PHYSICS

BOOKS - GR BATHLA & SONS PHYSICS (HINGLISH)

MOTION IN A STRAIGHT LINE

Question

1. A particle is moving in a plane with velocity $\vec{v} = u_0\hat{i} + k\omega\cos\omega t\hat{j}$. If the particle is at origin at $t = 0$, (a) determine the trajectory of the particle. (b) Find its distance from the origin at $t = 3\pi/2\omega$.

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2. (a) A particle is moving eastward with a velocity of 5 m/s. If in 10 s the velocity changes by $5m/s$ northwards. What is the average acceleration

in this time ?

(b) What is the retardation of a moving particle if the relation between time and position is, $t = Ax^2 + Bx$? (where A and B are appropriate constants)

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3. A particle moves along a straight line and its velocity depends on time as $v = 6t - 3t^2$ where 'v' is in m/sec and 't' is in sec. Find average velocity and average speed for first four seconds.

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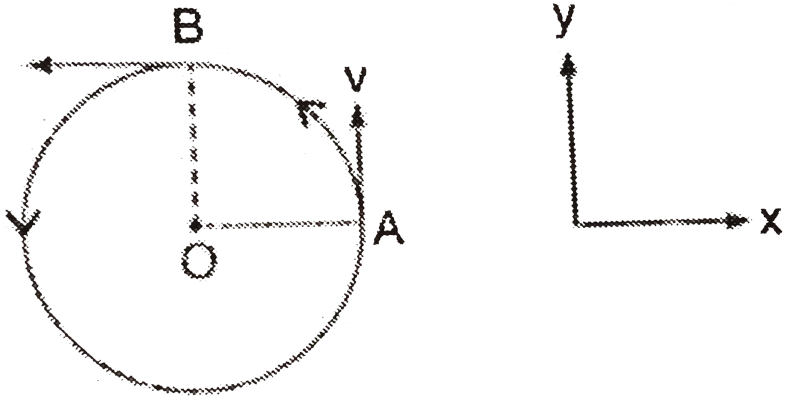
4. A particle starts moving on a circular track of radius $\frac{20}{\pi}m$ from point A with a uniform speed of $20m/s$. It reaches to point B after some time. Find :

(a) Distance travelled by particle from A to B and its displaement for the same duration.

(b) Find the average speed, average velocity and average acceleration from A to B



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5. Find the average velocity of a particle moving along a straight line such that its velocity changes with time as $v(m/s) = 4\sin.\frac{\pi}{2}t$, over the time interval $t = 0$ to $t = (2n-1)2$ seconds. (n being any $+$ ve integer).

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6. (a) If the initial velocity of a particle is u and collinear acceleration at any time t is at, calculate the velocity of the particle after time t.

(b) A particle moves along a straight line such that its displacement at any time t is given by $s = \left(t^3 - 6t^2 + 3t + 4\right)m$. What is the velocity of the particle when its acceleration is zero?

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7. A particle starts moving from the position of rest under a constant acc. If it travels a distance x in t sec, what distance will it travel in next t sec ?

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8. An aeroplane requires for take off a speed of $80km/h$ the run on the ground being 100 m The mass of aeroplane is 10^4 kg and coefficient of friction between aeroplane and ground is 0.2 What is the maximum force required by the engine of the plane for take off ?

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9. A particle moving with a velocity equal to $0.4m/s$ is subjected to an acceleration of $0.15m/s^2$ for $2s$. in a direction at the right angle to its direction of motion. The resultant velocity is

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10. At the insutant the traffic light turns green a car starts with a constant acc. $2m/s^2$. At the same instant a truck, travelling with a constant speed of $10m/s$, overtakes and passes the car. (a) How far beyond the starting point will the car overtake the truck ? (b) How fast will the car be travelling at that instant? (c) Draw s/t curves for each vehicle.

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11. A car accelerates from rest at a constant rate α for some time, after which it decelerates at a constant rate β, to come to rest. If the total time elapsed is t seconds. Then evalute (a) the maximum velocity reached and (b) the total distance travelled.

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12. A particle starts from rest and moves with an acceleration of $a = \{2 + |t - 2|\} m / s^2$ The velocity of the particle at $t = 4$ sec is

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13. A particle of mass m moves on the x-axis as follows. It starts from rest at t = 0 from the point x = 0 and comes to rest at t = 1 at the point x = 1 No other information is available about its motion at intermediate time $(0 < t < 1)$. If α denotes the instantaneous acceleration of the particle, then

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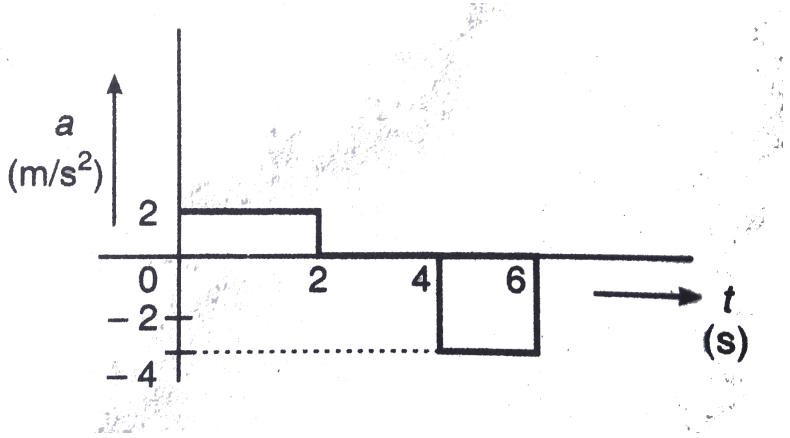
14. The acceleration versus time graph of a particle moving along a straight line is shown in the figure. Draw the respective velocity-time graph Given $v = 0$ at $t = 0$.



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15. A ball is projected vertically up with an initial speed of $20m/s$ on a planet where acceleration due to gravity is $10m/s^2$

(a) How long does it takes to reach the highest point?

(b) How high does it rise above the point of projection?

(c) How long wil it take for the ball to reach a point $10m$ above the point of projection?

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16. A juggler throws ball into air. He throus one whenever the previus one is at its highest point. How high do the balls rise if he throus (n) balls each second. Acceleration the to gravity=g`.

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17. A pebble is thrown vertically upwards from a bridge with an initial velocity of 4.9 m/s. It strikes the water after 2s. If acc. Due to gravity of $9.8m/s^2$ (a) what is the height of the bridge ? (b) with what velocity does the pebble strike the water ?

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18. Usually average speed means the rationof total distace travelled to the total time elapsed. However, sometimes thephrase ` average speed can be the magnitude of the average velocity. Are the two same ? Discuss.

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19. (a) Is it possible to be accelerating if you are travelling at constant speed?

(b) Is it possible to move on a curved path with zero acceleration, constant acceleration, variable acceleration

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20. What does $d\left|\vec{v}\right|/dt$ and $\left|d\vec{v}/dt\right|$ represent ? Can these be equal ? Can. (a) $d\left|\vec{v}\right|/dt = 0$ while $\left|d\vec{v}/dt\right| \neq 0$ (b) $d\left|\vec{v}\right|/dt \neq 0$ while $\left|d\vec{v}/dt\right| = 0$?

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21. A truck and a car are brought to a hault by application of same braking force. Which one will come to stop in a shorter distance if they are moving with same (a) velocity (b) kinetic energy and (c) momentum ?

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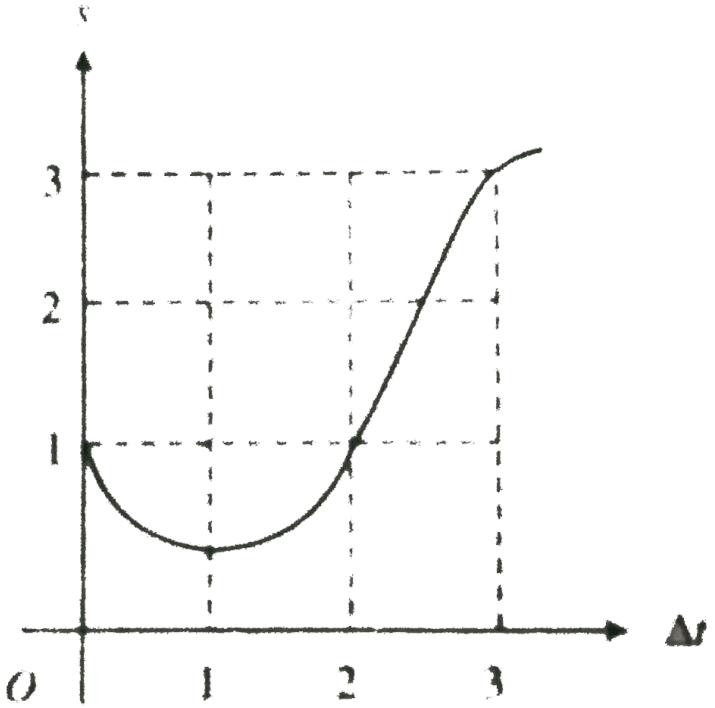
22. A cockroach moves rectilinearly such that after sometime t_0 let its (instantaneous) velocity be equal to its average velocity over that time. Referring to the $S\Delta t$ graph as shown in , for the motion of the cockroach, find the time t_0 and the average velocity of the cockroach over

the time t_0



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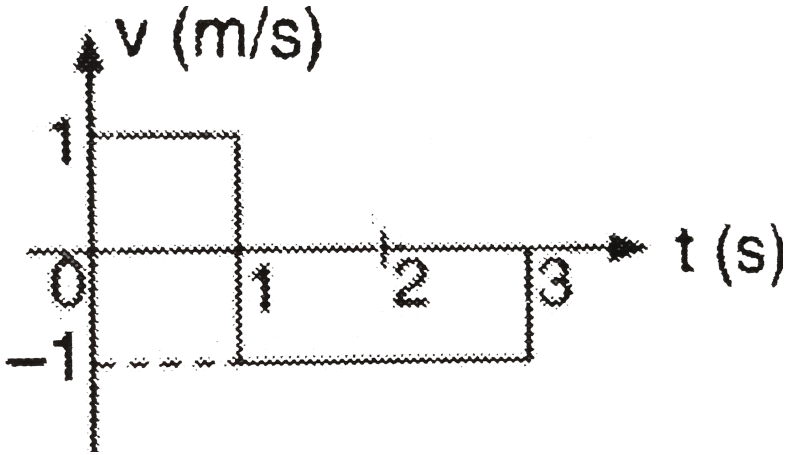
23. (The $v-t$ graph) A particle moving in x-axis is given. Find the distance and displacement of the particle during two seconds from

starting.



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24. A diwali rocket moves vertically up with a constant acceleration $a_1 = 20//3ms^{-2}$. After sometimes, its fuel gets exhausted and then it falls freely with an acceleration $a_2 = 10ms^{-2}$, If the maximum height attained by the diwali rocket is (h), using graphical method, find its speed when the fuel is just exhausted. Assume $h = 50m$.

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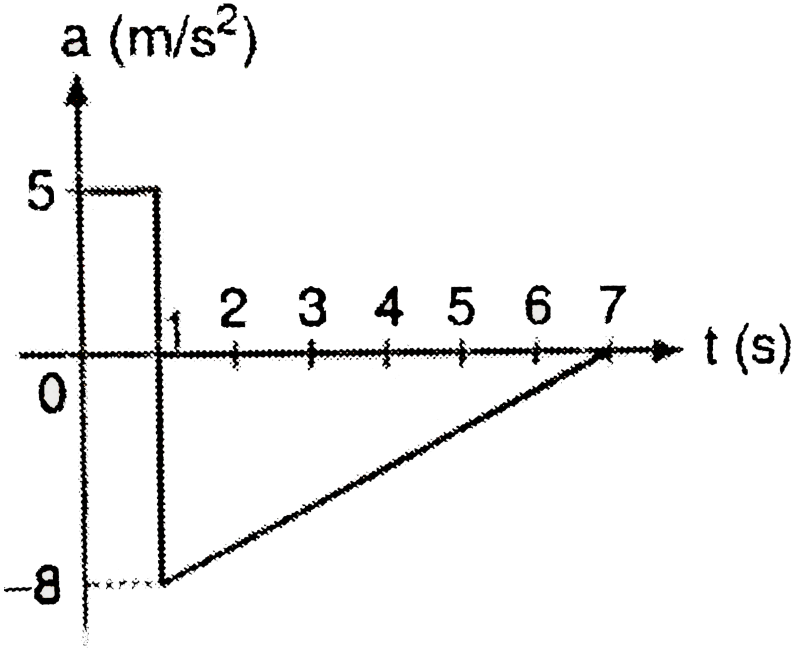
25. A particle moves vertically with an upward initial speed $v_0 = 5m/s$. If its acceleration varies with time as shwon in $a - t$ graph in the fig. 4.30, find the velocity of the particle at $t = 7s$.



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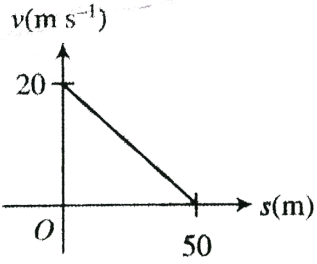
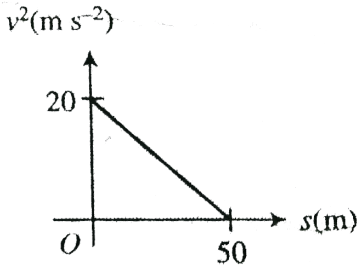
26. The $v - s$ and $v^2 - s$ graph are given for two particles. Find the accelerations of the particles at $s = 0$.





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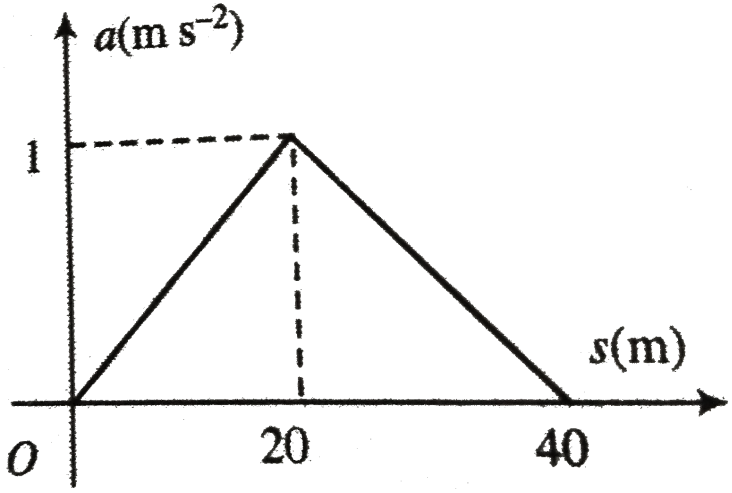
27. A racing motor boat speeds up in a straight line in a lake, from rest. Referring to the acceleration-displacement graph for the speeding boat find its speed when it passes a raft at a distance of $40m$ from the starting point.



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28. When the velocity is constant, can average velocity over any time interval differ from instantaneous velocity at any instant ? If so, give an example, if not, explain why?

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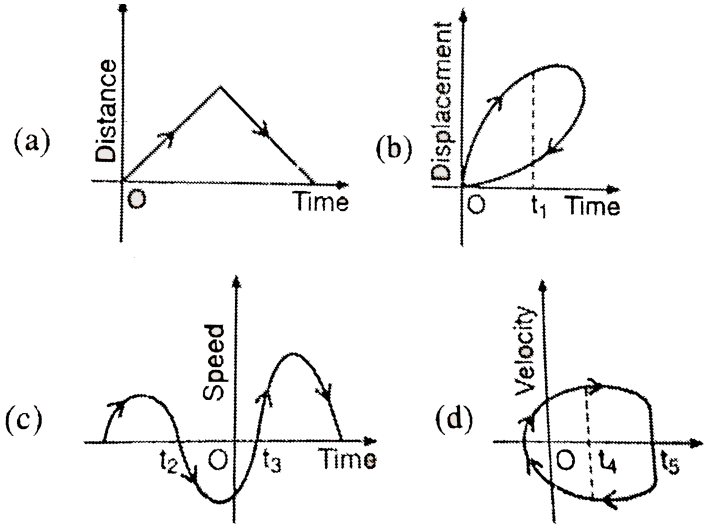
29. Explain with reasons which of the following gaphs can possibly represent the motion of a particle observed in nature ?



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30. Two balls of different masses are thrown vertically upwards with the same speed . They pass through the point of projection in their downward motion with the same speed (Neglect air resistance).

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31. A man standing on the edge of a cliff throws a stone straight up with initial speed (u) and then throws another stone straight down with same initial speed and from the same position. Find the ratio of the speeds. The stones would have attained when they hit ground at the base of the cliff.

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32. From top of a huilding a ball is dropped while another is frpjected horizontally at the same tme . (a) Which ball will strike the ground first ?

(b) Which ball will strike the ground with more speed.

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33. A steam boat goes across a lake and comes back : (a) on a quiet day when the water is still and (b) on a rough day when there is a uniform current so as to help the journey onward and to impede the journey backward. If the speed of launch on both days same, in which case will it complete the journey in lesser time?

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34. Four persons K,L,M,N are initially at the four corners of a square of side d. Each person now moves with a uniform speed v in such a way that K always moves directly towards L, L directly towards M, M directly towards N, and N directly towards K. The four persons will meet at a time..... .

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Problem

1. A rocket is fired vertically up from the ground with a resultant vertical acceleration of $10m/s^2$. The fuel is finished in 1 min and it continues to move up. (a) What is the maximum height reached? (b) Afte2r how much time from then will the maximum height be reached?(Take $g = 10m/s^2$)

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2. A body released from a great height, falls freely towards the earth. Another body is released from the same height exactly one second later. Then the separation between two bodies, two seconds after the release fo second body is.

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3. If the body travels half its total path in the last second of its fall from rest, find:

(a) The time and (b) height of its fall. Explain the physically unacceptable solution of the quadratic time equation. $\left(g = 9.8m/s^2\right)$

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4. A stone is dropped into a well and the sound of inpact of stone on the water is heard after 2.056 sec of the release of stone form the top. If acc. Due to gravity is $980cm/\sec^2$ and velocity of sound in air is $350m/s$, calculate the depth of the well.

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5. Two cars are moving in the same direction with the same speed $30km/h^{-1}$. They are separated by a distance of 4 km. What is the speed of a car moving in the opposite driection if it meets these two card at an interval if ` 5 mimutes.

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6. A person walks up a stalled escalator in 90 s. When standingon the same escalator, now moving, he is carried in 60 s.The time it would take him to walk up the moving escalator will be:

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7. Two trains are headed towards each other on the same straight line, each having a speed of $30kmh^{-1}$. A bird that can fly at $60kmh^{-1}$ flies off one train when they are $60km$ apart and leads directly form the other train, On reaching the other train, to flies back to the first train and so on.

(a) How many trips can the bird make from one train to the other train before they meet ? (b) What is the total distance the bird travels ?

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8. A passenger is standing d metres away from a bus. The bus begins to move eith constat acceleration `a. To catch the bus the passenger runs at a constant speed (v) towards the bus, at what minimum speed he must have ,so that he may catch the bus.

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9. The driver of a train moving at a speed v_1 sights another train at a disane d, ahead of him moving in the same direction with a slower speed v_2. He applies the brakes and gives a constant teradation a to his train. Show that here will be no collision if $d > (v_1 - v_2)^2 / 2a$.

