PHYSICS

BOOKS - DC PANDEY ENGLISH

MOTION IN A PLANE

Example

1. A scooter is moving along a straight line AB covers a distance of 360 m in 24 s and returns back from B to C and coveres 240 m in 18 s. Find the total distance travelled by the scooter.

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2. A wheel completes 2000 revolutions to cover the 9.5 km. distance. then the diameter of the wheel is

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3. A man starts from his home and walks 50 m towards, then he turns towards east and walks 40 m and then reaches to his office after moving 20 m towards south.

(i) What is the total distance covered by the man from his home to office ?

(ii) What is his displacement from his home to office ?

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4. An object covers 1/4 of the circular path, what will be the ratio of the distance and displacement of the object ?

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5. Displacement of a person moving from X to Y along a semicircular path of radius r is 200 m. What is the distance travelled by him ?

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6. An athlete complete one round of a circular track of diameter $200m$ in $40s$. What will be the distance covered and the displacement at the end of 2 minutes $20s$?

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7. The distance covered by an object (in meter) is given by

$s = 8t^3 - 7t^2 + 5t$

Find its speed at t = 2 s.

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8. Abdul while driving to school, computes the average speed for his trip to be $20kmh^{-1}$. On his return trip along the same route, there is less traffic and the average speed is $40kmh^{-1}$. What is the average speed for Abdul's trip ?

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

(a) $\frac{2v_dv_u}{v_d+v_u}$ (b) $\sqrt{v_uu_d}$ (c) $\frac{v_dv_u}{v_d+v_u}$ (d) $\frac{v_u+v_d}{2}$

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10. A particle travels along a straight line. It covers halg the distance with a speed (v). The remaining part of the distance was covere with speed v_1 for half the time and with speed v_2 for the other half the time . Find the average speed of the particle over the entire motion.

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11. A car covers the first half of the distance between two places at a speed of $40kmh^{-1}$ and second half at $60kmh^{-1}$ Calculate the average speed of the car.

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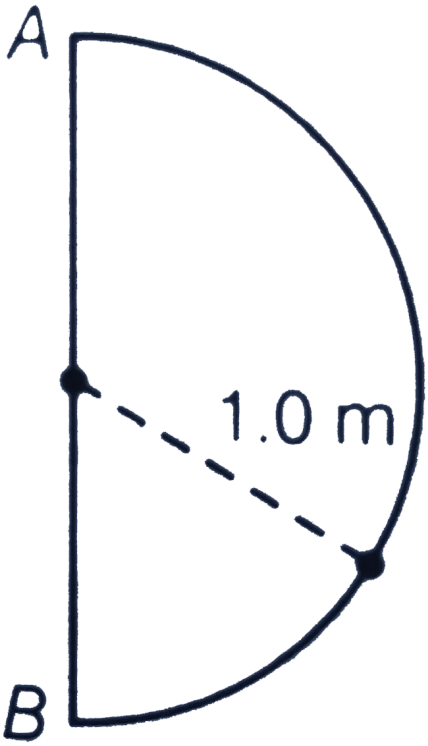
12. In one second, a particle goes from point A to point B moving in a semicircle (Fig). Find the magnitude of the average velocity.



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13. A farmer has to go 500 m due north, 400 m due east and 200 m due south to reach his field. If he takes 20 min to reach the field.

(a) What distance he has to walk to reach the field ?

(b) What is the displacement from his house to the field ?

(c) What is the average speed of farmer during the walk ?

(d) What is the average velocity of farmer during the walk ?

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14. Joseph jogs from one end A to the other end B of a straight 300 m road in 2 min 50 s and then turns around and jogs 100 m back to point C in another 1 min. What are Joseph's average speeds and velocities in jogging (i) from A to B and (ii) from A to C ?

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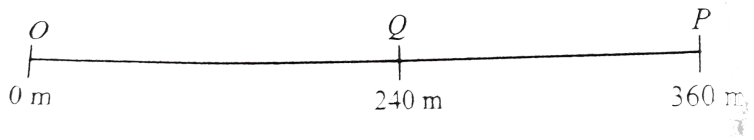
15. A car is moving along a straight line OP as shown in the figure. It moves from O to P in 18 s and returns from P to Q in 6 s. Which

of the following statements is not correct regarding the motion of the car ?



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16. The position of object moving along an x-axis is given by $x = 3t - 4t^2 + t^3$, where x is in meters and t in seconds. Find the position of the object at the following values of t : (i) 2s, (ii) 4s, (iii) What is the object's displacement between t = 0 s and t = 4 s ? and (iv) What is its average vvelocity for the time interval from t = 2 s to t = 4 ?

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17. The velocity of particle moving in the positive direction of x axis varies as $v = \alpha\sqrt{x}$, where α is a positive constnat. Assuming that at moment $t = 0$, the particle was located at the point x=0. find.

(a) the time dependence of the velocity and the acceleration of the particle.

