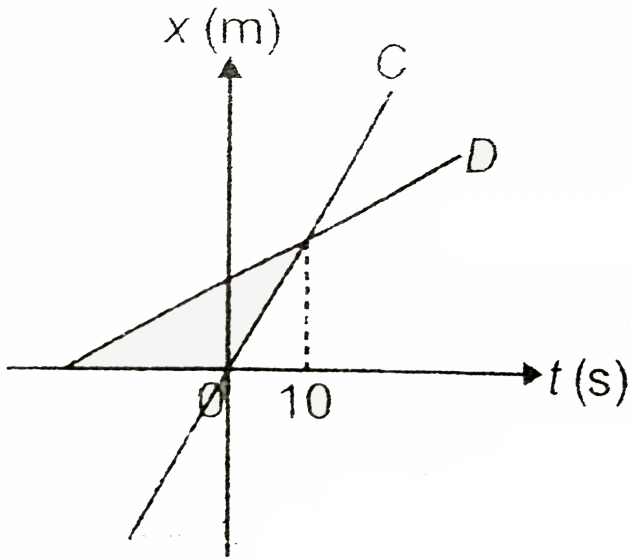

At t = 10 s

    A. C and D are at the same position

    B. C and D have the same velocity

    C. The velocity of D is greater than the velocity of C

    D. C is in front of D

Answer: A

Assignment Section E

1. STATEMENT - 1 : The instantaneous velocity is always tangential to the path

and

STATEMENT - 2 : The slope of position-time graph represents the velocity.

   A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

   B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

   C. Statement-1 is True, Statement-2 is False

   D. Statement-1 is False, Statement-2 is True

Answer: B

2. STATEMENT - 1 : Distance travelled by a particle moving rectilinearly may not be equal to magnitude of displacement of the particle.

and

STATEMENT - 2 : Distance travelled is a scalar but displacement is a vector.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

3. STATEMENT - 1 : Zero velocity of a particle does not mean zero acceleration.

and

STATEMENT - 2 : The moment at which velocity is zero, its rate of change may be non-zero.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-3

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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4. STATEMENT - 1 : A particle is thrown by a man from ground. Minimum speed of the particle in the subsequent motion may not be zero. (Air resistance is neglected).

and

STATEMENT - 2 : Acceleration of the particle is never zero during the motion of the particle

  A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-4

  B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-4

  C. Statement-1 is True, Statement-2 is False

  D. Statement-1 is False, Statement-2 is True

Answer: B

5. STATEMENT - 1 : A positive acceleration of a body can be associated with a slowing down of the body.

and

STATEMENT - 2 : Acceleration is a vector quantity.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: B

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6. STATEMENT - 1 : Two bodies projected vertically upward with different initial speeds cover same distances in last second of their upward journey.

and

STATEMENT - 2 : For uniformly accelerated motion, distance travelled in a time interval before coming to rest does not depend on initial speed.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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7. STATEMENT - 1 : A particle is projected vertically upwards with speed v. Starting from initial point, its average velocity is less than average speed than average speed when particle is returning back to ground.

and

STATEMENT - 2 : When particle turns back, its displacement is less than distance covered.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

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8. STATEMENT - 1 : Acceleration of a car moving on a circular track of radius r with speed v , for the person sitting in the car is zero.

and

STATEMENT - 2 : In the frame of reference of a person sitting in a car, the car always remains at rest irrespective of its motion with respect to ground.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False, Statement-2 is True

Answer: A

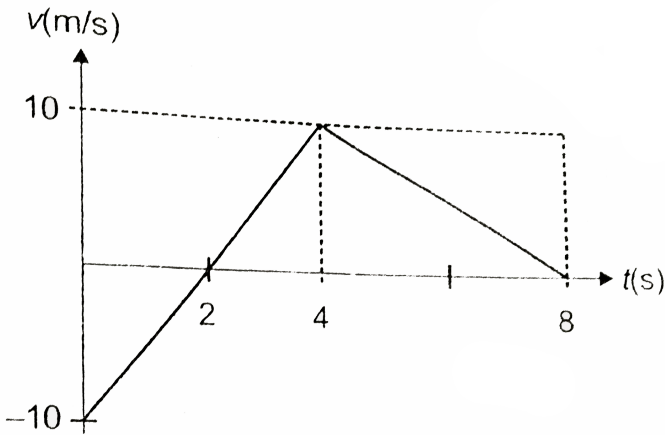▶ Watch Video Solution

1. For the v-t graph shown in figure find the acccelertion in 0-4 sec and 4-8 sec.

2. Two trains each of length 100 m are moving with speeds 54 km/h (for Train - 1) and 90 km/h (for Train-2) on two parallel tracks. Match the

entries given in column I with the entries given in column II

Column I	Column
(A) Time taken in passing (in s)	(p) 125
(B) Distance travelled by 1st train during passing (in m)	(q) 500
(C) Distance travelled by 2nd train during passing (in m) if both trains are moving in same direction	(r) 20
(D) Displacement of 1st train w.r.t. 2nd train in 2 s (in m)	(s) 300
	(t) 5

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1. The velocity of a particle moving on the x-axis is given by $v = x^2 + x$, where x is in m and v in m/s. What is its position (in m) when its acceleration is $30m/s^2$.