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10. Two particles A and B move with constant velocities v_1 and v_2 along two mutually perpendicular strainght lines. Towards the intersection point O. At moment $t = 0$ the particle were located at distance l_1 and l_2

from O respectively. Find the time when they are nearest and also this shortest distance

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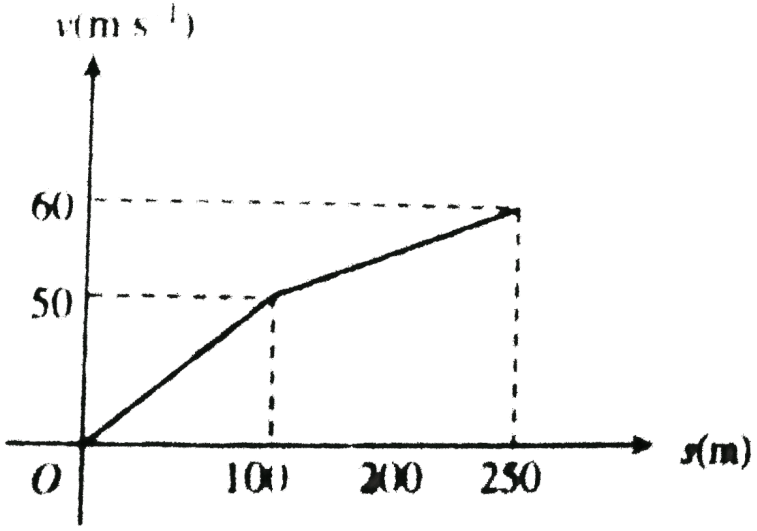
11. The velocity-displacement for a for plane on a straight runway is shown in . Determine the speed and acceleration of the jet plane at $s = 150m.$



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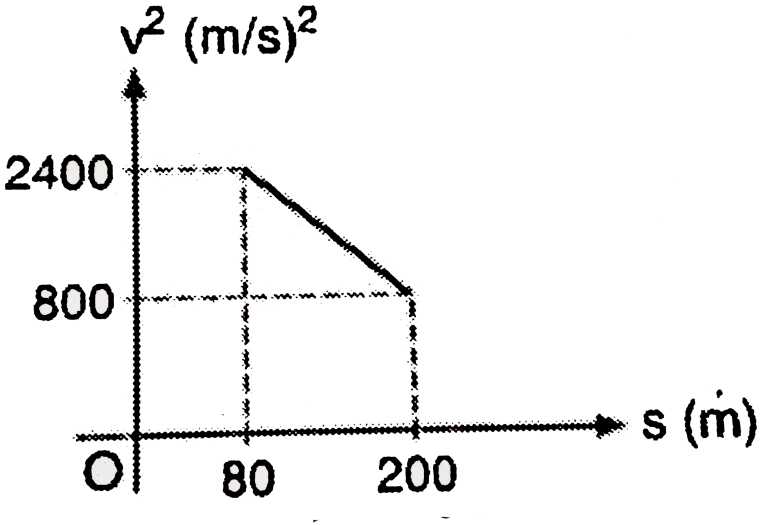
12. A body slows down such that v^2 is varying linearly with displacement 's' as shown in the Fig.4.5. Assuming rectiliear motion, find the :

(a) acceleration of the body

(b) speed of the body when it just cross $100m$

(c) $v - s$ group



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13. An elevator car whose floor to ceiling distance is equal to $2.7m$ starts ascending with constant acceleration $1.2m/s^2$. 2 s after the start, a bolt

begins falling from the ceiling of the car. Find

(a)the time after which bolt hits the floor of the elevator.

(b)the net displacement and distance travelled by the bolt, with respect to earth. (Take $g = 9.8m/s^2$)

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14. Consider a collection of a large number of particles each with speed v. The direction of velocity is randomly distributed in the collection. Show that the magnitude of the relative velocity between a pair of particles averaged over all the pairs in the collection is greater than v.

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Problems and Practice

1. Find the speed of two objects if, when they move unifromly towards each other, they get 4.0 metre closer each sec and when they move

uniformly in the same direction with the original speeds, they get $4.0m$ closer each 10 s.

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2. Snow is falling vertically at a constant speed of $8m/s$. (a) At what angle from the vertical and (b) with what speed do the snow flakes appear to be falling as viewed by the driver in a car travelling on a straight road with a speed of $21.6km/hr$?

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3. Wind is blowing west to east along twoparallelracs. Two trais moving with the same speed in opposite directions on these tracks have the steam tracks. If one stream track isdouble than the other, what is the speed of each train ?

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4. Two inclined planes (AB) and (BC) are placed as shown in Fig. 2 (ABC).3 A particle is projected from the foot of the plane of angle α along its line witn a velocity just sufficient to carry it to the top after which the particle slides down the other inclined plane. Fing the total time it will take to reach the pont (C).

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5. A lawyer seeks your advice in one of his cases. The question is whether a driver was exceeding a $45km/hr$ speed limit before he made an emergency stop, brakes locked and wheels sliding. The length of skid marks on the road was 5 m. The policeman, assuming that maximum deceleration of the car would not exceed the acceleration of a freely falling body $\left(10m/s^2\right)$, arrested the driver for speeding What is your opinion ?

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6. A balloon is ascending at the rate of $9.8m/s$ and is 39.2 m above the ground when a package is dropped. (a) How long does the package take to reach the ground? (b) with what speed does it hit the ground ? $(g = 9.8m/s^2)$

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7. A balloon of mass M descends with an acceleration a_0. The mass that must be thrown out in order to give the balloon an equal upwards acceleration will be

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8. A wooden block of mass $10gm$ is dropped from the top of a cliff $100m$ high. Simultaneously a bullet of same mass is fired from the foot of the cliff vertically upwards with a velocity of $100ms^{-1}$. If the bullet after collision gets embedded in the block, the common velocity of the bullet and the block immediately after collision is $(g = 10ms^{-2})$.

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9. In a detective story a body is found 5 m away from the base of a building and beneath an open window $25m$ above. Would you guess the death to be accidental or not ? Explain your answer. $\left(g = 10m / s^2\right)$

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10. A car waiting at a traffic light starts to move with a constant acceleration of $2.0m / s^2$ when the light truns green. Two second later, a truck moving in the same direction passes the light at a constant speed of $25m / s$ and soon passes the car. Soon the car passes the truck:

(a) How long after the car starts do the two overtakings occur ?

(b) How far from the light does each take place?

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11. At a picnic on a hill, a boy falls over the cliff. Suddenly Shaktiman arrives and dives off the edge $2.0s$ after the starts of the boyd's fall. If the cliff is $100m$ high, what must Shaktiman's initial velocity be if he is to catch the boy just before he reaches the ground ?

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12. A body is released from rest at $t_0 = 0, x_0 = 0$ and moves with constant acceleration. Its position is measured at the equally spaced times $t_1 = \Delta t, t_2 = 2\Delta t, t_3 = 3\Delta t$ and so forth. Prove that displacements $\Delta x_j - x_{j-1}$ which occur in the successive time intervals Δt are in the ratio

$\Delta x_1 : \Delta x_2 : \Delta x_3 ..... \approx 1 : 3 : 5 ...$

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13. A particle moves from rest in a straight line with alternate acceleration and retardation of mahnitudes f and f' during equal

intervals of time t. At the end of $2n$ such intervals prove that the space it has described is

$$\frac{nt^2}{2}[(2n+1)f-(2n-1)f']$$

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14. A helicopter takes off along the vertical with an acceleration $a=3m/s^2$ and zero initial velocity. In a certain time the pilot switches off the engine. At the point of take off, the sound dies away in a time $t_2=30\,\text{sec}$. Determine the velocity of the helicopter at the moment when its engine is switched off assuming that velocity of sound is 320 m/s.

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15. A particle having a velocity $v=v_0 \text{ at } t=0$ is accelerated at a rate $|a|=\alpha\sqrt{v}$, where α is a positive constant. Calculate the distance travelled before the particle is brought to rest.

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16. A small stone of mass m is thrown vertically upwards with an initially speed v. If the air resistance at speed v is mkv^2, where k is a constant, show that the strone returns to the starting point with a speed $v\left(1+\frac{kv^2}{g}\right)^{-1/2}$

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Objective question

1. A person travels along a straight road for the first half length with a constant speed v_1 and the second half length with a constant speed v_2. The average speed V is:

A. $(v_1+v_2)/2$

B. $2v_1v_2/(v_1+v_2)$

C. $(v_1v_2)^{1/2}$

D. $(v_2 / v_1)^{1/2}$

Answer: B

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2. A motorist travels from A to B at a speed of $40km / hr$ and returns at a speed of 60 km/hr. His average speed will be:

A. $40km / hr$

B. $48km / hr$

C. $50km / hr$

D. $60km / hr$

Answer: B

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3. A train of $150m$ length is going toward north direction at a speed of $10ms^{-1}$. A parrot flies at a speed of $5ms^{-1}$ toward south direction parallel to the railway track. The time taken by the parrot to cross the train is equal to.

A. $30s$

B. $15s$

C. $8s$

D. $10s$

Answer: D

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4. The displacement s of a point moving in a straight line is given by:

$s = 8t^2 + 3t - 5$

s being in cm and t in s. The initial velocity of the particle is:

A. 3 cm/s

B. 16 cm/s

C. 19 cm/s

D. zero

Answer: A

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5. A travelling wave in a stretched string is described by the equation $y = A\sin(kx - \omega t)$ the maximum particle velocity is

A. $A\omega$

B. ω / k

C. $d\omega / dk$

D. x / t

Answer: A

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6. The velocity of a body depends on time according to the equative $v = 20 + 0.1t^2$. The body is undergoing

A. uniform acceleration

B. unifrom retardation

C. non-uniform acceleration

D. zero acceleration

Answer: C

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7. A point moves with uniform acceleration and v_1, v_2, and v_3 denote the average velocities in the three successive intervals of time t_1. t_2, and t_3 Which of the following Relations is correct?.

A. $v_1 - v_2 : v_2 - v_3 = t_1 - t_2 : t_2 + t_3$

B. $v_1 - v_2 : v_2 - v_3 = t_1 + t_2 : t_2 + t_3$

C. $v_1 - v_2 : v_2 - v_3 = t_1 - t_2 : t_1 - t_3$

D. $v_1 - v_2 : v_2 - v_3 = t_1 - t_2 : t_2 - t_3$

Answer: B

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8. The relation between time t and displacement x is $t = \alpha x^2 + \beta x$, where α and β are constants. The retardation is

A. $2\alpha v^3$

B. $2\beta v^3$

C. $2\alpha\beta v^3$

D. $2\beta^2 v^3$

Answer: A

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9. How long will it take to stop a car travelling at a speed of $20m/\sec$, if the uniform acc. during braking is $-5m/s^2$?

A. $100s$

B. $4s$

C. $(1/4)s$

D. $(1/100)s$

Answer: B

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10. A body starting from rest covers a distance of 9 m in the fifth second. The acceleration of the body is:

A. $2m/s^2$

B. $0.2m/s^2$

C. $1.8m/s^2$

D. $4m/s^2$

Answer: A

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11. A car is moving along a straight road with a uniform acceleration. It passes through two points P and Q separated by a distance with velocity $30km/h$ and $40km/h$ respectively. The velocity of the car midway between P and Q is

A. $33.3km/hr$

B. $20\sqrt{3}km/hr$

C. $25\sqrt{2}km/hr$

D. $35km/hr$

Answer: C

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12. A particle starts moving from the position of rest under a constant acc. It travels a distance x in the first 10 sec and distance y in the next 10 sec, then:

A. $y = x$

B. $y = 2x$

C. $y = 3x$

D. $y = 4x$

Answer: C

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13. Tripling the speed of the motor car multiplies the distance needed for stopping it by

A. 3

B. 6

C. 9

D. some other number

Answer: C

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14. A car travelling at a speed of 30 km / hour is brought to a halt in 8 m by applying brakes. If the same car is travelling at 60 km / hour , it can be brought to a halt with the same braking force in

A. 8 m

B. 16 m

C. 24 m

D. 32 m

Answer: D

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15. A truck and a car moving with the same KE are brought to rest by the application of brakes which provide equal retarding force. Which of them will come to rest in a shorter distance ?

A. The truck

B. The car

C. Both will travel same distance before coming to rest

D. The distance of travel will depend on the horse power of the vehicle

Answer: C

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16. A body sliding on a smooth inclined plane requires $4s$ to reach the bottom, starting from rest at the at the top. How much time does it take to cover ont-foruth the distance startion from rest at the top?

A. 1 s

B. 2 s

C. 4 s

D. 16 s

Answer: B

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17. A body of mass m slides down an inclined plane making an angle of 45° with the horizontal. If the coefficient of friction between the body

and the plane be 0.3, the acceleration of the body is approximately equal to :

A. 0.22 g

B. 0.30 g

C. 0.49 g

D. 0.70 g

Answer: C

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18. Check up only the correct statement in the following.

A. A body has a constant velocity and still it can have a varying speed

B. A body has a constant speed but it can have a varying velocity

C. A body having constant speed cannot have any acceleration

D. A body in motion under a force acting upon it must

Answer: B

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19. An electron of mass m_e initially at rest moves through a certain distance in a uniform electric field in time t_1. A proton of mass m_p also initially at rest takes time t_2 to move through an equal distance in this uniform electric field.Neglecting the effect of gravity, the ratio of t_2 / t_1 is nearly equal to

A. 1

B. $(m_p / m_e)^{1/2}$

C. $(m_e / m_p)^{1/2}$

D. 1836

Answer: B

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20. A particle moving in a straight in a straight line has velocity and displacement equation as

$v = 4\sqrt{1+s},$

where v is in m/s and s is in m. The initial velocity of the particle is:

A. 4 m/s

B. 16 m/s

C. 2 m/s

D. zero

Answer: A

Watch Video Solution

21. Starting from rest a particle moves in a straight line with acceleration

$a = \left(25 - t^2\right)^{1/2} m/s^2 \quad \text{for} \quad 0 \leq t \leq 5s$

$a = \frac{3\pi}{8} m/s^2 \quad \text{for} \quad t > 5s$

The velocity of particle at $t = 7s$ is:

A. 11 m/s

B. 22 m/s

C. 33 m/s

D. 44 m/s

Answer: B

Watch Video Solution

22. The motion of a body falling from rest in a resisting medium is described by the equation $(dv)/(dt) = a - bv$ where a and b are constant . The velocity at any time t is given by

A. $\frac{A}{B}(1 - e^{Bt})$

B. $A\left(1 - e^{-B^2t}\right)$

C. Abe^{-1}

D. $AB^2(1 - t)$

Answer: A

Watch Video Solution

23. If a light and a heavy body are released from same height:

A. heavier body hits the ground with greater velocity

B. lighter body hits the ground with greater velocity

C. both hits the ground with same velocity

D. which one will hit the ground with greater velocity depends on their shape

Answer: C

Watch Video Solution

24. Two bodies of different masses m_a and m_b are dropped from two different heights, viz, a and b. The ratio of time taken by the two to drop

through these distance is:

A. $a : b$

B. $m_a / m_b : b / a$

C. $\sqrt{a} : \sqrt{b}$

D. $a^2 : b^2$

Answer: C

Watch Video Solution

25. Two bodies one held 30 cm directly above the other are relased simultaneously and fall freely under gravity. After 2 sec their relative separation will be :

A. 10 cm

B. 20 cm

C. 30 cm

D. zero

Answer: C

Watch Video Solution

26. A body is released from the top of a tower of height h. It takes t sec to reach the ground. Where will be the ball after time $\frac{t}{2}$ sec?

A. At $(h/4)$ m from the ground

B. At $(h/2)m$ from the ground

C. At $(3h/4)m$ from the ground

D. Depends upon the mass and volume of the ball

Answer: C

Watch Video Solution

27. A body is released from a great height and falls freely towards the earth. Exactly one sec later another body is released. What is the distance between the two bodies 2 sec after the release of the second body ?

A. 4.9 m

B. 9.8 m

C. 24.5 m

D. 50 m

Answer: C

Watch Video Solution

28. A body falls from rest freely under gravity with an acceleration of $9.8m/s^2$. Neglecting air resistance, the distance travelled by the body during the third second of its motion will be:

A. 14.7 m

B. 24.5 m

C. 19.6 m

D. 29.4 m

Answer: B

Watch Video Solution

29. A stone is thrown upwards from the surface of the earth with an initial speed of 5 m/s. The stone comes to rest at a height of : $(g = 1000\text{dyne}/g)$

A. 1.25 m

B. 12.5 m

C. 125 m

D. 2.45 m

Answer: A

Watch Video Solution

30. An object is projected upwards with a velocity of 4.9 m/s. It will strike the ground in approximately

A. 2 s

B. 1 s

C. 1.5 s

D. 0.5 s

Answer: B

Watch Video Solution

31. A boy throws balls into air.He throws one, whenver the previous one is at its highest point. How high do the balls rise if he throws one ball each

sec ?

A. 19.6 m

B. 9.8 m

C. 4.9 m

D. 2.45 m

Answer: C

Watch Video Solution

32. A pebble is thrown vertically upwards from a bridge with an height of the bridge is :

A. 19.6 m

B. 14.7 m

C. 9.8 m

D. 4.9 m

Answer: C

View Text Solution

33. A ball is thrown vertically upwards with a speed of $10m/s$ from the top of a tower 200 m height and another is thrown vertically downwards with the same speed simultaneously. The time difference between them on reaching the ground is $\left(g = 10m/s^2\right)$

A. 12

B. 6

C. 2

D. 1

Answer: C

Watch Video Solution

34. A wooden block is dropped from the top of a cliff 100m high and simultaneously a bullet of mass 10 g is fired from the foot of the cliff upwards with a velocity of $100m/s$. The bullet and wooden block will meet each other after a time:

A. 10 s

B. 0.5 s

C. 1 s

D. 7 s

Answer: C

Watch Video Solution

35. A stone is dropped into a lake from a tower 500 metre high. The sound of the splash will be heard by the man approximately after

A. 21 s

B. 10 s

C. 11.5 s

D. 14 s

Answer: C

Watch Video Solution

36. A block slides down a smooth inclined plane when released from the top, while another falls freely from the same point :

A. sliding block will reach the ground first with greater speed

B. freely falling block will reach the ground first with greater speed

C. both the blocks will reach the ground at the same time but with different speeds

D. both the blocks will reach the ground with same speed but the freely falling block first

Answer: D

Watch Video Solution

37. The time taken by a particle to slide down a smooth inclined plane is double the time it would take in falling down through a height equal to the vertical height of the plane. The inclination of the plane with horizontal is :

A. 30°

B. 45°

C. 60°

D. 90°

Answer: A

Watch Video Solution

38. Between two stations a train starting from rest first accelerates uniformly, then moves with constant velocity and finally retarts uniformly to come to rest. If the ratio of the time taken be $1:8:1$ and the maximum speed attained be $60km/h$, then what is the average speed over the whole journey ?

A. 25 km/hr

B. 54 km/hr

C. 40 km/hr

D. 50 km/hr

Answer: A

Watch Video Solution

39. A ball is thrown vertically upwards from the ground. If T_1 and T_2 are the respective time taken in going up and coming down, and the air resistance is not ignored, then

A. $t_1 > t_2$

B. $t_1 = t_2$

C. $t_1 < t_2$

D. t_1 can be greater or smaller depending upon the initial velocity of the body

Answer: C

Watch Video Solution

40. Name the property of bodies due to which they resist change in their state of rest or state of uniform motion along a straight line.