(b) the mean velocity of the particle averaged over the time that the particle takes to cover first s meters of the path

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18. The distance travelled by an object moving along a straight line is directly proportional to the square of the time. Its acceleration

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19. Give examples where a. the velocity of a particle is zero but its acceleration is not zero. b.the velocity is opposite in direction to the acceleration, c. the velocity is perpendicular to the acceleration.

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20. The velocity of a particle is given by $v = \left(2t^2 - 3t + 10\right) ms^{-1}$. Find the instantaneous acceleration at t = 5 s.

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21. A particle is moving with a velocity of $v = \left(3 + 6t + 9t^2\right) \frac{m}{s}$. Find out

(a) the acceleration of the particle at $t = 3s$.

(b) the displacement of the particle in the interval $t = 5s$ to $t = 8s$.

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22. The motion of a particle along a straight line is described by the function $x = (2t - 3)^2$, where x is in metres and t is in seconds. Find

(a) the position, velocity and acceleration at $t = 2s$.

(b) the velocity of the particle at origin.

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23. The radius vector of a point depends on time t, as

$$r = ct + \frac{bt^2}{2}$$

where c and b are constant vectors. Find the modulus of velocity and acceleration at any time t.

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24. A particle is moving in a straight line. Its displacement at any instant t is given by $x = 10t + 15t^3$, where x is in meters and t is in seconds. Find

(i) the average acceleration in the intervasl t = 0 to t = 2s and

(ii) instantaneous acceleration at t = 2 s.

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25. (i) What does $\left|\frac{dv}{dt}\right|$ and $\frac{d|V|}{dt}$ represent ?

(ii) Can these be equal ?

(iii) Can $\frac{d\mid V}{dt} = 0$ while $\left|\frac{dV}{dt}\right. \neq 0$?

(iv) Can $\frac{d|V|}{dt} \neq 0$ while $\left|\frac{dv}{dt}\right| = 0$?

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

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27. Two cars start off a race with velocities 2m/s and 4m/s travel in straight line with uniform acceleration $2m/s^2$ and $1m/s^2$ respectively. What is the length of the path if they reach the final point at the same time ?

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28. A body starting from rest has an acceleration of $4ms^{-2}$. Calculate distance travelled by it in 5th second.

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29. A train, travelling at $20km/hr$ is approaching a platform. A bird is sitting on a pole on the platform. When the train is at a distance of 2 km from pole, breakes are applied which produce auniform deceleration in it. At that instant the bird flies towards the train at $60km/hr$ and after touching the nearest point on the train flies back to the pole and then flies towards the train and continues repeating itself. Calculate how much distance will the bird have flown before the train stops?

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30. A particle starts with an initial velocity and passes successively over the two halves of a given distance with constant accelerations a_1 and a_2 respectively. Show that the final velocity

is the same as if the whole distance is covered with a uniform acceleration $\frac{a_1 + a_2}{2}$.

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31. In a car race, car A takes a time t less than car B at the finish and passes the finishing point with speed v more than that of the car B. Assuming that both the cars start from rest and travel with constant acceleration a_1 and a_2 respectively. Show that $v = \sqrt{a_1 a_2} t$.

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32. A particle starts from rest and moves under constant acceleration in a straight line. Find the ratio of displacement (a) in successive second and (b) in successive time interval t_0.

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33. Velocity and acceleration of a particle at time $t = 0$are $u = \left(2\hat{i} + 3\hat{j}\right)m/s$ and $a = \left(4\hat{i} + 3\hat{j}\right)m/s^2$ respectively. Find the velocity and displacement if particle at $t = 2s$.

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34. A ball is thrown upwards from the top of a tower $40m$ high with a velocity of $10m/s$. Find the time when it strikes the ground. Take $g = 10m/s^2$.

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35. A pobble is thrown vertically upwards from a bridge with an initial velocity of $4.9ms^{-1}$. It strikes the water after 2 s. If

acceleration due to gravity does the pebble strike the water ?

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36. 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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37. A juggler throws balls into air. He throws one when ever the previous one is at its highest point. If he throws n balls each second, the height to which each ball will rise is

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

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39. A ball is thrown vertically upwards with a velocity of $20ms^{-1}$ from the top of a multistore building of 25 m high. How high will the ball rise? (Take g = $10ms^{-2}$)

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40. A ball is thrown upwards from the ground with an initial speed of u. The ball is at height of $80m$ at two times, the time interval being 6 s. Find u. Take $g = 10m/s^2$.

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41. A particle of mass 1 kg has a velocity of $2m/s$. A constant force of 2N acts on the particle for 1s in a direction perpendicular to its initial velocity. Find the velocity and displacement of the particle at the end of 1 s.

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42. An open elevator is ascending with constant speed $v = 10m/s$. A ball is thrown vertically up by a boy on the lift when he is at a height $h = 10m$ from the ground. The velocity of projection is $v = 30m/s$ with respect to elevator. Find

(a) the maximum height attained by the ball.

(b) the time taken by the ball to meet the elevator again.

(c) time taken by the ball to reach the ground after crossing the elevator.