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2. Does the escape speed of a body from the earth depend on.

(i)mass of the body

(ii)the location from where it is projected

(iii)the direction of projection
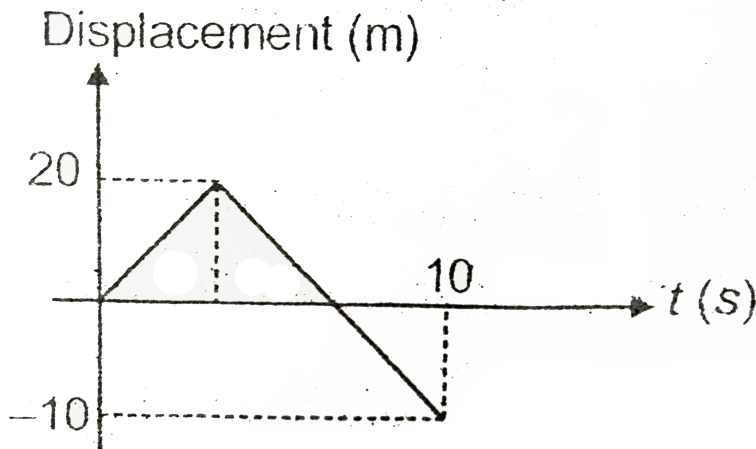
(iv)the height of the location from where the body is launched?

3. The diagram shows the displacement-time graph for the particle moving in a straight line. What is average speed (in m/s) for the interval 0-10 s?

Displacement (m)

4. A boy standing on the top of a tower of height 54 ft. throws a packet with a speed of 20 ft/s directly aiming towards his friend standing on the ground at a distance of 72 ft from the foot of the tower. The packet falls short of the person on the ground by $x \times \dfrac{16}{3}$ ft. The value of x is

Assignment Section H

1. STATEMENT - 1 : Distance is a vector quantity and displacement is a scalar quantity.

STATEMENT - 2 : A person makes a round - trip journey, finishing where she started. The displacement for the trip is 0 and the distance is some nonzero value.

STATEMENT - 3 : A person starts at position A and finishes at position B. The distance for the trip is the length of the segment measured from A to B.

A. T T T

B. F T F

C. F F F

D. F T T

Answer: B

2. STATEMENT - 1 : If person walks in a straight line and never changes direction, then the distance and the displacement will have exactly the same magnitude.

STATEMENT - 2 : The phrase "20 m, northwest" likely describe the distance for a motion.

STATEMENT - 3 : The phrase "20 m, west" likely describes the displacement for a motion

A. TFT

B. TTF

C. FTT

D. TTT
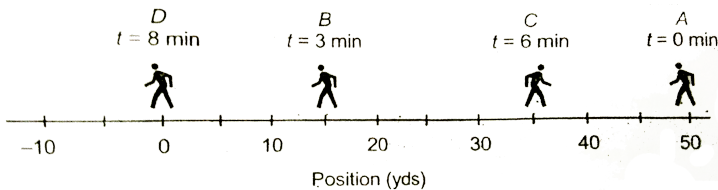
Answer: A

3. STATEMENT - 1 : The diagram below depicts the path of a person walking to and fro from position A to B to C to D. The distance for this motion is 100 yds.

STATEMENT - 2 : For the same diagram below, the displacement is 50 yds

STATEMENT - 3 : Position-time graphs cannot be used to represent the motion of object with accelerated motion.

A. TTT

B. FTF

C. FFF

D. TFF

Answer: C

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4. STATEMENT - 1 : The slope on a position-time graph is representative of the acceleration of the object.

STATEMENT - 2 : A straight, diagonal line on a position-time graph is representative of an onject with a constant velocity.

STATEMENT - 3 : I an object is at rest, then the position-time graph must be a horizontal line located on the time-axis.

A. FFF

B. FTT

C. FTF

D. TTT

Answer: C

---

5. STATEMENT - 1 : All accelerated object are represented on position-time graphs by curved lines.

STATEMENT - 2 : An object with a positive velocity will be represented on a position-time graph by a line with a positive slope.

STATEMENT - 3 : An object with a negative velocity will be represented on a position-time graph by a line with a negative slope.

A. FTT

B. TTT

C. TFT

D. FTF

Answer: B

6. STATEMENT - 1 : A falling skydiver which has reached terminal velocity is considered to be in a state of free fall.

STATEMENT - 2 : A ball is thrown upwards and is rising towards its peak. As it rises upwards, its speed increases

STATEMENT - 3 : An object in free fall experiences an acceleration which is independent of the mass of the object

A. FFT

B. TFT

C. FTT

D. TTT

Answer: A

7. STATEMENT - 1 : A ball is thrown upwards, rises to its peak and eventually falls back to the original height. As the ball rises, its acceleration is upwards, as it falls, its acceleration is downwards.