A. mass

B. weight

C. inertia

D. moment of inertia

Answer: C

Watch Video Solution

41. Velocity-time curve for a body projected vertically upwards is with times (s)

A. parabola

B. ellipse

C. hyperbola

D. straight line

Answer: D

Watch Video Solution

42. If earth stands still what will be its effect's on man's weigh

A. Increases

B. Decreases

C. Remains the same

D. none of these

Answer: A

Watch Video Solution

43. 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. $1:2$

B. $1:\sqrt{3}$

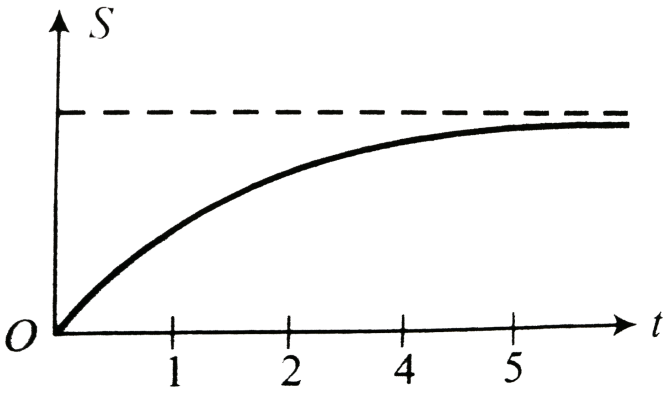
C. $\sqrt{3}:1$

D. $1:3$

Answer: D

Watch Video Solution

44. The displacement of a particle as a function of time is shown in . It indicates



A. the particle starts with a certain velocity but the motion is retarded and finally the particle stops

B. the velocity of the particle is constant throughout

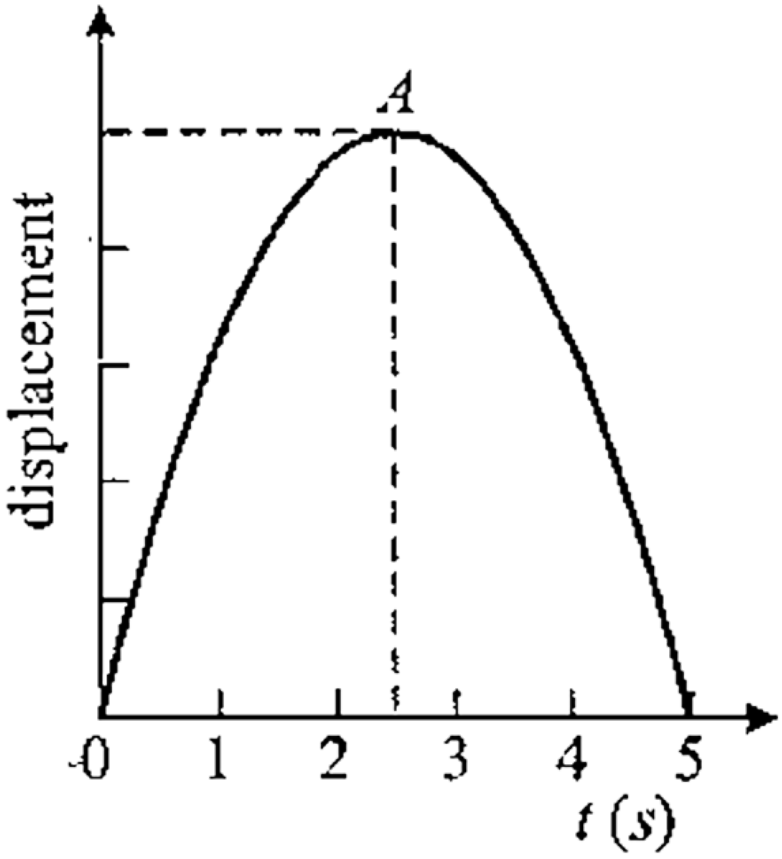
C. the acceleration of the particle is constant

D. the particle starts with a constant velocity, the motion is accelerated and finally the particle moves with another constant velocity

Answer: A

Watch Video Solution

45. The Figure-1.109 shows the displacement-time graph ofa body subject only to the force of gravity. This graph indicates that:



A. at A, acceleration = 0

B. at A, velocity = maximum

C. at A, displacement = 0

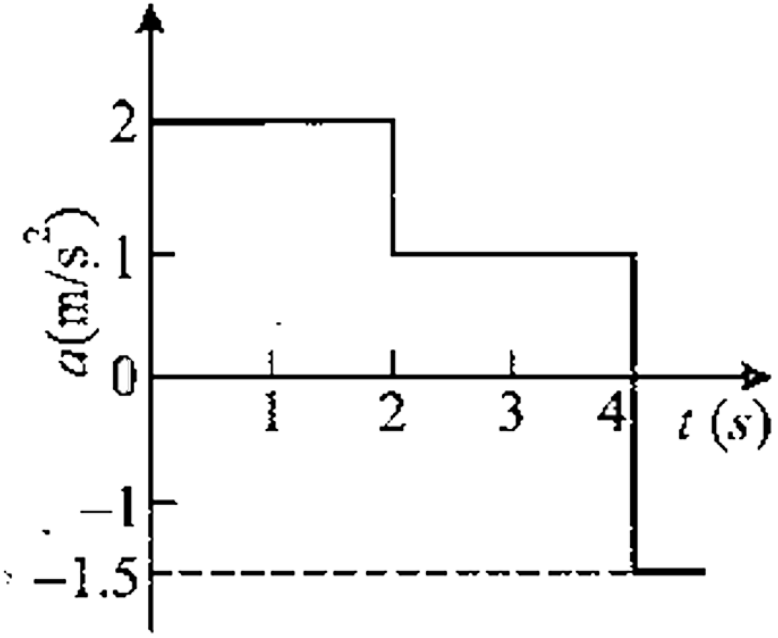
D. the acceleration is constant at all the time

Answer: D

Watch Video Solution

Watch Video Solution

46. The figure-1.125 shows the acceleration versus time graph of a train. If it starts from rest, the distance it travels before it comes to rest is :



A. 30 m

B. 26 m

C. 13 m

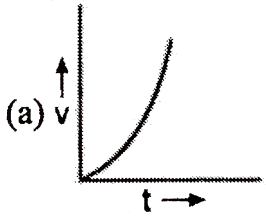
D. 40 m

Answer: B

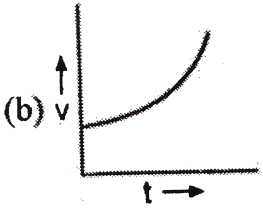
Watch Video Solution

47. Which of the following represents the motion of a body moving in a straight line under constant acceleration ?

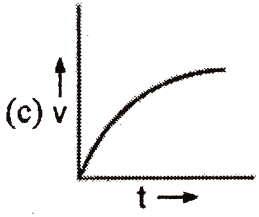
A.



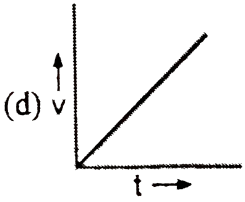
B.



C.



D.

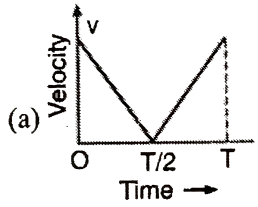


Answer: D

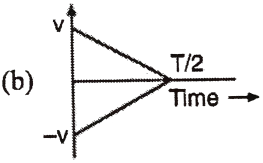
Watch Video Solution

48. A particle is thrown vertically upwards with a velocity v. It returns to the ground in time T. which of the following graphs correctly represents the motion ?

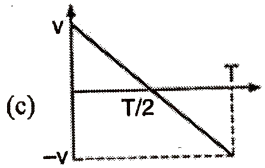
A.



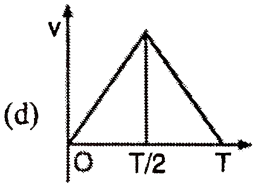
B.



C.



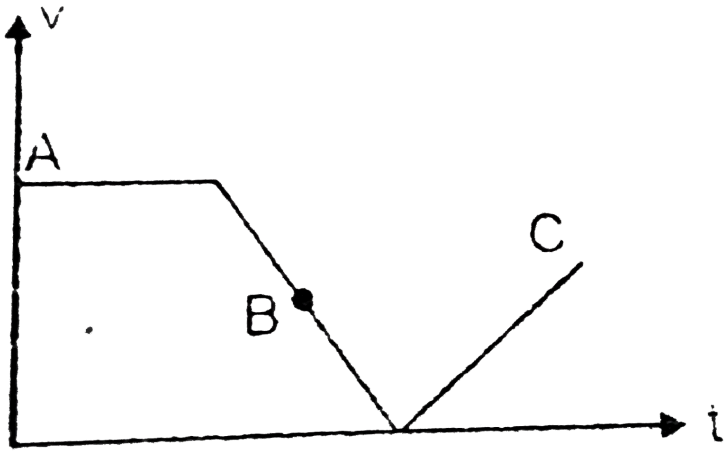
D.



Answer: C

Watch Video Solution

49. The velocity time graph of a body is shown in fig. it indicates that :



A. at B force is zero

B. at B there is a force but towards motion

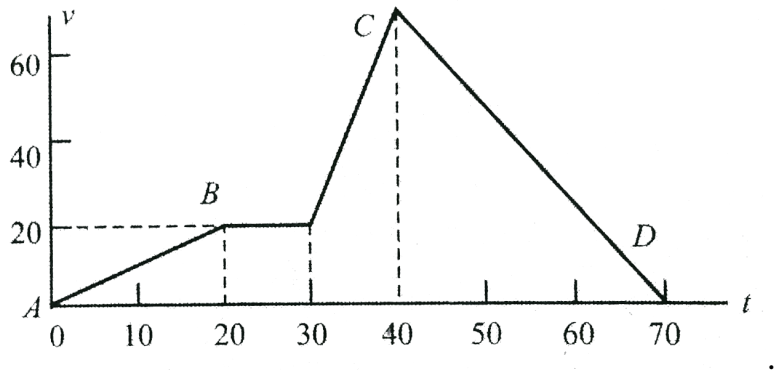
C. at B there is a force that opposes the motion

D. forces are equal at A, B and C

Answer: C

Watch Video Solution

50. The velocity time curve of a moving point is shown in Fig. Find the retardation of the particle for the portion CD.



A. $1cm/\sec^2$

B. $2cm/\sec^2$

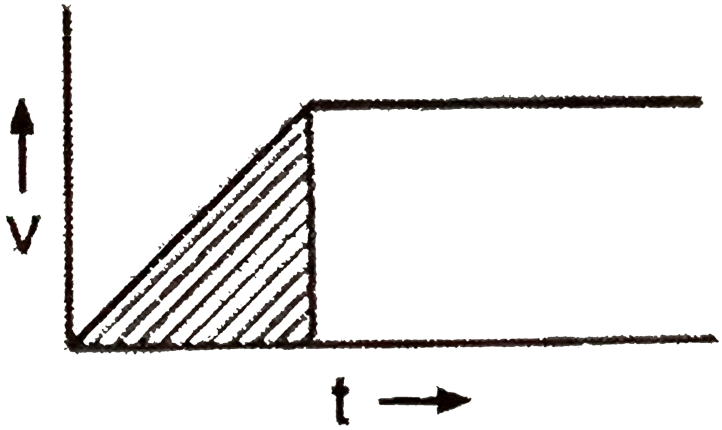
C. $3cm/\sec^2$

D. $4cm/\sec^2$

Answer: B

Watch Video Solution

51. The area of the shaded portion of the graph represents :



A. the average acceleration

B. the maximum KE

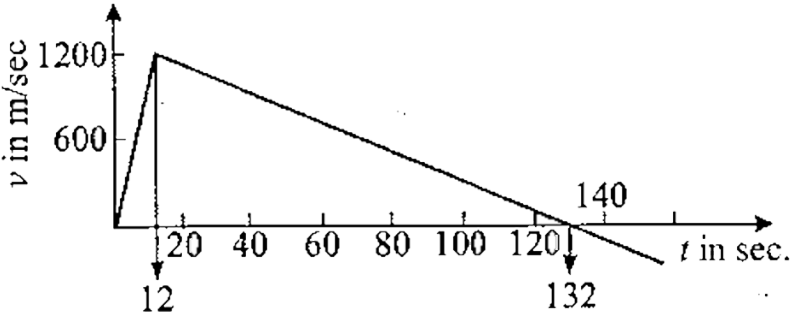
C. the momentum

D. the displacement

Answer: B

Watch Video Solution

52. A rocket is fired upwards. Its velocity versus time graph is shown in the figure-1.131. The maximum height reached by the rocket is:



A. 7.1 km

B. 79.2 km

C. 72 km

D. infinite

Answer: B

Watch Video Solution

53. In the above problem the acceleration of the rocket during burning interval is :

A. $(1200/12)m/s^2$

B. $(12/1200)m/s^2$

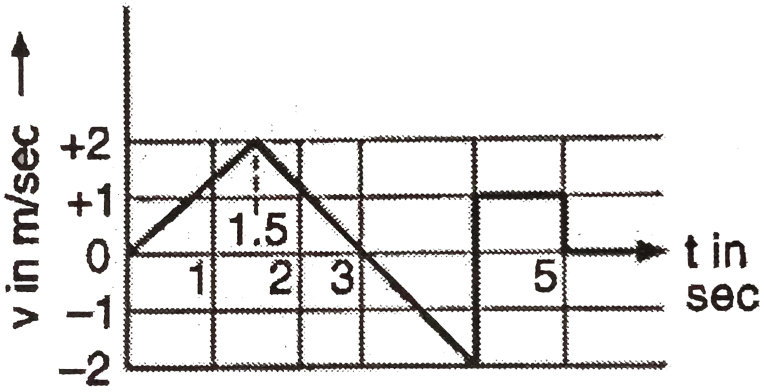
C. $(1200 \times 12)m/s^2$

D. $(1200/132)m/s^2$

Answer: A

View Text Solution

54. The velocity versus time graph of a body moving in a straight line is as follows. The distance travelled by the body is 5 sec is



A. 2 m

B. 3 m

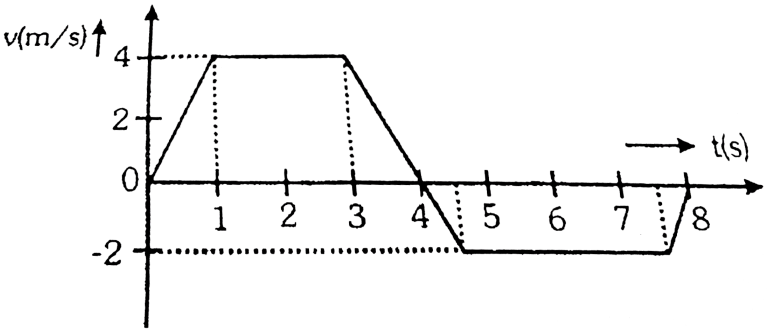
C. 4 m

D. 5 m

Answer: D

Watch Video Solution

55. The velocity-time graph of a linear motion is shown in figure. The displacement & distance from the origin after 8 sec is :-



A. 18 m

B. 16 m

C. 8 m

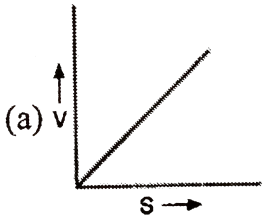
D. 6 m

Answer: D

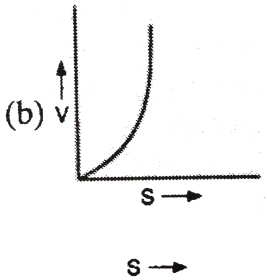
Watch Video Solution

56. A body starting from rest moves along a straight line with a constant acceleration. The variation of speed (v) with distance (s) is represented by the graph:

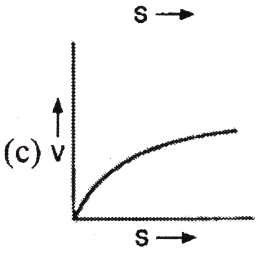
A.



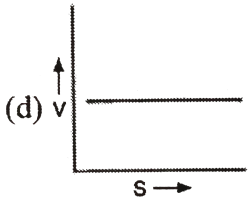
B.



C.



D.



Answer: C

Watch Video Solution

57. A ballon is ascending vertically with an acceleration fo $0.2m/s^2$. Two stones are dropped from it at an interval of $2\sec$. Find the distance between them $1.5\sec$ after the second stone is released. (use $g = 9.8m/s^2$)

A. $\frac{1}{2}t\left(\frac{g+f}{t'}\right)$

B. $\frac{1}{2}t\left(\frac{g+f}{t'+2t'}\right)$

C. $\frac{1}{2}t\left(\frac{g+f}{t'+t'}\right)$

D. $\frac{1}{2}t\left(\frac{gtf}{t'+t'}\right)$

Answer: B

Watch Video Solution

58. A swimmer crosses a flowing stream of width ω to and fro in time t_1. The time taken to cover the same distance up and down the stream is t_2. If t_3 is the time the swimmer would take to swim a distance 2ω in still water, then

A. $T_1 = T_2 . T_3$

B. $T_1^2 = T_2 . T_3$

C. $T_2^2 = T_1 . T_3$

D. $T_2^3 = T_1 . T_2$

Answer: B

Watch Video Solution

59. A street car moves rectilinearly from station A to the next station B (from rest to rest) with an acceleration varying according to the law $f = a - bx,$ where a and b are constants and x is the distance from station A. The distance between the two stations and the maximum velocity are

A. $\frac{2a}{b}$

B. $\frac{a}{b}$

C. $\frac{a}{2b}$

D. $2a - b$

Answer: A

Watch Video Solution

60. A particle starts from rest and moves with acceleration a which varies with time t as $a = kt$ where k is a costant. The displacement s of the particle at time t is

A. $\frac{1}{2}kt^2$

B. $\frac{1}{2}at^2$

C. $\frac{1}{6}at^2$

D. kt^3

Answer: C

Watch Video Solution

61. A boy throws up a ball vertically insided an elevator, with a velocity of 10 m/s relative to the elevator. It takes 1 second for the ball to reach the hand of the boy. The acceleration of the elevator, taking $= 10m/s^2$, is:

A. zero

B. $10m/s^2$

C. $30m/s^2$

D. $20m/s^2$

Answer: B

Watch Video Solution

62. A body of mass m, moving along the positive x direction is subjected to a resistive force $F = Kv^2$ (where K is a constant and v the particle n velocity). If $m = 10kgv = 10m/s$ at $t = 0,$ and $K = 2N(m/s)^{-2}$ the velocity when $t = 2s$ is:

A. $\frac{10}{3}m/s$

B. $2m/s$

C. $-\frac{10}{3}m/s$

D. $\frac{3}{10}m/s$

Answer: B

Watch Video Solution

63. It takes one minute for a passenger standing on an escalator to reach the top. If the escalator does not move it takes him 3 minute to walk up. How long will it take for the passenger to arrive at the top if he walks up the moving escalator ?

A. 2 minute

B. 1.5 minute

C. 0.75 minute

D. 1.25 minute

Answer: C

Watch Video Solution

64. For $\frac{1}{m}$ of the distance between two stations a train is uniformly accelerated and $\frac{1}{n}$ of the distance it is uniformly retarded. It starts from rest at one station and comes to rest at the other. The ratio of the greatest velocity to the average velocity will be:

A. $\left(1+\frac{1}{m}-\frac{1}{n}\right)$

B. $\left(1+\frac{1}{m}+\frac{1}{n}\right)$

C. $\left(\frac{1}{m}+\frac{1}{n}-1\right)$

D. $\left(\frac{1}{m}+\frac{1}{n}\right)$

Answer: B

View Text Solution

65. Two plane, smooth surfaces are parallel to each other and are initiallt a distance of 2 metre apart. The two surfaces approach each other with a velocity of $1cm/\sec$. A particle starts with a velocity of 4 cm/sec from one surface and collides normally and elastically on the other surface from the time the two surfaces start moving. The collisions continues back and forth till the surfaces touch each other. The total distance covered by the particle is :

A. 2 m

B. 1 m

C. 4 m

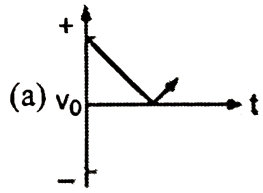
D. 3 m

Answer: C

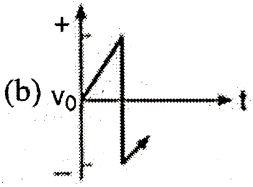
View Text Solution

66. A tennis ball is released so that it falls vertically to the floor and bounces again. Taking velocity upwards as positive, which of the following graphs best represents the variation of its velocity v with time t?

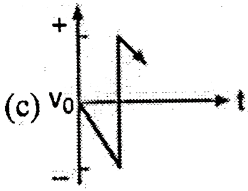
A.



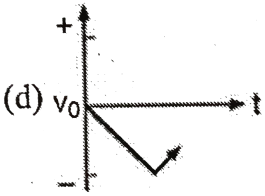
B.



C.



D.



Answer: C

Watch Video Solution

67. Two trains take $3s$ to pass another when going in the opposite directions but only $2.5s$ if the speed of one is increased by $50\,\%$. The time one would take to pass the other when going in the same direcrtioin at their original speed is

A. 10 sec

B. 12 sec

C. 15 sec

D. 18 sec

Answer: C

Watch Video Solution

68. Two bodies move in a straight line towards each other at initial velocities v_1 and v_2 and with constant acceleration a_1 and a_2 directed

against the corresponding velocities at the initial instant. What must be the maximum initial separation between the bodies for which they meet during the motion ?

A. $\frac{v_1^2}{a_1} + \frac{v_2^2}{a_2}$

B. $\frac{(v_1 + v_2)^2}{2(a_1 + a_2)}$

C. $\frac{v_1 v_2}{\sqrt{a_1 a_2}}$

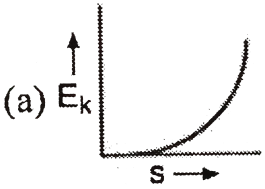
D. $\frac{v_1^2 - v_2^2}{(a_1 - a_2)}$

Answer: B

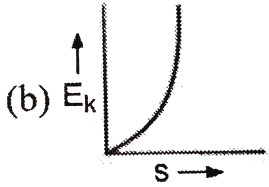
Watch Video Solution

69. A body moves from rest with a constant acceleration. Which one of the following graphs represents the variation of its kinetic energy K with the distance travelled x?

A.



B.



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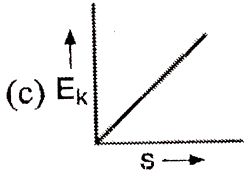

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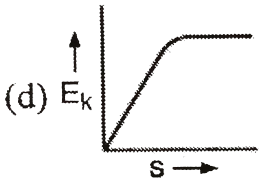


Answer: C

Watch Video Solution

70. A particle travels 10m in first 5 sec and 10 m in next 3 sec. Assuming constant acceleration what is the distance travelled in next 2 sec.