STATEMENT - 2 : A ball is thrown upward, rises to its peak and eventually falls back to the original height. The speed at which it is launched equals the speed at which it lands. (Assume negligible air resistance)

STATEMENT - 3 : A very massive object will free fall at the same rate of acceleration as a less massive object.

A. FFF

B. FTT

C. TTT

D. TFT

Answer: B

8. STATEMENT - 1 : Equation of motion $(v = u + at)$ is applicable even if the acceleration is non-uniform.

STATEMENT - 2 : The initial velocity of a body is u and its acceleration is ft where f is a constant and t is time. The displacement in time t is $\left(ut + \dfrac{1}{2} ft^2 \right)$.

STATEMENT - 3 : The area enclosed by the a-t graph and time axis gives the change in velocity of the body.

    A. FFT

    B. TTF

    C. TTF

    D. FTT

Answer: A

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9. STATEMENT - 1 : If the body is moving in the opposite direction of positive motion, then its speed is negative.

STATEMENT - 2 : A scalar quantity is one that must be dimensionless.

STATEMENT - 3 : A body is momentarily at rest when it reverse its direction of motion.
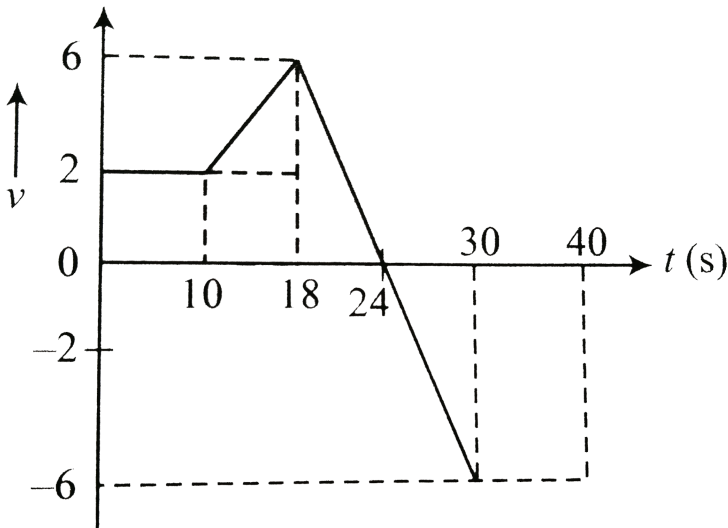
A. FFT

B. TFT

C. TTF

D. FTT

Answer: A

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Assignment Section I

1. A particle moves in a straight line with the velocity as shown in. At $t = 0$, $x = -16m$,

2. A balloon moves up vertically such that if a stone is thrown from it with a horizontal velocity v_0 relative to it the stone always hits the ground at a fixed point $2v_0^2/g$ horizontally away from it. Find the height of the balloon as a function of time.

3. The position of a particle along x-axis at certain time is given below

Determine the following

| t (s)	0	1	2	3
x (m)	−2	0	6	16

(a) Average velocity of particle in first 3 seconds.

(b) Position of particle at the end of 4th second if particle continue the trend.

(c) Acceleration of particle at time t = 3 s

(d) Type of motion

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Assignment Section J

1. The given construction as shown in Fig. 2 (HT) .3, consists of two rhombus with the ratio $3:2$, The vertex A_2 moves In the horizontal direction with a velocity v. Find the velocity of A_1.
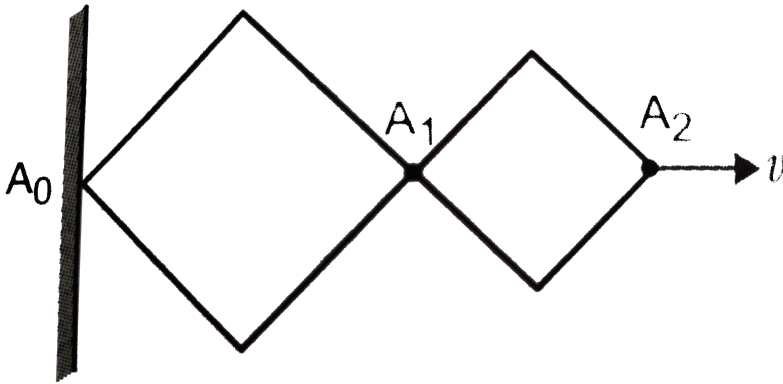
2. The retardation experienced by a moving motor bike after its engine is cut-off , at the instant (t) is given by, $a = -kv^4$, where (k) is a constant. If v_0 is the magnitude of velocity at the cut-off , the magnitude of velocity at time (t) after the cut-off is .