A. 8.33 m

B. 5.67 m

C. 9.37 m

D. 10 m

Answer: A

Watch Video Solution

71. A man starts chasing his dog 10 second after the latter runs along a straight track at a unifrom acceleration of $0.5m/s^2$. The track is 2 km long after which it bends aways into the field. What will be the minimum constant speed of the man so that he may catch the dog before the bend in the track ?

A. 1.50 km/hr

B. 40 m/s

C. 90 km/hr

D. 20 m/s

Answer: C

Watch Video Solution

72. The speed of a body moving on a straight track varies according to $v = 2t + 13 \text{ for } 0 \leq t \leq 5s, v = 3t + 8 \text{ for } 5 < t < 7s$ and $v = 4t + 1 \text{ for } t < 7s$. The distance are measured in metre. The distance in metres moved by the particle at the end of 10 second is :

A. 127

B. 247

C. 186

D. 313

Answer: B

Watch Video Solution

73. The speed of a car was $50km/hr$ for the first 900s, then 40 km/hr for the 50 km and then the car decelerated uniformly at $10km/hr^2$ till it came to rest. The average speed of the car was :

A. 50 km/hr

B. 7.2 m/s

C. 30 km/hr

D. 9.0 m/s

Answer: B

View Text Solution

74. From the top of a tower a stone is thrown up which reaches the ground in time t_1. A second stone thrown down with the same speed reaches the ground in a time t_2. A third stone released from rest from the same location reaches the ground in a time t_3. then:

A. $\frac{1}{t_3} = \frac{1}{t_1} + \frac{1}{t_2}$

B. $t_3^2 = t_1^2 - t_2^2$

C. $t_3 = \frac{t_1 + t_2}{2}$

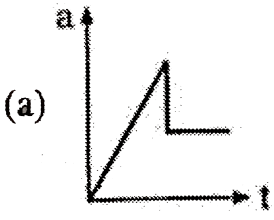
D. $t_3 = \sqrt{t_1 t_2}$

Answer: D

View Text Solution

75. A parachutist steps from an aircraft, falls freely for two second, and then opens his parachute. Which of the following acceleration time $(a - t)$ graphs best represents his downward acceleration a during the first 5 second ?

A.



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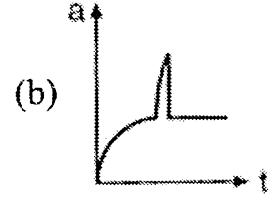
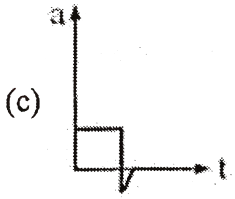
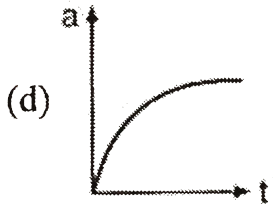


C.



D.



Answer: C

Watch Video Solution

76. With what speed should a body be thrown upwards so that the distances traversed in 5th second and 6th second are equal?

A. 58.4 m/s

B. 49 m/s

C. 98 m/s

D. $\sqrt{98}m/s$

Answer: B

Watch Video Solution

77. A particle moving with a uniform acceleration along a straight line covers distances a and b in successive intervals of p and q second. The acceleration of the particle is

A. $\frac{pq(p+q)}{2(bp-aq)}$

B. $\frac{2(aq-bp)}{pq(p-q)}$

C. $\frac{bp-aq}{pq(p-q)}$

D. $\frac{2(bq-aq)}{pq(p+q)}$

Answer: D

Watch Video Solution

78. A particle's position as a function of time is described as $y(t) = 2t^2 + 3t + 4$. What is the average velocity of the particle from $t = 0$ to $t = 3$ sec ?

A. 3 m/sec

B. 6 m/sec

C. 9 m/sec

D. 12 m/sec

Answer: C

Watch Video Solution

79. A coin is dropped in a lift. It takes time t_1 to reach the floor when lift is stationary. It takes time t_2 when lift is moving up with costant acceleration. Then

A. $t_1 > t_2$

B. $t_2 > t_1$

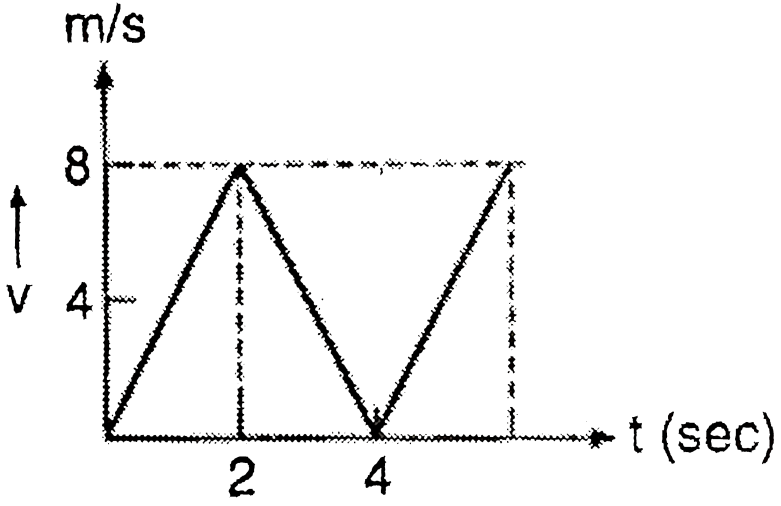
C. $t_1 = t_2$

D. $t_1 > \ > t_2$

Answer: A

Watch Video Solution

80. The $v - t$ graph for a particle is shown. The distance travelled in the first four seconds is:



A. 12 m

B. 16 m

C. 20 m

D. 24 m

Answer: B

Watch Video Solution

81. The velocity of a particle is $v = v_0 + gt + ft^2$. If its position is $x = 0$ at $t = 0$, then its displacement after unit time $(t = 1)$ is

A. $v_0 + g/2 + f$

B. $v_0 + 2g + 3f$

C. $v_0 + g/2 + f/3$

D. $v_0 + g + f$

Answer: C

Watch Video Solution

82. A particle located at $x = 0$ at time $t = 0$, starts moving along with the positive $x - direction$ with a velocity 'v' that varies as $v = a\sqrt{x}$. The displacement of the particle varies with time as

A. $t^{1/2}$

B. t^3

C. t^2

D. t

Answer: C

Watch Video Solution

83. A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m while applying the force and the ball

goes upto 2 m height further, find the magnitude of the force. (Consider $g = 10m/s^2$).

A. 20 N

B. 22 N

C. 4 N

D. 16 N

Answer: A

Watch Video Solution

84. A man throws balls with the same speed vertically upwards one after the other at an interval of 2s. What should be the speed of the throw so that more than two balls are in the sky at any time ? (Given $g = 9.8m/s^2$)

A. Any speed less than 19.6 m/s

B. Only with speed 19.6 m/s

C. More than 19.6 m/s

D. At least 9.8 m/s

Answer: C

Watch Video Solution

85. A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is :

A. $\frac{2v_dv_u}{v_d+v_u}$

B. $\sqrt{v_uv_d}$

C. $\frac{v_dv_u}{v_d+v_u}$

D. $\frac{v_u+v_d}{2}$

Answer: A

Watch Video Solution

86. A point initially at rest moves along x-axis. Its acceleration varies with time as $a = (6t + 5)m/s^2$. If it starts from origin, the distance covered in 2 s is:

A. 20 m

B. 28 m

C. 16 m

D. 25 m

Answer: B

Watch Video Solution

87. A lift is moving with a uniform downward acceleration of $2m/s^2$. A ball is dropped from a height 2 m from the floor of lift. Find the time taken after which ball will strke the floor ? (Take $g = 10m/s^2$)

A. 1.25 m

B. $\sqrt{2}\sec$

C. $2\sec$

D. $\frac{1}{2}\sec$

Answer: D

Watch Video Solution

88. A juggler maintains four balls in vertically upwards motion. He attempts next ball after $\frac{1}{4}$ seconds. For the show to go one, what should be the height for which he thrwos the ball ? $\left(g = 10m/s^2\right)$

A. 1.25 m

B. 5 m

C. 2.5m

D. 1.0 m

Answer: A

Watch Video Solution

89. A particle is projected vertically from the ground, takes time t_1 upto point A, t_2 from point A to B and time t_3 from point B to highest point and back to the ground. Find the height of the middle point of A and B from the ground.

A. $\frac{g}{2}\left[t_1^2+t_2^2+2(t_1t_2+t_2t_3+t_3t_1)\right]$

B. $\frac{g}{4}\left[\frac{t_1^2}{2}+\frac{t_2^2}{2}+t_1t_2+t_1T_3+t_2t_3\right]$

C. $\frac{g}{2}\left[t_1^2+t_2^2+t_1t_2+t_1t_3+t_2t_3\right]$

D. none of the above

Answer: B

View Text Solution

90. A particle moving in a straight line covers half the distance with speed of $3m/s$. The half of the distance is covered in two equal intervals

with speed of $4.5m/s$ and $7.5m/s$ respectively. The average speed of the particle during this motion is :

A. 4.0 m/s

B. 5.0 m/s

C. 5.5 m/s

D. 4.8 m/s

Answer: A

Watch Video Solution

91. A train moving with uniform speed passes a pole in 10 sec and a bridge of length 1200 m in 130 sec. speed of the train is :

A. 90 km/hr

B. 72 km/hr

C. 36 km/hr

D. 54 km/hr

Answer: C

Watch Video Solution

92. 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:

A. $\frac{v-u}{2}$

B. $\frac{v+u}{2}$

C. $\sqrt{v^2-u^2}$

D. $\sqrt{\frac{v^2+u^2}{2}}$

Answer: D

Watch Video Solution

93. For a particle moving along a straight line, its velocity 'v' and displacement 's' are related as $v^2 = cs$, here c is a constant. If the displacement of the particle at $t = 0$ is zero, its velocity after 2 sec is:

A. $\frac{c}{2}s^0$

B. cs^0

C. $\frac{c}{2}s^{-1}$

D. cs^{-1}

Answer: B

Watch Video Solution

94. A car accelerates from rest at a constant rate α for some time, after which it decelerates at a constant rate β, to come to rest. If the total time elapsed is t seconds. Then evalute (a) the maximum velocity reached and (b) the total distance travelled.

A. $\frac{\alpha\beta(\alpha+\beta)}{t}$

B. $\frac{\alpha\beta}{(\alpha-\beta)}t$

C. $\frac{\alpha\beta}{\alpha+\beta}t$

D. $\frac{\alpha+\beta}{\alpha\beta}t$

Answer: C

Watch Video Solution

95. In Q.94, time for which the car decelerates is:

A. $\frac{\alpha}{\alpha+\beta}t$

B. $\frac{\beta}{\alpha+\beta}t$

C. $\frac{\alpha}{\beta}t$

D. $\frac{\beta}{\alpha}t$

Answer: A

View Text Solution

96. In Q.94, total distance travelled by the car is:

A. $\frac{\alpha+\beta}{(\alpha^2+\beta^2)}\frac{t^2}{2}$

B. $\frac{\alpha-\beta}{(\alpha^2+\beta^2)}\frac{t^2}{2}$

C. $\frac{\alpha\beta}{(\alpha-\beta)}\frac{t^2}{2}$

D. $\frac{\alpha\beta}{(\alpha+\beta)}\frac{t^2}{2}$

Answer: D

View Text Solution

97. A person is standing at a distance 's' m from a bus. The bus begins to move with cosntant acceleration 'a' m/s^2 away from the person. To catch the bus, the person runs at a constant speed 'v' m/s towards the bus. Minimum speed of the person so that he can catch the bus is:

A. $\sqrt{2as}$

B. $\sqrt{as}$

C. $\sqrt{3as}$

D. $\sqrt{\frac{as}{3}}$

Answer: A

Watch Video Solution

98. The driver of a train moving at a speed v_1 sights another train at a disane d, ahead of him moving in the same direction with a slower speed v_2. He applies the brakes and gives a constant teradation a to his train. Show that here will be no collision if $d > (v_1 - v_2)^2 / 2a$.

A. $d < \frac{(v_1 + v_2)^2}{a}$

B. $d > \frac{(v_1 - v_2)^2}{2a}$

C. $d > \frac{(v_1 - v_2)^2}{a}$

D. $d < \frac{(v_1 - v_2)^2}{a}$

Answer: B

Watch Video Solution

99. The deceleration exerienced by a moving motor blat, after its engine is cut-off is given by $dv/dt = -kv^3$, where k is constant. If v_0 is the magnitude of the velocity at cut-off, the magnitude of the velocity at a time t after the cut-off is.

A. $\frac{v_0}{2}$

B. v_0

C. $v_0 e^{-kt}$

D. $\frac{v_0}{\sqrt{2v_0^2kt+1}}$

Answer: D

Watch Video Solution

100. A train is moving towards East with a speed 20 m/s. A person is running on the roof of the train with a speed 3 m/s against the motion

of train. Velocity of the person as seen by an observer on ground will be :

A. 23 m/s towards East

B. 17 m/s towards East

C. 23 m/s towards West

D. 17 m/s towards

Answer: B

Watch Video Solution

101. A packet is released from a balloon which is moving upward when the balloon is at a height 200 m above ground. The packet reaches the ground in 8 sec. Speed of the balloon when the packet is released, is: (Take $g = 10m/s^2$)

A. 18 m/s

B. 15 m/s

C. 12 m/s

D. 9 m/s

Answer: B

Watch Video Solution

102. A stone dropped from the top of a tower travels $\frac{5}{9}$ th of the height of tower during the last second of fall. Height of the tower is: (Take $g = 10m/s^2$)

A. 52 m

B. 36 m

C. 45 m

D. 78 m

Answer: C

Watch Video Solution

103. Engine of a car can produce a maximum acceleration $2m/s^2$ and its brakes can produce a maximum retardation $3m/s^2$. Minimum time in which the car can travel a distance 6 km is:

A. 120 sec

B. 100 sec

C. 82 sec

D. 64 sec

Answer: B

Watch Video Solution

104. Train A and B are moving towards each other on the same track with velocities 40 km/hr and 20 km/hr respectivley. A sparrow which can fly at 30 km/hr flies off from train A when the train are 30 km apart. The sparrow directly moves towards the train 'B' and on reaching there flies

back to 'A' and so on. Distance travelled by the sparrow till the two trains will hit is:

A. 60 km

B. 45 km

C. 30 km

D. 15 km

Answer: D

Watch Video Solution

105. A ballon is moving vertically up with a velocity 4 m/s. When it is at a height h, a body is gently released from it. If it reaches ground in 4 sec, the height of balloon, when the body is released, is: (Take $g = 9.8m/s^2$)

A. 62.4 m

B. 42.4 m

C. 78.4 m

D. 82.2 m

Answer: A

Watch Video Solution

106. A packet is dropped from a balloon that is moving upward when the balloon is at a height 60 m above ground. If the speed of the balloon at the moment of release of packet is 5 m/s, time taken by the packet to reach ground will be: (Take $g = 10m/s^2$)

A. 6 sec

B. 4 sec

C. 2 sec

D. 3.2 sec

Answer: B

Watch Video Solution

107. When a motorcyle moving with a unifrom speed 11 m/s is at a distance 24 m from a car, the car starts from rest and moves with a uniform acceleration $2m/s^2$ away from the motorcyle. If the car begins motion at $t = 0$, time at which the motorcyle will overtake the car is $t = ?$

A. 8 sec

B. 6 sec

C. 3 sec

D. 1.5 sec

Answer: C

View Text Solution

108. In Q.107, after the car is overtaken by the motorycle, it will again overtake the motorcycle at what time, from $t = 0$?

A. 8 sec

B. 6 sec

C. 3 sec

D. 1.5 sec

Answer: A

View Text Solution

109. An object is thrown vertically upward with a speed u_1 and it travels 8 m in the last secon of its upward motion. If the object is thrown upward with a speed u_2 which is twice of u_1, the distance now travelled by the object during the last second of its upward journey will be:

A. 32 m

B. 16 m

C. 12 m

D. 8 m

Answer: D

Watch Video Solution

110. A stone dropped form the top of a tower is found to travel $(5/9)$ of the height of tower during last second of its fall. The time of fall is :

A. 2 s

B. 3 s

C. 4 s

D. 5 s

Answer: B

Watch Video Solution

111. A long horizontal belt is moving from left to right with a uniform speed 2 m/s. There are two ink marks A and B on the belt 60 m apart. An insect runs on the belt to the fro between A and B such that its speed releatice to belt is constant and equals 4 m/s. When the insect is moving on the belt in the directoin of motion of the belt, its speed as observed by a person standing on ground will be:

A. 6 m/s

B. 2 m/s

C. 1.5 m/s

D. 4 m/s

Answer: A

View Text Solution

112. In Q.111, if A lies to the left of B, then :

A. time taken by insect to travel form A to B and time taken by it to travel from B to A

B. time taken by insect to travel form A to B is less than time taken by it to travel from B to A

C. time taken by insect to travel from A to B is more than the time taken by it to travel from B to A

D. none of the above

Answer: A

View Text Solution

113. In Q.111, if A lies to the left of B, time taken by the insect to travel from B to A will be:

A. 12 sec

B. 15 sec

C. 18 sec

D. 21 sec

Answer: B

View Text Solution

114. An object is dropped from the top of a tower. It travels a distance 'x' in the first second of its motion and a distance '7x' in the last second. Height of the tower is: (Take $g = 10m/s^2$)

A. 60 m

B. 70 m

C. 80 m

D. 90 m

Answer: C

Watch Video Solution

115. A bus starts from rest and acceleration at a uniform rate $4m/s^2$ for certain time. It then moves with a constant speed for some time and finally retards at $4m/s^2$ to come to rest. Average speed of the bus during the total journey is 15 m/s and the total time is 20 sec. Time duration for which the car moves with constant speed is:

A. 18 sec

B. 16 sec

C. 12 sec

D. 10 sec

Answer: D

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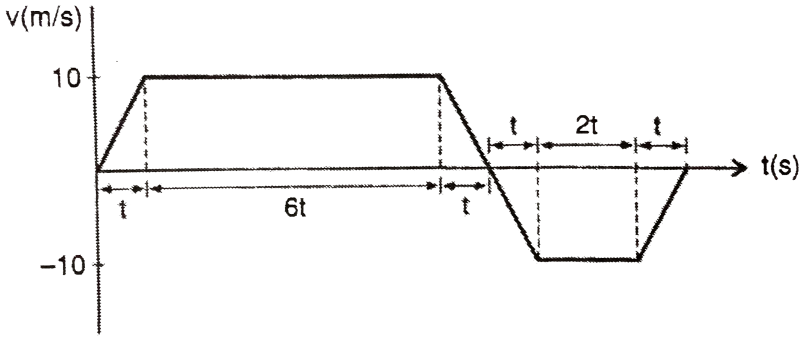
116. Velocity time graph for the motion of a particle along a straight line is as shown in figure.



Average speed of the particle for the whole motion is:

A. 9.6 m/s

B. 7.2 m/s

C. 8.3 m/s

D. 6.5 m/s

Answer: C

Watch Video Solution

117. Average velocity of the particle for the motion

A. 3.3 m/s

B. 6.7 m/s

C. 2.7 m/s

D. 7.6 m/s

Answer: A

View Text Solution

118. A particle is moving such that its position vector varies with time as $\vec{r} = (1 - \alpha t)t\vec{A}$, where α and $\vec{A}$ are constant quantities. At $t = 0$, the particle is at a position O. At some later instant $'t_0'$, the particle is again at O. Velocity of the particle at the instant t_0 is:

A. $2\vec{A}$

B. $\vec{A}$

C. $-\vec{A}$

D. $-2\vec{A}$

Answer: C

View Text Solution

119. In Q.118, total distance travelled by the particle from $t = 0$ to $t = t_0$ is:

A. $\frac{A_0}{2\alpha}$

B. $\frac{A_0}{\alpha}$

C. $\frac{2A_0}{\alpha}$

D. $\frac{4A_0}{\alpha}$

Answer: A

View Text Solution

120. A body is thrown vetically upward at $t = 0$. It is at a height 80 m at two instant t_1 and t_2, then $t_1 t_2$ is: (Take $g = 10m/s^2$)

A. 30

B. 24

C. 16

D. 12

Answer: C

Watch Video Solution

121. A body is thrown vertically upwards at $t = 0$. It is at a height 80 m at instants t_1 and t_2. Also, it is at a height 60 m at instant t_1 and t_2. Then:

A. $t_1 + t_2 = t'_1 + t'_2$

B. $t_1 + t_2 > t'_1 + t'_2$

C. $t_1 + t_2 < t'_1 + t'_2$

D. none of these

Answer: A

View Text Solution

122. When a body is thrown up in a lift with a velocity u relative to the lift, the time of flight is found to be t. The acceleration with which the lift is moving up is

A. $\frac{u-gt}{t}$

B. $\frac{2u-gt}{t}$

C. $\frac{u+gt}{t}$

D. $\frac{2u+gt}{t}$

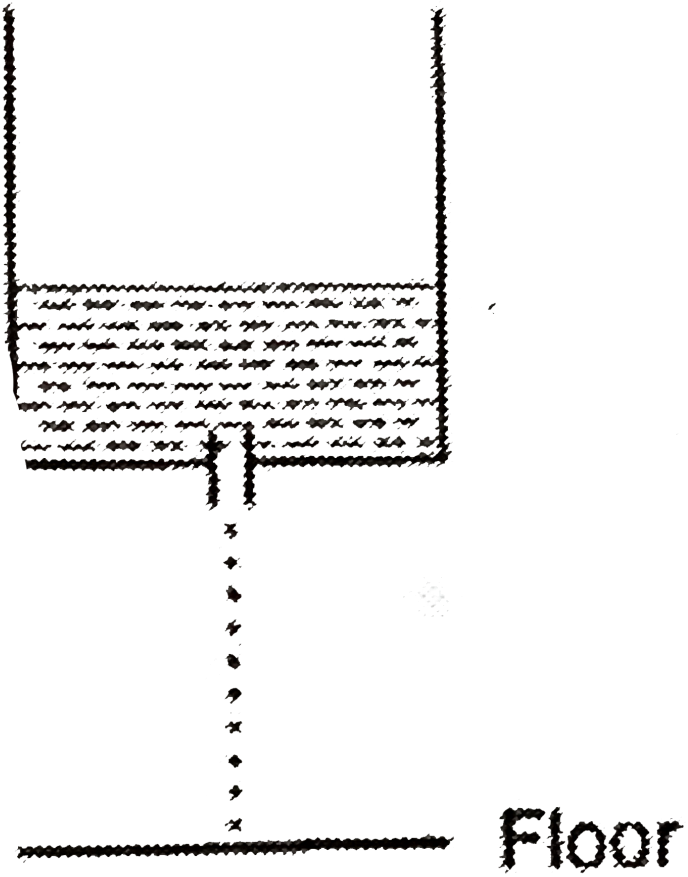
Answer: B

Watch Video Solution

123. Water drops fall at regular intervals form a hole at the bottom of a vessel placed at a high level. The ninth drop is about to fall when the first drop just falls on the floor after being in the air for 2 second. The

distance between the 3rd and the 5 th drop at the instant is :

(Taking $g = 10m/s^2$)



A. $\frac{40}{9}m$

B. $\frac{25}{4}m$

C. $5m$

D. $\frac{5}{16}m$

Answer: B

View Text Solution

124. A particle moving along x-axis has acceleration f, at time t, given by $f = f_0\left(1 - \frac{t}{T}\right)$, where f_0 and T are constant.

The particle at $t = 0$ has zero velocity. In the time interval between $t = 0$ and the instant when $f = 0$, the particle's velocity (v_x) is :

A. $\frac{1}{2}f_0T^2$

B. f_0T^2

C. $\frac{1}{2}f_0T$

D. f_0T

Answer: C

Watch Video Solution

125. A body projected vertically upwords from the top of a tower reaches the ground in t_1 second . If it projected vertically downwards from the some top with same velocity ,it reaches the ground in $t_2$seconds . If it is just dropped from the top it reaches the ground in t second .prove that $t = \sqrt{t_1 t_2}$

A. $t_3 = \left(\frac{t_1 + t_2}{2}\right)$

B. $t_3 = \sqrt{t_1 t_2}$

C. $\frac{1}{t_3} = \frac{1}{t_1} - \frac{1}{t_2}$

D. $t_3^2 = t_2^2 - t_1^2$

Answer: B

Watch Video Solution

126. A point initially at rest moves along x-axis. Its acceleration varies with time as $a = (6t + 5)m/s^2$. If it starts from origin, the distance covered in 2 s is:

A. 20 m

B. 18 m

C. 16 m

D. 25 m

Answer: B

Watch Video Solution

127. A body moving with a uniform acceleration crosses a distance of 65 m in the 5 th second and 105 m in 9th second. How far will it go in 20 s?

A. 2040 m

B. 240 m

C. 2400 m

D. 2004 m

Answer: C

Watch Video Solution

128. A diwali rocket is ejecting $0.05kg$ of gases per second at a velocity of $400m/\sec$. The accelerating force on the rocket is

A. 22 dyne

B. 20 N

C. 20 dyne

D. 100 N

Answer: B

Watch Video Solution

129. A ball is dropped from a bridge at a height of 176.4 m over a river. After 2s a second ball is thrown straight downwards. What should be the initial velocity of the second ball so that both hit the water simultaneously ?

A. 2.45 m/s

B. 49 m/s

C. 14.5 m/s

D. 24.5 m/s

Answer: D

View Text Solution

130. Which of the following are true ?

(A) A body having constant speed can have varying velocity.

(B) Position time graphs for two objects with zero relative velocity are parallel.

(C) The numerical ratio of velocity, to speed of an object can never be more than one.

A. A

B. B and C

C. All

D. None of these

Answer: C

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131. A constant power P is applied to a car starting from rest. If v is the velocity of the car at time t, then:

A. $v \propto t$

B. $v \propto \frac{1}{t}$

C. $v \propto \sqrt{t}$

D. $v \propto \frac{1}{\sqrt{t}}$

Answer: C

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132. Displacement (x) of a particle is related to time (t) as

$x = at + bt^2 - ct^3$

where a,b and c are constant of the motion. The velocity of the particle when its acceleration is zero is given by:

A. $a + \frac{b^2}{c}$

B. $a + \frac{b^2}{2c}$

C. $a + \frac{b^2}{3c}$

D. $a + \frac{b^2}{4c}$

Answer: C

Watch Video Solution

133. The acceleration a (in ms^{-2}) of a body, startin gfrom rest varies with time t (in s) following the equation $a = 3t + 4$. The velocity of the body at time $t = 2s$ will be:

A. $10ms^{-1}$

B. $18ms^{-1}$

C. $14ms^{-1}$

D. $26ms^{-1}$

Answer: C

Watch Video Solution

134. The acceleration of a'particle starting from rest, varies with time according to the relation $a = kt + c$. The velocity of the particle after time t will be :

A. $\frac{\alpha t^2}{2} + \beta$

B. $\frac{\alpha t^2}{2} + \beta t$

C. $\alpha t^2 + \frac{1}{2}\beta t$

D. $\frac{(\alpha t^2 + \beta)}{2}$

Answer: B

Watch Video Solution

135. Two stones are thrown from top of tower, one vertically upward and other downward with same speed. Ratio of velocity when they hit the ground is:

A. $1:2$

B. $1:1$

C. $2:1$

D. $1:9$

Answer: B

Watch Video Solution

136. A body is thrown vertically up to reach its maximum height in t seconds. The total time from the time of projection to reach a point at half of its maximum height while returning (in second) is:

A. $\sqrt{2}t$

B. $\left(1+\frac{1}{\sqrt{2}}\right)t$

C. $\frac{3t}{2}$

D. $\frac{t}{\sqrt{2}}$

Answer: B

Watch Video Solution

137. A ball is falling freely from a certain height. When it reached $10m$ height from the ground its velocity is v_0. It collides with the horizontal

ground and loses $50\,\%$ of its energy and rises back to height of $10m$. The value of velocity v_0 is

A. 7 m/s

B. 10 m/s

C. 14 m/s

D. 16 m/s

Answer: C

Watch Video Solution

138. If x, v and a denote the displacement, the velocity and the acceleration of a particle executing simple harmonic motion of time period T, then, which of the following does not change with time?

A. aT/x

B. $aT + 2\pi v$

C. aT/v

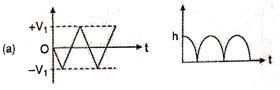
D. $a^2T^2 + 4\pi^2v^2$

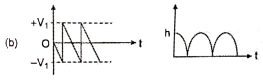
Answer: A

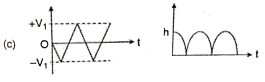
Watch Video Solution

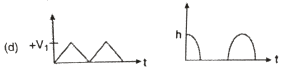
139. Consider a rubber ball freely falling from a height $h = 4.9m$ onto a horizontally elastic plate. Assume that the duration of collision is negligible and the collisions with the plate is totally elastic .

Then the velocity as a function of time and the height as a function of time will be :

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

140. From an elevated point A, a stone is projected vertically upwards. When the stone reaches a distance h below A, its velocity is doubleof what it was at a height h above A. Show that the greatest height attained by the stone is $\frac{5}{3}h$.

A. $\frac{3}{5}h$

B. $\frac{5}{3}h$

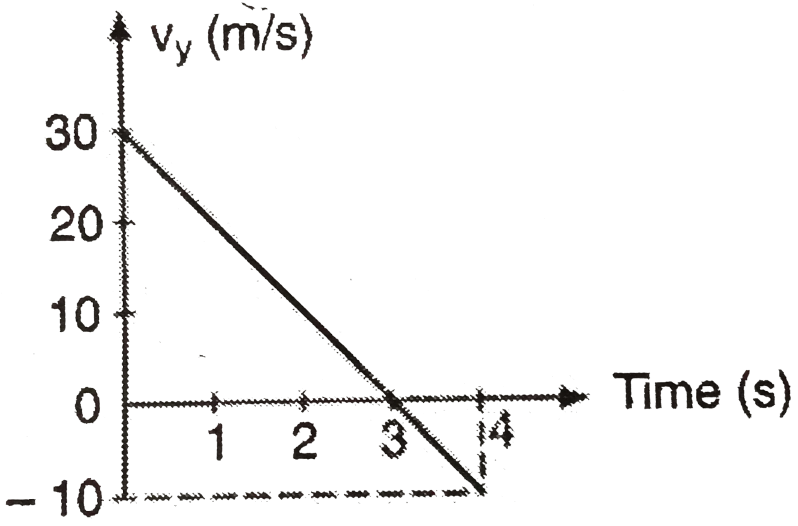
C. $\frac{7}{5}h$

D. $\frac{5}{7}h$

Answer: B

Watch Video Solution

141. The velocity time graph for the veticaly component of the velocity of a body thrown upwards from the ground and landing on the roof of a building is given in the figure.The height of the building is:



A. 50 m

B. 40 m

C. 20 m

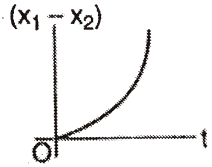
D. 30 m

Answer: B

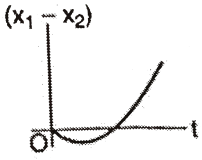
Watch Video Solution

142. A body is at rest at $x = 0$. At $t = 0$, it starts moving in the positive $x - direction$ with a constant acceleration . At the same instant another body passes through $x = 0$ moving in the positive $x - direction$ with a constant speed . The position of the first body is given by $x_1(t)$ after time 't', and that of the second body by $x_2(t)$ after the same time interval . which of the following graphs correctly describes $(x_1 - x_2)$ as a function of time 't' ?

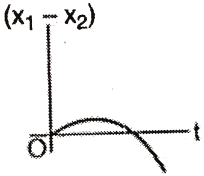
A. (a)



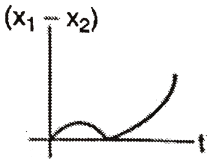
B. (b)



C. (c)



D. (d)



Answer: B

Watch Video Solution

143. A boy throws n balls per second at regular time intervals. When the first ball reaches the maximum height, he throws the second one vertically up. The maximum height reached by each ball is

A. $\frac{g}{2(n-1)^2}$

B. $\frac{g}{2n^2}$

C. $\frac{g}{n^2}$

D. $\frac{g}{n}$

Answer: B

Watch Video Solution

144. Two particles P and Q simultaneously start moving from point A with velocities $15m/s$ and $20m/s$ respectively. The two particles move with acceleration equal in magnitude but opposite in direction. When P overtakes Q at point B then its velocity is $30m/s$, the velocity of Q at point B will be

A. 30 m/s

B. 5 m/s

C. 10 m/s

D. 15 m/s

Answer: B

Watch Video Solution

145. A stone projected vertically up from the ground reaches a height y in its path at t_1 seconds and after further t_2 seconds reaches the ground.

The height y is equal to

A. $\frac{1}{2}g(t_1 + t_2)$

B. $\frac{1}{2}g(t_1 + t_2)^2$

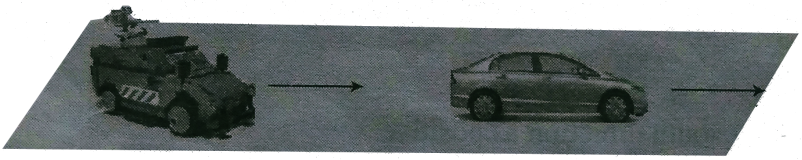
C. $\frac{1}{2}gt_1t_2$

D. gt_1t_2

Answer: C

Watch Video Solution

146. A police van moving on a highway with a speed of $30kmh^{-1}$ Fires a bullet at a thief's car speeding away in a same direction with a speed of $192kmh^{-1}$. If the muzzle speed of the buller is $150ms^{-1}$, with what speed does the bullet hit thief's car? .



A. 25 m/s

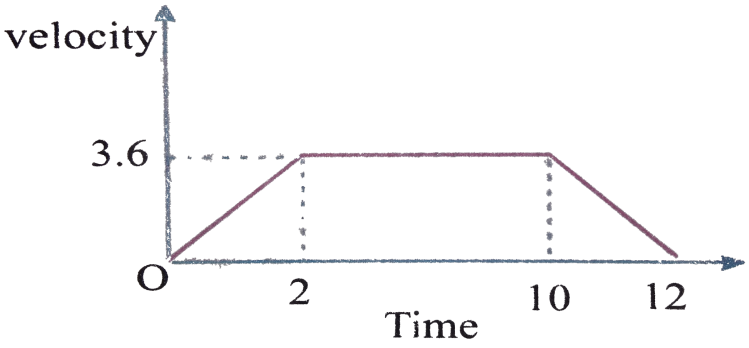
B. 50 m/s

C. 75 m/s

D. 105 m/s

Answer: D

Watch Video Solution



147.

An elevator is going up. The variation in the velocity of the elevator is as given in the graph. What is the height to which the elevator takes the passenger?

A. 3.6 m

B. 28.8 m

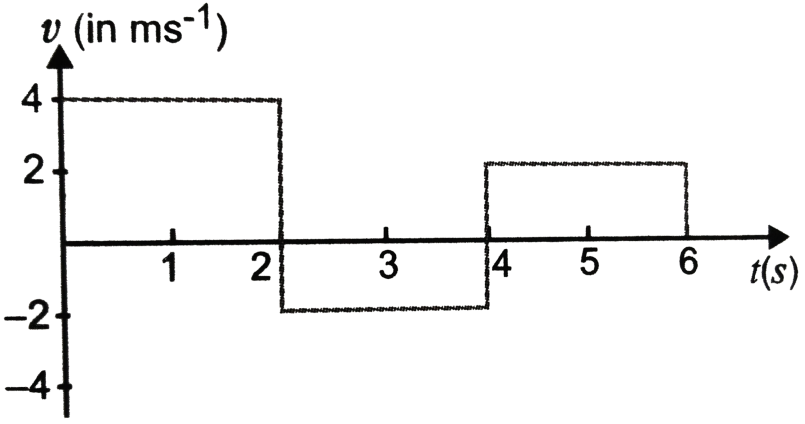
C. 36.0 m

D. 72.0 m

Answer: C

Watch Video Solution

148. The velocit-time graph of a body moving in a straight line is shown in Fig. 2 (d) . 32. Find the displacement and the distance travelled by the body in $6\,\text{sec}\,onds$.



A. 8, 16

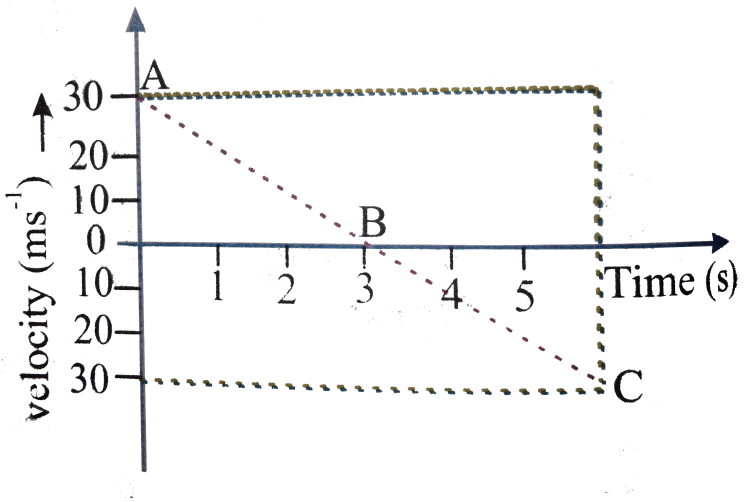
B. 16, 8

C. 16, 16

D. 8, 8

Answer: A

Watch Video Solution



149.

The velocity-time graph of a stone thrown vertically upward with an initial velocity of $30ms^{-1}$ is shown in the figure. The velocity in the

upward direction is taken as positive and that in the downward direction as negative. What is the maximum height to which the stone rises?

A. 30 m

B. 45 m

C. 60 m

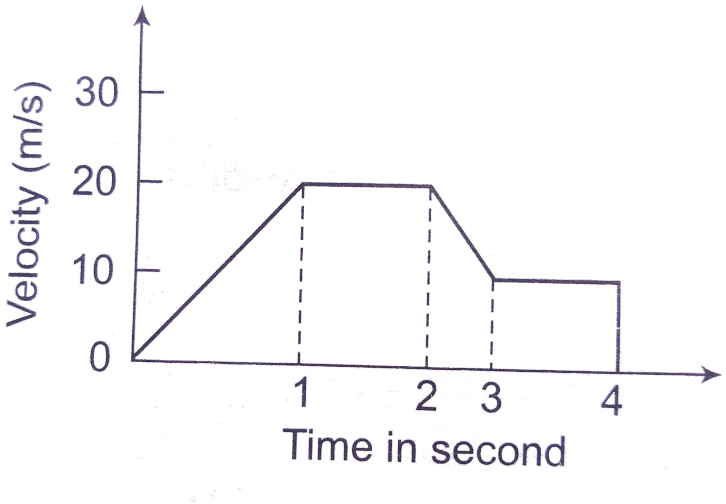
D. 90 m

Answer: B

Watch Video Solution

150. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled

by the particle in four seconds is.



A. 55 m

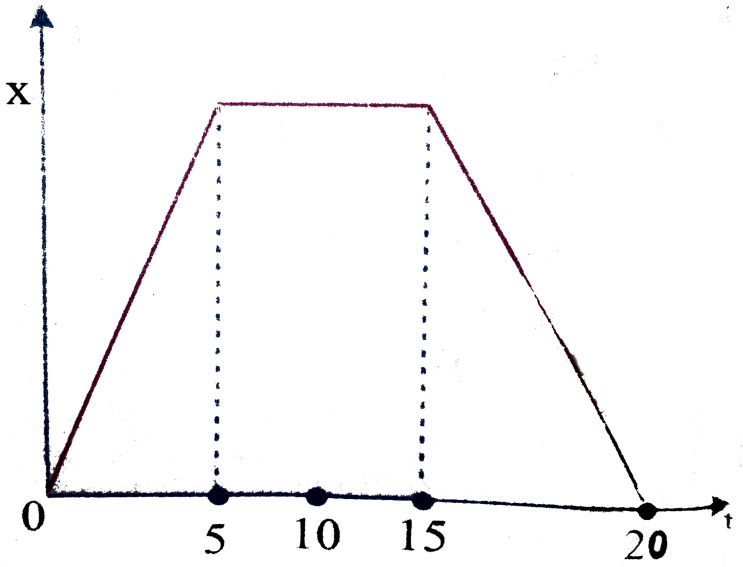
B. 30 m

C. 25 m

D. 60 m

Answer: A

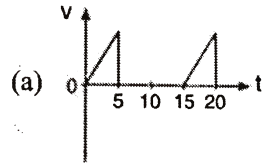
Watch Video Solution



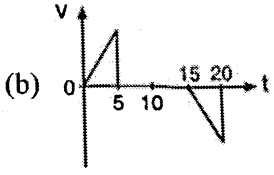
151.

Figure shows the displacement time (x-t) graph of a body moving in a straight line which one of the graph shown in figure represents the velocity- time (v-t) graph of the motion of the body.

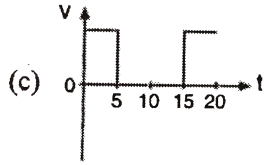
A.



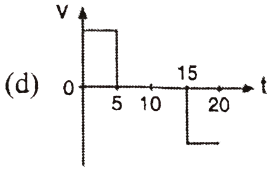
B.



C.



D.

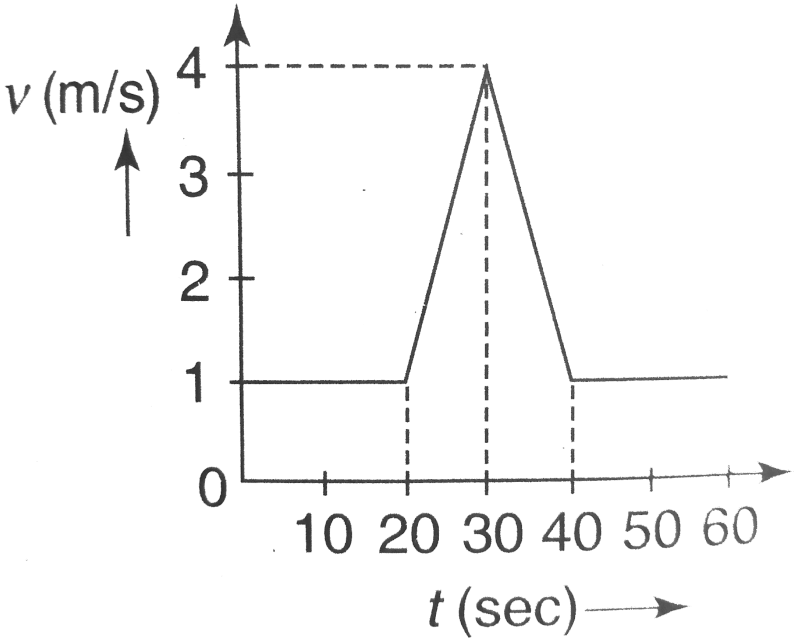


Answer: D

Watch Video Solution

152. Velocity-time graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is non-

zero acceleration and retardation is.



A. 60 m

B. 50 m

C. 30 m

D. 40 m

Answer: B

Watch Video Solution

153. A car 2m long and 3m wide is moving at $10m/s$ when a bullet hits it in a direction making an angle of $\tan^{-1}(3/4)$ with the car as seen from the ground. The bullet enters one edge of the car at the corner and passes out at diagonally opposite corner. Neglecting gravity, the time for the bullet to cross the car is

A. 0.20 s

B. 0.15 s

C. 0.10 s

D. 0.50 s

Answer: A

Watch Video Solution

154. Two particles start simultaneously from the same point and move along two straight lines. One with uniform velocity v and other with a uniform acceleration a. if α is the angle between the lines of motion of

two particles then the least value of relative velocity will be at time given by

A. $\frac{v}{a}\sin\alpha$

B. $\frac{v}{a}\cos\alpha$

C. $\frac{v}{a}\tan\alpha$

D. $\frac{v}{a}\cot\alpha$

Answer: B

Watch Video Solution

155. A jet airplance travelling at the speed of $500km^{-1}$ ejects its products of combustion at the speed of $1500kmh^{-1}$ relative to the jet plane. What is the speed of the burnt gases with respect to observer on the ground ?

A. $-100kmph$

B. $-1000kmph$

C. $-10kmph$

D. $-11kmph$

Answer: B

Watch Video Solution

156. A body is projected upwards with a velocity u. It passes through a certain point above the ground after t_1, Find the time after which the body passes through the same point during the journey.

A. $\left(\frac{u}{g} - t_1^2\right)$

B. $2\left(\frac{u}{g}\right) - t_1$

C. $3\left(\frac{u^2}{g} - t_1\right)$

D. $3\left(\frac{u^2}{g^2} - t_1\right)$

Answer: B

Watch Video Solution

157. A small block slides without friction down an iclined plane starting form rest. Let S_n be the distance traveled from time $t = n - 1$ to $t = n$. Then $\frac{S_n}{S_{n+1}}$ is:

A. $\frac{2n-1}{2n}$

B. $\frac{2n+1}{2n-1}$

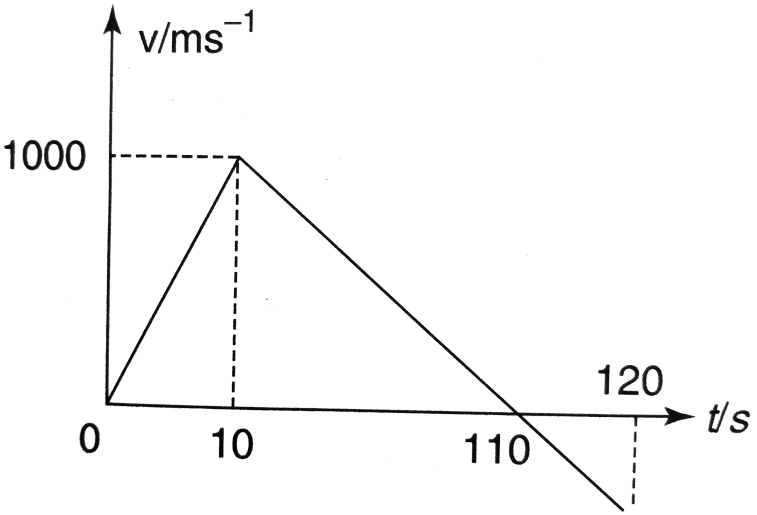
C. $\frac{2n-1}{2n+1}$

D. $\frac{2n}{2n+1}$

Answer: C

Watch Video Solution

158. The graph shown the variation of velocity of a rocket with time. Then, the maximum height attained by the rocket is.



A. 1.1 km

B. 5 km

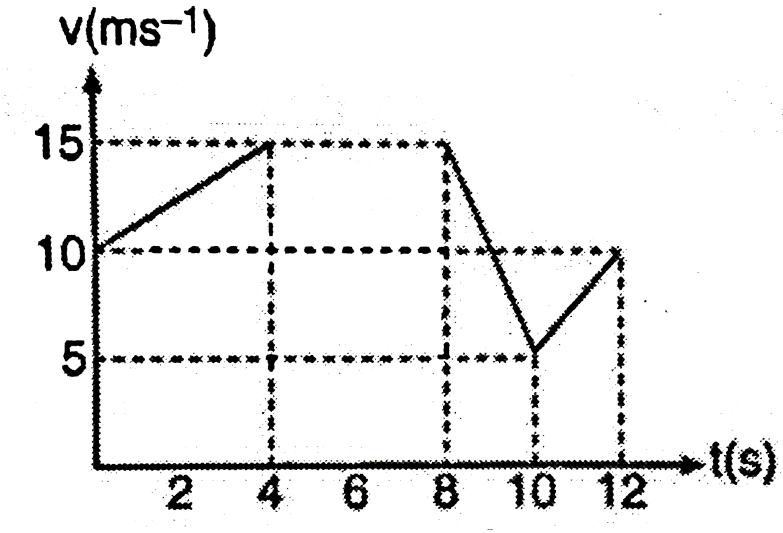
C. 55 km

D. none of these

Answer: C

Watch Video Solution

159. The velocity -time $(v-t)$ graph of a particle moving in a straight line is shown in figure. The acceleration of the particle at $t=9$ is:



A. zero

B. $5ms^{-2}$

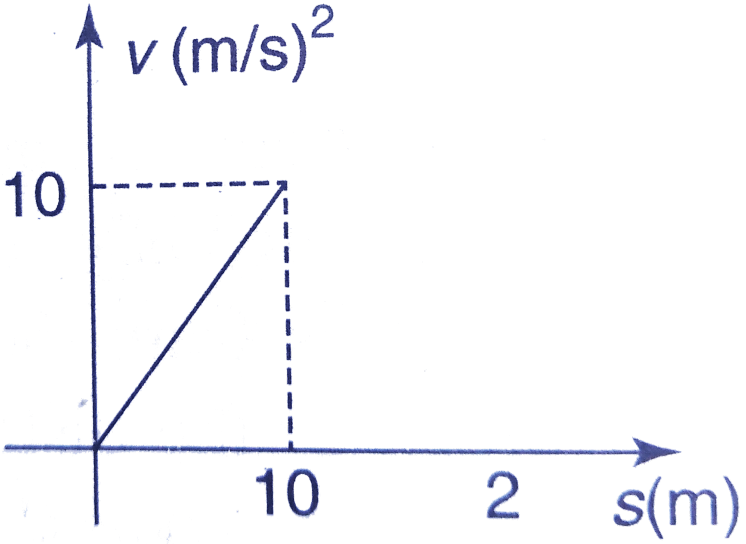
C. $-5ms^{2}$

D. $-2ms^{-2}$

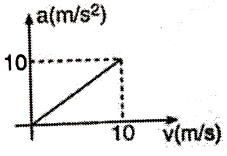
Answer: C

Watch Video Solution

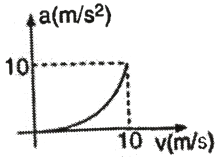
160. Velocity versus displacement graph of a particle moving in a straight line is shown in figure. Corresponding acceleration versus velocity graph will be.



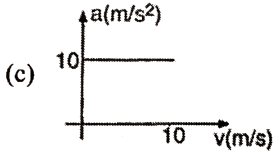
A. (a)



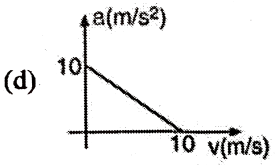
B. (b)



C.



D.

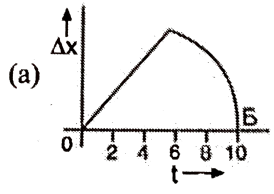


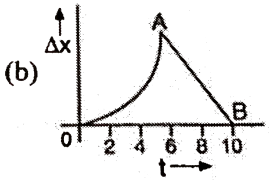
Answer: A

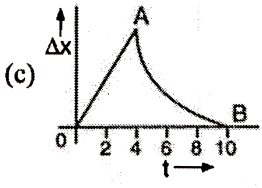
Watch Video Solution

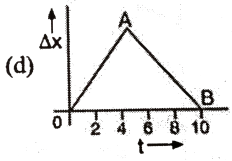
161. Two stones are thrown up simultaneously with initial speeds of u_1 and $u_2(u_2 > u_1)$. They hit the ground after 6 s and 10 s respectively. Which graph in fig. correctly represents the time variation of $\Delta x = (x_2 - x_1)$ the relative position of the second stone with respect to the first upto $t = 10$ s? Assume that the stones do not rebound after hitting the ground.

A.



B. 

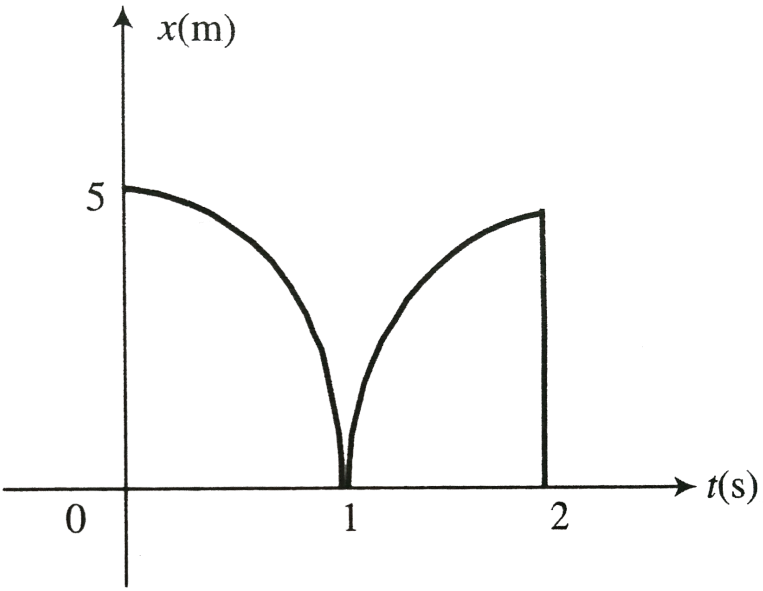
C. 

D. 

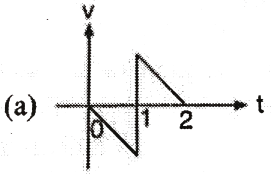
Answer: A

Watch Video Solution

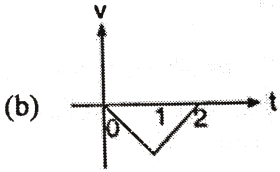
162. The displacement-time graph of a moving particle with constant acceleration is shown in. The velocity-time is given by



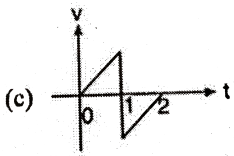
A.

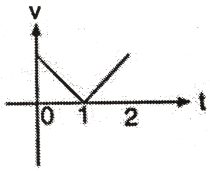


B.



C.



D. (d) 

Answer: A

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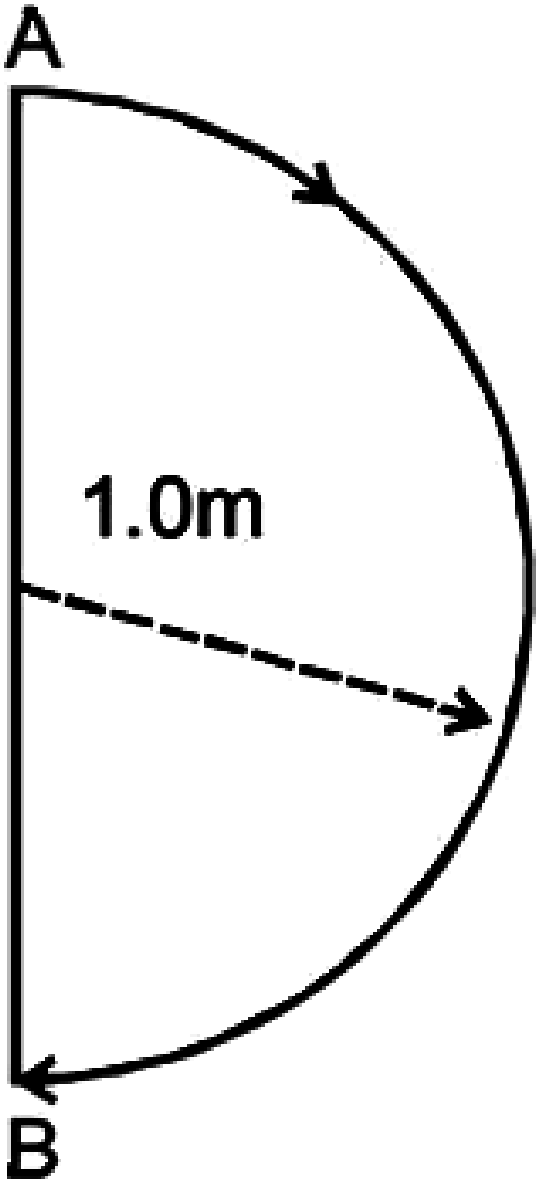
163. In $1.0s$, a particle goes from point A to point B , moving in a semicircle of radius $1.0m$ (see figure). The magnitude of the average

velocity



A. $3.14ms^{-1}$

B. $2.0ms^{-1}$

C. $1.0ms^{-1}$

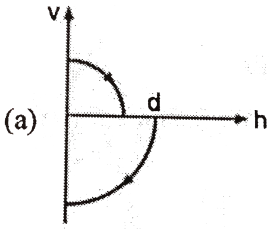
D. zero

Answer: B

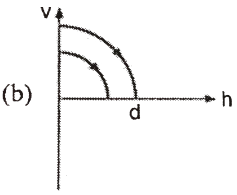
Watch Video Solution

164. A ball is dropped vertically from a height d above the ground . It hits the ground and bounces up vertically to a height $(d)/(2). Neg \leq ct \in g \subset sequentmotion$ and $airresis\tan ce, itsvelocity$ v$varieswiththeheighth$` above the ground as

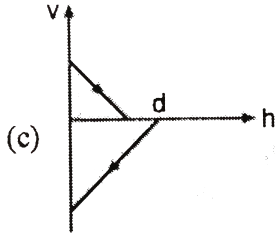
A.



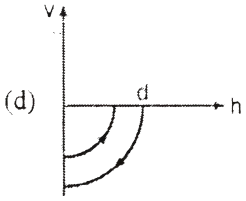
B.



C.



D.



Answer: A

Watch Video Solution

165. A small block slides without friction down an iclined plane starting form rest. Let S_n be the distance traveled from time $t = n - 1$ to $t = n$. Then $\frac{S_n}{S_{n+1}}$ is:

A. $\frac{2n-1}{2n}$

B. $\frac{2n+1}{2n-1}$

C. $\frac{2n-1}{2n+1}$

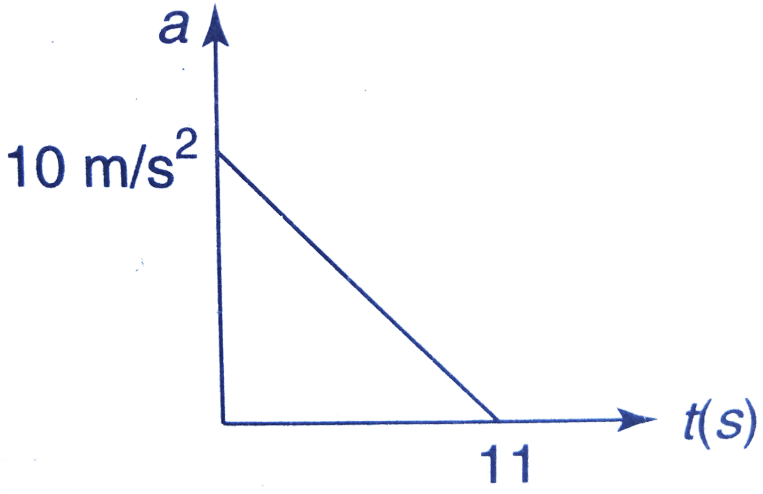
D. $\frac{2n}{2n+1}$

Answer: C

Watch Video Solution

166. A particle starting from rest. Its acceleration (a) versus time (t) is as shown in the figure.

The maximum speed of the particle will be.



A. 110 m/s

B. 55 m/s

C. 550 m/s

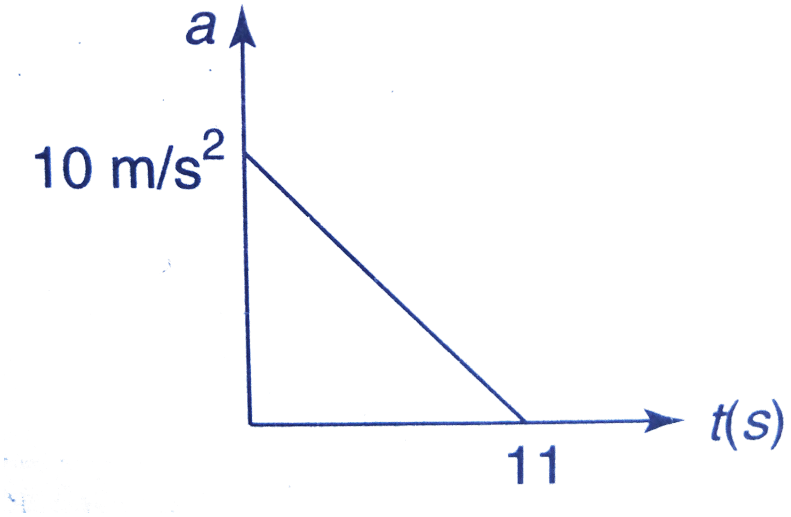
D. 660 m/s

Answer: B

Watch Video Solution

167. A particle starting from rest. Its acceleration (a) versus time (t) is as shown in the figure.

The maximum speed of the particle will be.



A. $110ms^{-1}$

B. $55ms^{-1}$

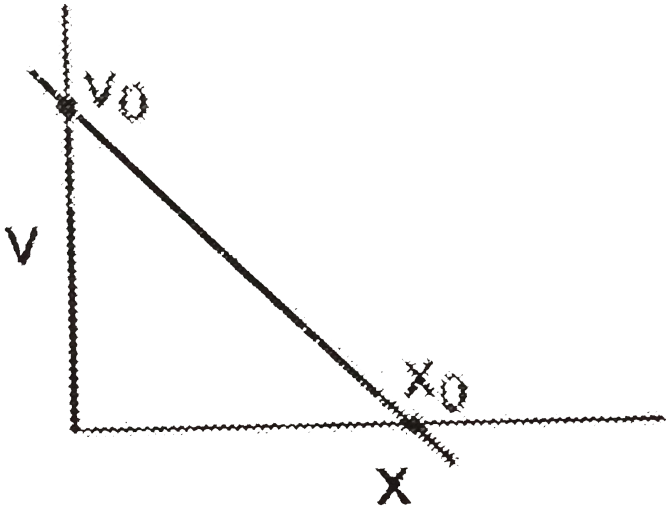
C. $550ms^{-1}$

D. $660ms^{-1}$

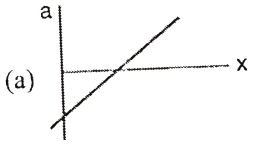
Answer: B

Watch Video Solution

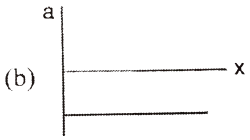
168. Depict the shown $v - x$ graph $a - x$ graph:



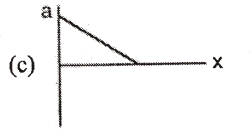
A.



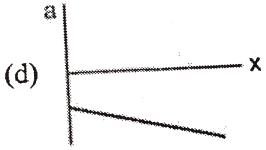
B.



C.



D.



Answer: A

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More than one choice is correct

1. Which of the following statements about distance are tire?

A. It cannot be negative

B. It cannot be zeero

C. It can never be lesser than magnitude of displacement

D. It can never decrease with time

Answer: A::C::D

Watch Video Solution

2. If a body after travelling some distance comes back to its starting point.

A. average velocity is zero

B. average speed is zero

C. distance travelled is zero

D. displacement is zero

Answer: A::D

Watch Video Solution

3. If the velocity of a body is constant:

A. |velocity| = speed

B. |average velocity| = speed

C. velocity = average velocity

D. speed = average speed

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

Watch Video Solution

4. If a particle travels a linear distance at speed v_1 and comes back along the same track at speed v_2.

A. its average speed is arithemtic mean $(v_1 + v_2)/2$

B. its avcrage speed is geometric mean $\sqrt{v_1 v_2}$

C. its average speed is harmonic mean $2v_1 v_2/(v_1 + v_2)$

D. its velocity is zero

Answer: C::D

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5. For a moving particle, which of the following options may be correct?

Here, V_{av} is average velocity and v_{av} the average speed.

A. $\left|\overrightarrow{v}_{av}\right| > v_{av}$

B. $\left|\overrightarrow{v}_{av}\right| < v_{av}$

C. $\overrightarrow{v}_{av} = 0$ but $v_{av} \neq 0$

D. $\overrightarrow{v}_{av} \neq 0$ but $v_{av} = 0$

Answer: B::C

Watch Video Solution

6. Which of the following statements are ture?

A. A body can have constant speed but varying velocity

B. A body can have constant velocity but varying speed

C. A body can have acceleration without having velocity

D. acceleration is $4ms^{-2}$ at $t = 0$

Answer: A::C::D

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7. If a body is accelerating:

A. it may speed up

B. it may speed down

C. it may move with same velocity

D. it may move with same speed

Answer: A::B::D

Watch Video Solution

8. If two bodies are in motion with velocity $\vec{v}_1$ and $\vec{v}_2$:

A. $|v_{\text{rel}}| = \sqrt{v_1^2 + v_2^2}$

B. $\left| \overrightarrow{\quad} (\text{rel}) \right| = v_1 \pm v_2 \Big|$

C. $v_{\text{re}} = 0$

D. $v_{\text{rel}} > c$ (speed of light)

Answer: A::B::C

Watch Video Solution

9. The velocity of a particle is at any time related to the distance travelled by the particle by the relation $v(x) = ax + b$, where a is positive and b is

$\leq \frac{a}{b}$. Which of the following statement will be tue for this motion? (given $x = 0$ where $t = 0$)

A. The displacement of the particle at time t is $x = \frac{b}{a}\left(e^{at} - 1\right)$

B. The particle will experience a retardation if $b < 0$

C. The particle will be at rest at time $t = 0$

D. The motion of the particle is under constant acceleration

Answer: A::B

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10. A train accelerating uniformly passes three successive kilometre posts at time $t = 0, t = 75$ and $t = 125$ (all in second), In respect of this motion, which of the following statement are true ?

A. The acceleration of the train is $\left(\frac{8}{75}\right) m/s^2$

B. The speed at the last of the three posts is 22.67 m/s

C. The initial velocity of the train is 10 m/s

D. The train will travel the next one kilometre in 15 second

Answer: A::D

View Text Solution

11. Two cities A and B are connected by a regular bus service with buses plying in either direction every T seconds. The speed of each bus is uniform and equal to V_b. A cyclist cycles from $A \to B$ with a uniform speed of V_c. A bus goes past the cyclist in T_1 second in the direction $A \to B$ and every T_2 second in the direction $B \to A$. Then

A. $T_1 = \frac{V_b T}{V_b + V_c}$

B. $T_2 \frac{V_b T}{V_b - V_c}$

C. $T_1 = \frac{V_b T}{V_b - V_c}$

D. $T_2 = \frac{V_b T}{V_b + V_c}$

Answer: C::D

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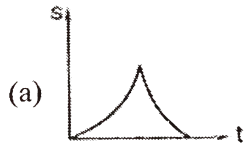
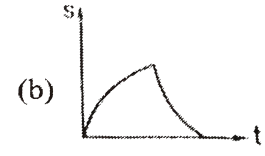
12. A carrom striker is given velocity on carrom based has always. Friction cause constant retardation. Striker hits boundary of carrom and come to rest at point from where it started. Take initial velocity direction as positive, choose correct graph describing motion : (v – velocity, s-displacement, t-time)

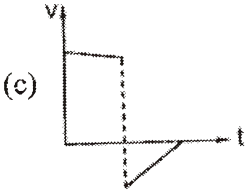
A.

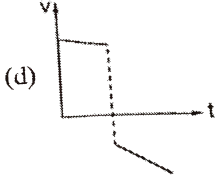


B.



C.





D.

Answer: B::C

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13. For the one dimensional motion, described by $x = t - \sin t$

A. $x(t) > 0$ for all $t > 0$

B. $v(t0 > 0$ for all $t > 0$

C. $a(t) > 0$ for all $t > 0$

D. $v(t)$ lies between 0 and 2

Answer: A::D

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14. A particle moves along a straight line its velocity dipends on time as $v = 4t - t^2$. Then for first $5s$:

A. average velocity is $25/3ms^{-1}$

B. average speed is $10ms^{-1}$

C. average velocity is $5/3ms^{-1}$

D. acceleration is $4ms^{-2}$ at $t = 0$

Answer: C::D

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15. A particle moves with an initial velocity v_0 and retardation αv, where v is the velocity at any time t.

A. The particle will cover a total distance $\frac{v_0}{\alpha}$

B. the particle will come to rest after time $\frac{1}{\alpha}$

C. the particle will continue to move for a along time

D. The velocity of particle will become $\frac{v_0}{e}$ after time $\frac{1}{\alpha}$

Answer: A::C::D

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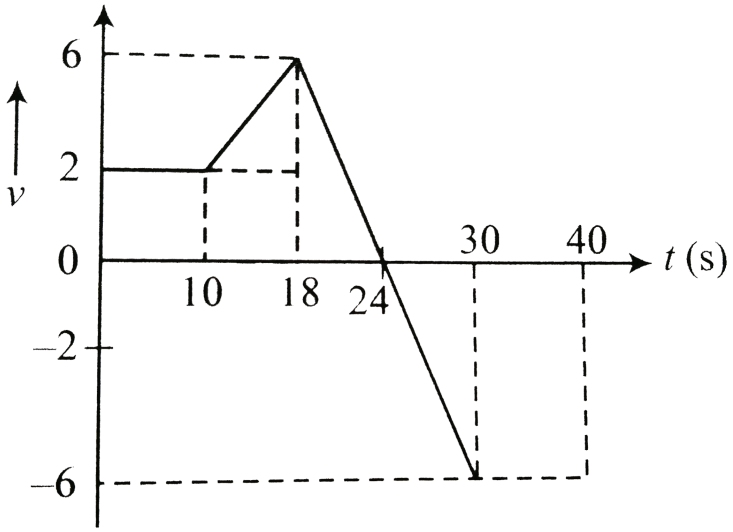
16. A particle moves in a straight line with the velocity as shown in. At $t = 0, x = -16m,$



A. The maximum value of the position coordinate of the particle is 54 m

B. The maximum value of the position coordinate of the particle is 36 m

C. The particle is at the position of 36 m at $t = 18s$

D. The particle is at the position of 36 m at $t = 30s$

Answer: A::C::D

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Assertion Reason

1. A body X is thrown vertically upwards with an initial speed 45 m/s. Another body Y is also thrown vertically upwards with an initial speed 27 m/s. During the last $\frac{1}{2}$ sec of motion of each body, speed of each reduces by the same value.

R : Both bodies are moving with same value

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: A

View Text Solution

2. A: A body is thrown vertically upwards with an initial speed 25 m/s from a position 1. It falls back to position 1 after some time. During this time duration, total change of velocity of the body is zero.

R : Average acceleration of the body during this time is zero

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If both A and R are false

Answer: D

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3. A: An object moving with a velocity of magnitude 10 m/s is subjected to a uniform acceleration $2m/s^2$ at right angle to the initial motion. Its velocity after 5 s has a magnitude nearly 14 m/s

$\rightarrow \quad \rightarrow \quad \rightarrow$

R: The equation $\vec{v} = \vec{u} + \vec{a}t$ can be applied to obtain $\vec{v}$ if $\vec{a}$ is constant

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: A

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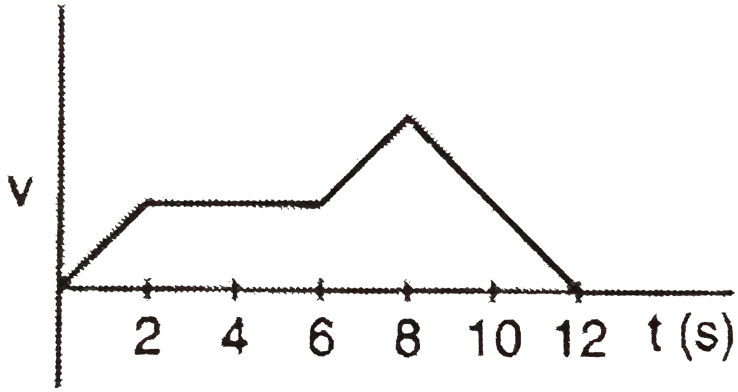
4. A: A body is moving along a straight line such that its velocity varies with time as shown in figure. Magnitude of displacement of the body from $t = 0$ to $t = 12s$ is the same as the distance travelled by it in the given time duration,



R: For a unidirectional motion of a body, |displacement| = distance

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: A

View Text Solution

5. A: A body is thrown with a velocity u inclined to the horizontal at an angle $\theta(\theta > 0, 90^\circ)$. At the highest point, the angle between instantaneous velocity and acceleration is zero

R: At the highest point velocity of the projectile is zero.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If both A and R are false

Answer: D

View Text Solution

6. A: A body X is dropped from the top of a tower. At the same time, another body Y is thrown horizontally from the same position with a

velocity u. Both bodies will reach the ground at the same time.

R: Horizontal velocity has no effect on motion in the vertical direction.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: A

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7. Assertion : Two bodies of unequal masses m_1 and m_2 are dropped from the same height. If the resistance offered by air to the motion of both bodies is the same, the bodies will reach the earth at the same time.

Reason : For equal air resistance, acceleration of fall of masses m_1 and m_2 will be different.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: D

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8. A: A body is released from a height. As it is falling vertically downwards, at some position, it explodes into fragments under purely internal force. Centre of mass of the system of fragments will keep moving along the original vertical line and also accelerate downwards with an acceleration g.

R: Whenever linear momentum of a system is conserved, its centre of mass always remains at rest.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: C

View Text Solution

9. A: Two particles starts from the rest simultaneously and proceed with the same acceleration in the same direction. The relative velocity of these particles will be zero throughout motion.

R: At every moment the two particle will have the same velocity.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: C

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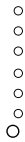
10. Figure shows sequence of large number of photograph of on object moving vertically under gravity. A motion picture of this photograph is run backward.



Statement-1: In time reversal sequence the gravitational acceleration will appear to be upward.

Statement-2: A time reversal operation changes every $\vec{v} \rightarrow -\vec{v}$.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: D

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11. A: If two particle are neither approaching towards nor receding away from other then their relative velocity is zero.

R: Relative velocity of 1 w.r.t. 2 is given by $\vec{v}_{12} = \vec{v}_1 - \vec{v}_2$.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: D

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12. Statement I: In an elastic collision between two bodies, the relative speed of the bodies after collision is equal to the relative speed before the collision.

Statement II: In an elastic collision, the linear momentum of the system is conserved.

A. If both A and B are true and R is the correct explanation of A

B. If both A and R are true but R is not correct explantion of A

C. If A is true but R is false

D. If A is false but R is true

Answer: B

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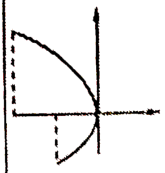
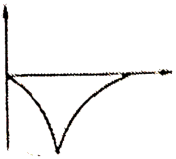
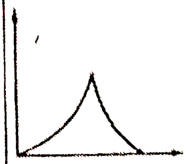
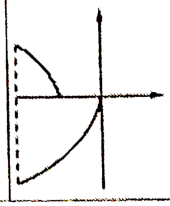
Matrix -match

1. A ball is allowed free to fall from height 'H' which rebounds back to maximum height 'h' (H). Take upward as the direction and initial position on origin

Column - I		Column - II	
(a)	Displacement *versus* time graph is	(p)	
(b)	Distance from starting point *versus* time graph is	(q)	
(c)	Distance *versus* time graph is	(r)	
(d)	Velocity *versus* displacement graph is	(s)	
		(t)	

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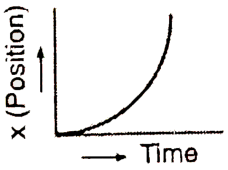
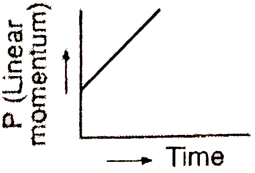
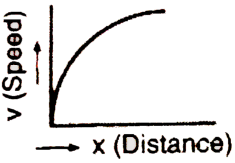
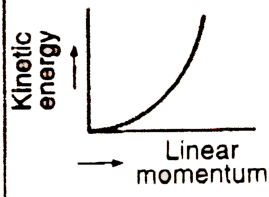
2. Assuming one dimensional motion (along x-direction) in all the cases, match columns-I and II

Column - I		Column - II	
(a)	 The motion depicted in this graph	(p)	is uniform linear motion
(b)	 The motion depicted in this graph	(q)	is non-uniform linear motion
(c)	 The motion depicted in this graph	(r)	involves positive acceleration
(d)	 The motion depicted in this graph	(s)	involves negative acceleration

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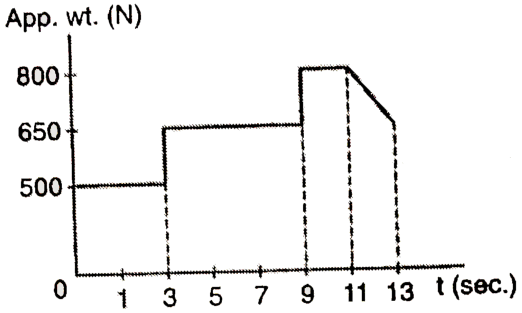
3. A person of mass 65 kg gets into an elevator at the 30th floor of a building. The elevator begins to move at $t = 0$. Apparent weight of the person as a function of time is shown in figure. Take $g = 10m/s^2$ and match column -I and II:



	Column - I		Column - II
(a)	The elevator is moving down at	(p)	$t = 1\,s$
(b)	Magnitude of acceleration of the object is 2.3 m/s^2 at	(q)	$t = 10\,s$
(c)	Speed of the object is 2.3 m/s at	(r)	$t = 12\,s$
(d)	Magnitude of acceleration of the object is 1.15 m/s^2 at	(s)	$t = 11\,s$

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4. Column I describes some situations in which a small object moves. Column II describes some characteristics of these motion. Match the situtions in column I with the characteristics in column II.

Column - I		Column - II	
(a)	The object moves on the x-axis under a conservative force in such a way that its speed and position satisfy $v = c_1\sqrt{c_2 - x^2}$, where c_1 and c_2 are positive constants.	(p)	The object executes a simple harmonic motion.
(b)	The object moves on the x-axis in such a way that its velocity and its displacement from the origin satisfy $v = -kx$, where k is a positive constant.	(q)	The object does not change its direction.

(c)	The object is attached to one end of a massless spring of a given spring constant. The other end of the spring is attached to the ceiling of an elevator. Initially everything is at rest. The elevator starts going upwards with a constant acceleration a. The motion of the object is observed from the elevator during the period it maintains this acceleration.	(r)	The kinetic energy of the objects keeps on decreasing.
(d)	The object is projected from the earth's surface vertically upwards with a speed $2\sqrt{GM_e / R_e}$, where M_e is the mass of the earth and R_e is the radius of the earth. Neglect forces from objects other than the earth.	(s)	The object can change its direction only once.

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Integer

1. The displacement of a particle moving in straight line is given as function of time as $s = \left(\frac{t^3}{3} - \frac{3t^2}{2} + 2t\right)$, s is in m and t is in sec. The particle comes to momentary rest n times Find the value of n

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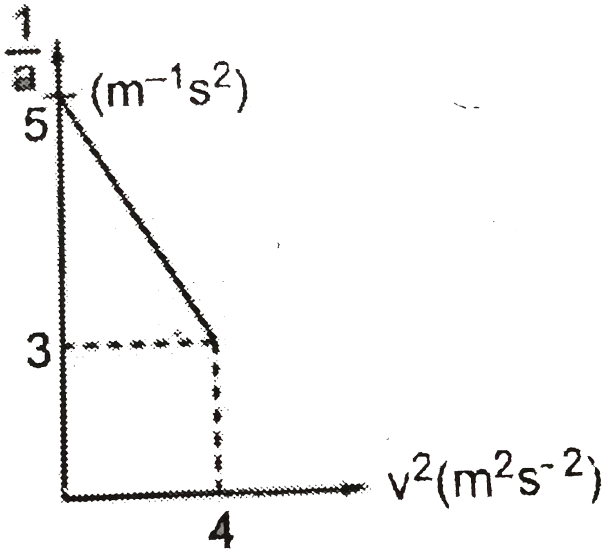
2. Adjacent graph is drawn for particle along straight line motion, where $a -$ acceleration and $v -$ velocity. The displacement of particle from rest till it acquires velocity $\sqrt{2} m s^{-1}$ is s. Find the value of 2s (in m).



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3. Five person A, B, C, D and E are pulling a cart of mass 100 kg on a smooth surface and cart is moving with acceleration $3m/s^2$ in each direction. When person 'A' stops pulling, it moves with acceleration $1m/s^2$ in the west direction. When person 'B' stops pulling, it moves with acceleration $24m/s^2$ in the north direction. The magnitude of acceleration of the cart when only A and B pull the cart keeping their directions same as the old directions, is $(25/n)m/s^2$, value of n is:

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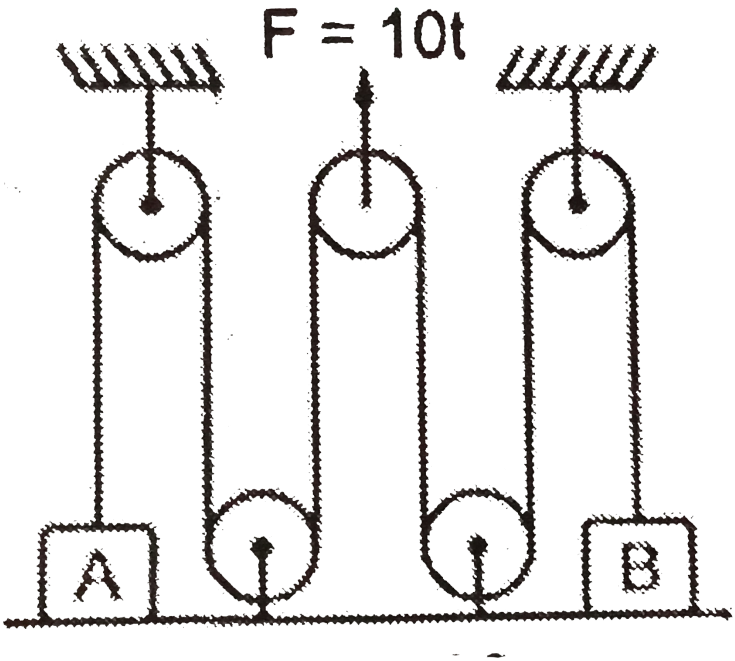
4. In the arrangement shown in figure, $m_A = 1kg$ and $m_B = 2kg$, while all the pulleys and strings are massless and frictionless. At $t = 0$, a force $F = 10t$ starts acting over central pulley in vertically upward direction. If

the velocity of A is $x \times 10m/s$ when B loses contact with floor, find x.



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5. A lift is moving up with a constant retardation of $2m/s^2$. When its upward velocity is 5 m/s, a boy in the lift tosses a coin, imparting it an upward velocity of 3 m/s, w.r.t. himself. His fingers at the moment of toss are midway between the floor and cciling, whose total height is 2 m.

Displacement of coin when it hits the ground is x metre (in earth frame).

Value of x is : $\left(g = 10m/s^2\right)$

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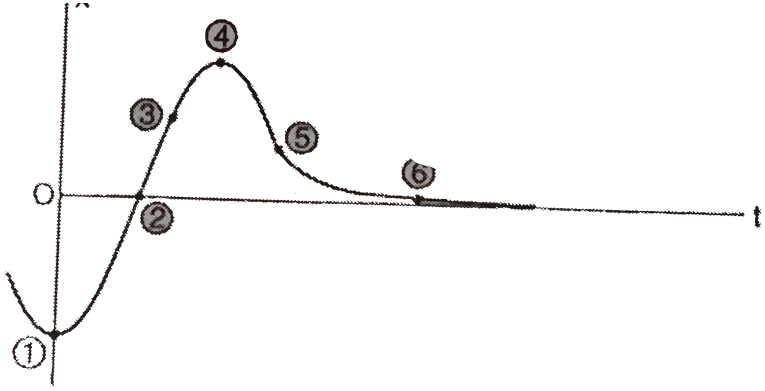
Comprehension type Queston

1. A particle is moving along X-axis under a force such that its position - time graph is as shown in figure.



As the particle passes position (1):

A. it is moving along negative X-direction with a speed that is increasing with time

B. it is moving along positive X-direction with a speed that is decreasing with time

C. it is moving along negative X-direction with a speed that is decreasing with time

D. it is moving along positive X-direction with a speed that is increasing with time

Answer: D

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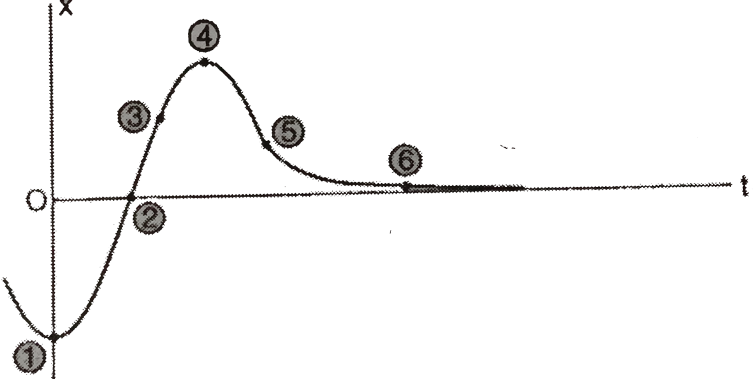
2. A particle is moving along X-axis under a force such that its position - time graph is as shown in figure.



As the particle passes position (2):

A. it is moving along negative X-direction with a maximum speed

B. it is moving along positive X-direction with a minimum speed

C. it is moving along negative X-direction and its speed is zero here

D. it is moving along negative X-direction with a minimum speed

Answer: A

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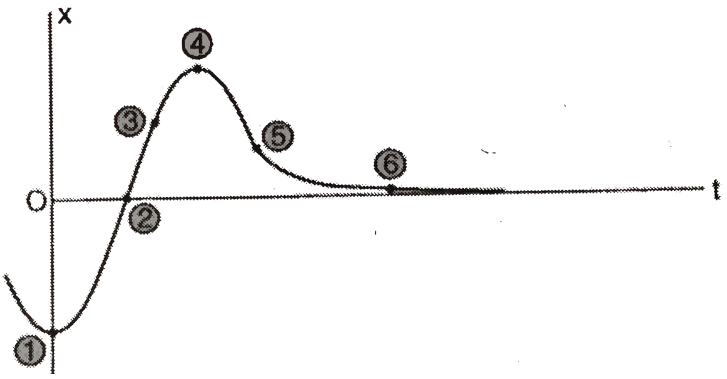
3. A particle is moving along X-axis under a force such that its position - time graph is as shown in figure.



As the particle passes position (3) :

A. it is moving along positive X-direction with a maximum speed

B. it is moving along negative X-direction with a speed that is increasing with time

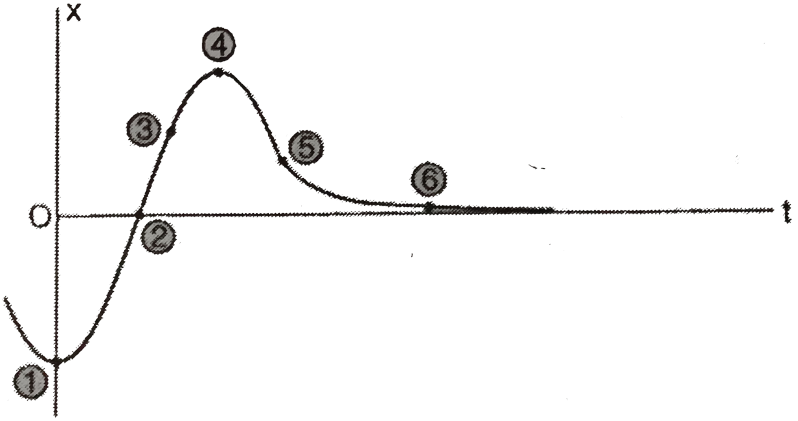
C. it is moving along positive X-direction with a speed that is decreasing with time

D. it is moving along negative X-direction with a speed that is decreasing with time

Answer: C

View Text Solution

4. A particle is moving along X-axis under a force such that its position - time graph is as shown in figure.



As the particle passes position (5) :

A. it is instantaneously at rest and will now move along negative X-direction

B. it is instantaneously at rest and will now move along positive X-direction

C. it is moving along positive X-direction with a maximum speed

D. it is moving along negative X-direction with a maximum speed

Answer: A

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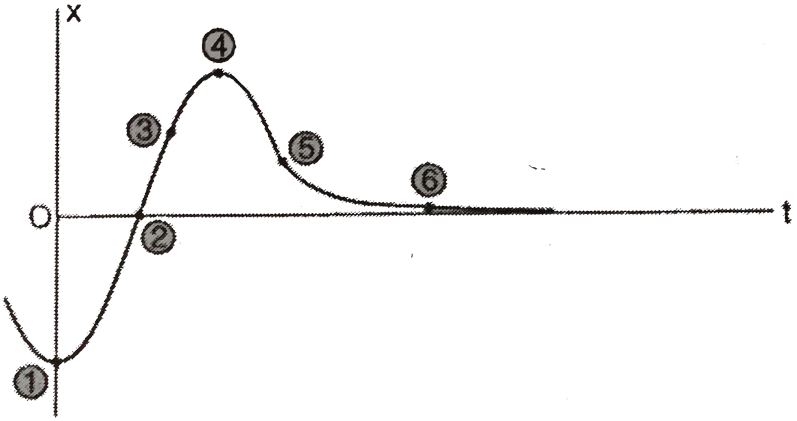
5. A particle is moving along X-axis under a force such that its position - time graph is as shown in figure.



As the particle passes position (5) :

A. it is instantaneously at rest and will now move along positive X-direction

B. it is moving along positive X-direction with a speed that is decreasing with time

C. it is moving along negative X-direction with a maximum speed

D. it is moving along negative X-direction with a minimum speed

Answer: C

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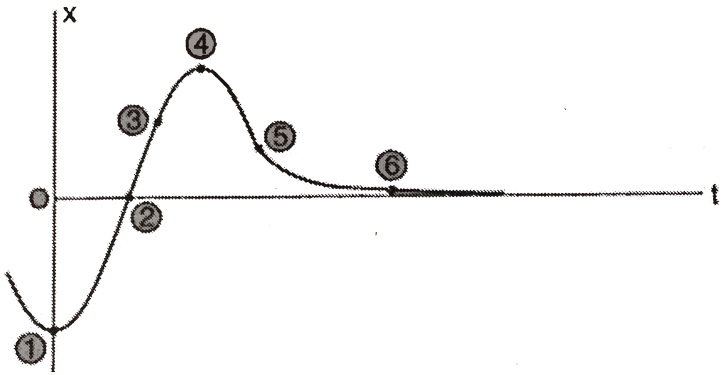
6. A particle is moving along X-axis under a force such that its position - time graph is as shown in figure.



As the particle passes position (6) :

A. it is moving along positive X-direction with a speed that is increasing with time

B. it is moving along positive X-direction with a speed that is decreasing with time

C. it is moving along negative X-direction with a speed that is increasing with time

D. it is moving along negative X-direction with a speed that is decreasing with time

Answer: D

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7. A person standing on the roof of a building throws a ball vertically upward at an instant $t = 0$. The ball leaves his hand with an upward speed 20 m/s and it is then in free fall. The ball rises to a certain height and then moves down. On its way down, the ball just misses to hit the roof of the building and keeps falling towards the earth. the ball hits earth at $t = 5$sec. considering that (i) the vertically upward direction is the positive Y-direction (ii) the position of ball at $t = 0$ is the origin (iii) the ball does not rebound and comes to rest at the same place where it

hits earth and (iv) air resistance is negligible. (Take $g = 10m/s^2$)

Maximum displacement of the ball from the initial position is :

A. $45\hat{j}m$

B. $-45\hat{j}m$

C. $25\hat{j}m$

D. $-25\hat{j}$

Answer: D

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8. A person standing on the roof of a building throws a ball vertically upward at an instant $t = 0$. The ball leaves his hand with an upward speed 20 m/s and it is then in free fall. The ball rises to a certain height and then moves down. On its way down, the ball just misses to hit the roof of the building and keeps falling towards the earth. the ball hits earth at $t = 5$sec. considering that (i) the vertically upward direction is the positive Y-direction (ii) the position of ball at $t = 0$ is the origin (iii)

the ball does not rebound and comes to rest at the same place where it hits earth and (iv) air resistance is negligible. (Take $g = 10m/s^2$)

Average velocity of the ball from $t = 0$ to $t = 5$ sec

A. $10\hat{j}m/s$

B. $-5\hat{j}m/s$

C. $-8\hat{j}m/s$

D. $-9\hat{j}m/s$

Answer: B

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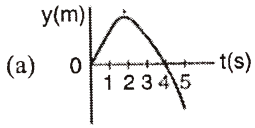
9. A person standing on the roof of a building throws a ball vertically upward at an instant $t = 0$. The ball leaves his hand with an upward speed 20 m/s and it is then in free fall. The ball rises to a certain height and then moves down. On its way down, the ball just misses to hit the roof of the building and keeps falling towards the earth. the ball hits earth at $t = 5$sec. considering that (i) the vertically upward direction is

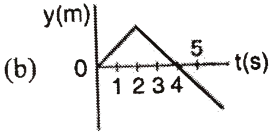
the positive Y-direction (ii) the position of ball at $t = 0$ is the origin (iii) the ball does not rebound and comes to rest at the same place where it hits earth and (iv) air resistance is negligible. (Take $g = 10m/s^2$)

Position -time graph for the given motion of the ball is :

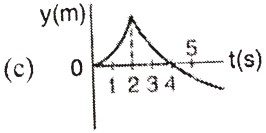
A.



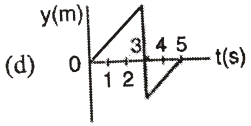
B.



C.



D.



Answer: A

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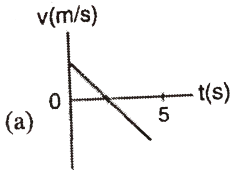
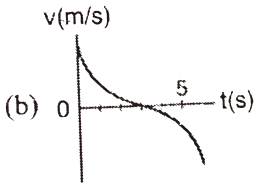
10. A person standing on the roof of a building throws a ball vertically upward at an instant $t = 0$. The ball leaves his hand with an upward speed 20 m/s and it is then in free fall. The ball rises to a certain height and then moves down. On its way down, the ball just misses to hit the roof of the building and keeps falling towards the earth. the ball hits earth at $t = 5$sec. considering that (i) the vertically upward direction is the positive Y-direction (ii) the position of ball at $t = 0$ is the origin (iii) the ball does not rebound and comes to rest at the same place where it hits earth and (iv) air resistance is negligible. (Take $g = 10m/s^2$)

Velocity of the ball will vary with time as:

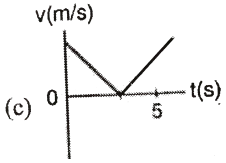
A.



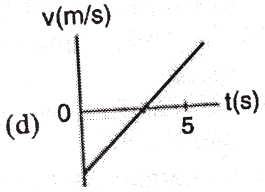
B.



C.



D.



Answer: A

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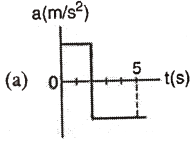
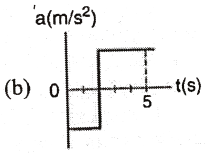
11. A person standing on the roof of a building throws a ball vertically upward at an instant $t = 0$. The ball leaves his hand with an upward speed 20 m/s and it is then in free fall. The ball rises to a certain height and then moves down. On its way down, the ball just misses to hit the roof of the building and keeps falling towards the earth. the ball hits earth at $t = 5$sec. considering that (i) the vertically upward direction is the positive Y-direction (ii) the position of ball at $t = 0$ is the origin (iii) the ball does not rebound and comes to rest at the same place where it hits earth and (iv) air resistance is negligible. (Take $g = 10m/s^2$)

Acceleration of the ball will vary with time as:

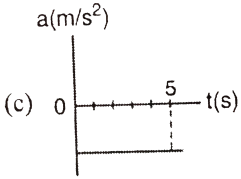
A.



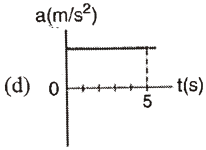
B.



C.



D.



Answer: C

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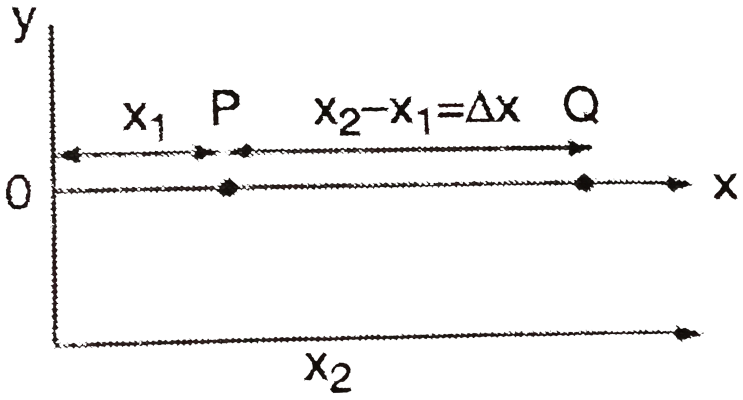
12. Consider a particle moving along x-axis. Its distance from origin O is described by the co-ordinate x which varies with time. At a time t_1, the particle is at point P, where its co-ordinate is x_1 and at time t_2, the particle is at point Q, where its co-ordinate is x_2. The displacement

during the time interval from t_1 to t_2 is the vector from P to Q, the x-component of this vector is $(x_2 - x_1)$ and all other components are zero.

It is convenient to represent the quantity $x_2 - x_1$ the change in x by means of a notation Δ, thus $\Delta x = x_2 - x_1$ and $\Delta t = t_2 - t_1$.



The average velocity $\overline{V} = \dfrac{x_2 - x_1}{t_2 - t_1} = \dfrac{\Delta x}{\Delta t}$

A particle moves half the time of its journey with u. The rest of the half time it moves with two velocities v_1 and v_2 such that half the distance it covers with v_1 and the other half with v_2. The net average velocity is: (Assume straight line motion)

A. $\dfrac{u(v_1 + v_2) + 2v_1v_2}{2(v_1 + v_2)}$

B. $\dfrac{2u(v_1 + v_2)}{2u + v_1 + v_2}$

C. $\dfrac{u(v_1 + v_2)}{2v_1}$

D. $\frac{2v_1v_2}{u+v_1+v_2}$

Answer: A

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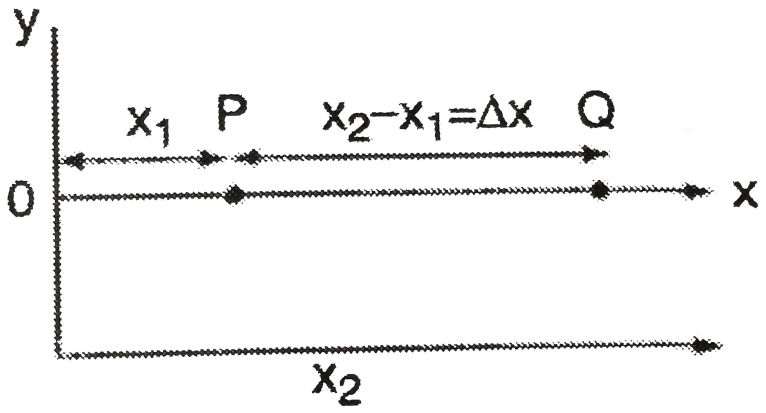
13. Consider a particle moving along x-axis. Its distance from origin O is described by the co-ordinate x which varies with time. At a time t_1, the particle is at point P, where its co-ordinate is x_1 and at time t_2, the particle is at point Q, where its co-ordinate is x_2. The displacement during the time interval from t_1 to t_2 is the vector from P to Q, the x-component of this vector is $(x_2 - x_1)$ and all other components are zero.

It is convenient to represent the quantity $x_2 - x_1$ the change in x by means of a notation Δ, thus $\Delta x = x_2 - x_1$ and $\Delta t = t_2 - t_1$.



The average velocity $\overline{V} = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t}$

A particle moves according to the equation $x = t^2 + 3t + 4$. The average velocity in the first 5 s is:

A. 8 m/s

B. 7.6 m/s

C. 6.4 m/s

D. 5.8 m/s

Answer: A

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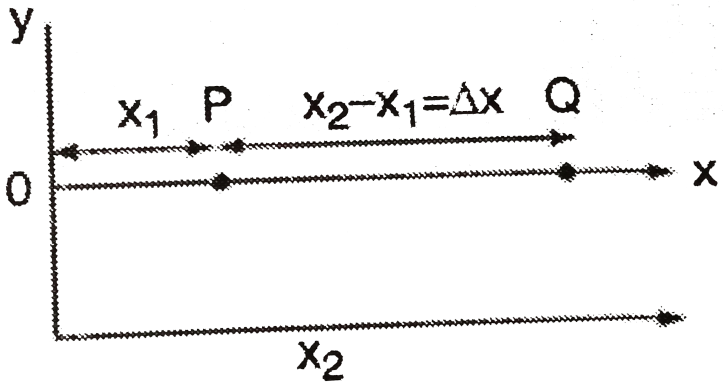
14. Consider a particle moving along x-axis. Its distance from origin O is described by the co-ordinate x which varies with time. At a time t_1, the particle is at point P, where its co-ordinate is x_1 and at time t_2, the particle is at point Q, where its co-ordinate is x_2. The displacement during the time interval from t_1 to t_2 is the vector from P to Q, the x-component of this vector is $(x_2 - x_1)$ and all other components are zero.

It is convenient to represent the quantity $x_2 - x_1$ the change in x by means of a notation Δ, thus $\Delta x = x_2 - x_1$ and $\Delta t = t_2 - t_1$.



The average velocity $\overline{V} = \dfrac{x_2 - x_1}{t_2 - t_1} = \dfrac{\Delta x}{\Delta t}$

The resistive force suffered by a motor boat is proportional to v^2, where v is instantaneous velocity. The engine was shut down when the velocity of the boat was v_0. Find the average velocity at any time t.

A. $\frac{v_0 + v}{2}$

B. $\frac{vv_0}{2(v_0 + v)}$

C. $\frac{vv_0 \log_e\left(\frac{v_0}{v}\right)}{(v_0 - v)}$

D. $\frac{2vv_0 \log_e\left(\frac{v_0}{v}\right)}{(v_0 + v)}$

Answer: C

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