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43. A particle is thrown vertically upwards from the surface of the earth. Let T_P be the time taken by the particle to travel from a point P above the earth to its highest point and back to the point P. Similarly, let T_Q be the time taken by the particle to travel from another point Q above the earth to its highest point and back to the same in terms of T_P, T_Q and H, is :-

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44. Drop of water fall at regular intervals from roof of a building of height (H=16 m), the first drop striking the ground at the same moment as the fifth drop falls from the roof. The distances

between separate drops in air as the first drop reaches the ground are.

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45. A ball is dropped from the top of a tower. After 2 s another ball is thrown vertically downwards with a speed of $40ms^{-1}$. After how much time and at what distance below the top of tower the balls meet ?

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46. Velocity-time equation of a particle moving in a straight line is, $v = \left(10 + 2t + 3t^2\right)$ (SI units) Find

(a) displacement of particle from the mean position at time $t = 1s,$ if it is given that displacement is 20m at time $t = 0.$

(b) acceleration-time equation.

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47. Displacement-time equation of a particle moving along x-axis is $x = 20 + t^3 - 12t$ (SI units)

(a) Find, position and velocity of particle at time t=0.

(b) State whether the motion is uniformly accelerated or not.

(c) Find position of particle when velocity of particle is zero.

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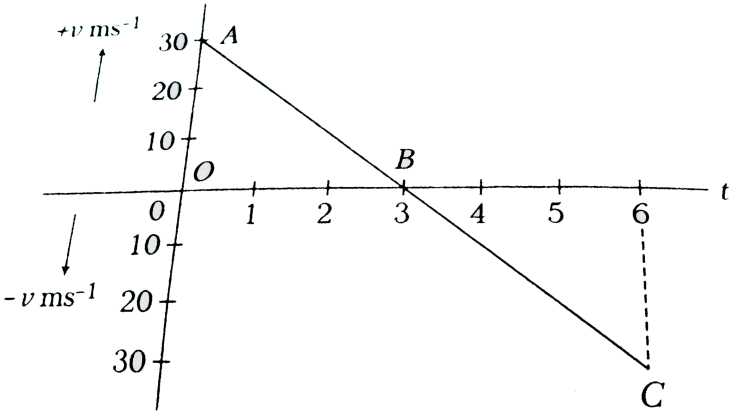
48. With the help of the given velocity - time graph, find the

(i) displacement in first three seconds and

(ii) acceleration for the graph.



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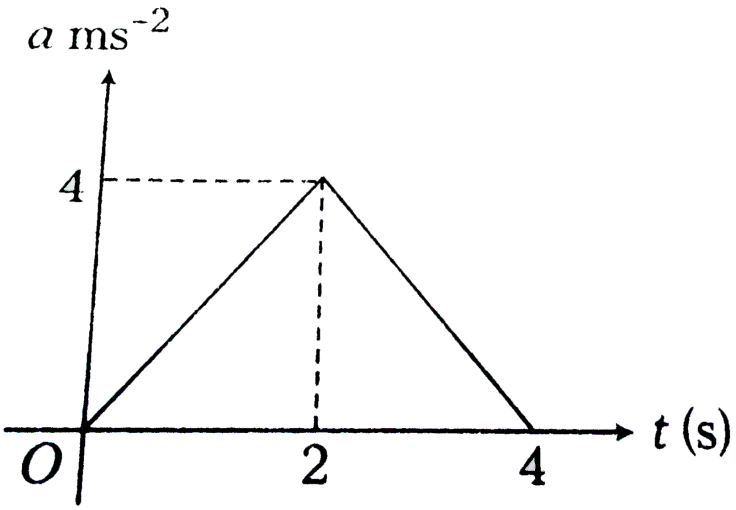
49. Acceleration - time graph of a particle moving in a straight line is shown in figure. Velocity of particle at time t = 0 is $2ms^{-1}$. Find

velocity at the end of fourth second.



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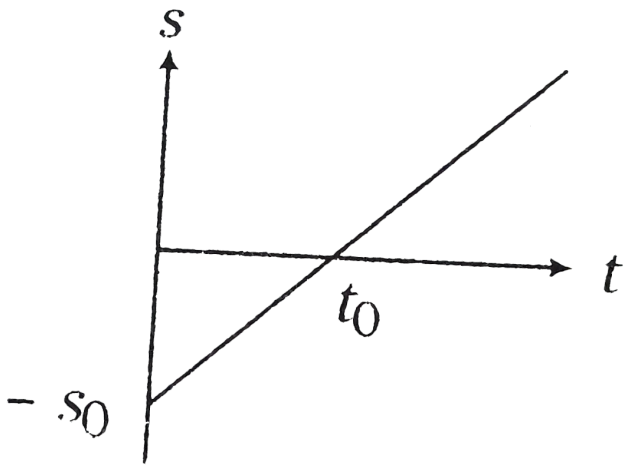
50. Displacement - time graph of particle moving in a straight line is as shown in figure. State whether the motion is accelerated or not. Describe the motion in detail. Given,

$s_0 = 20m$ and $t_0 = 4s$.



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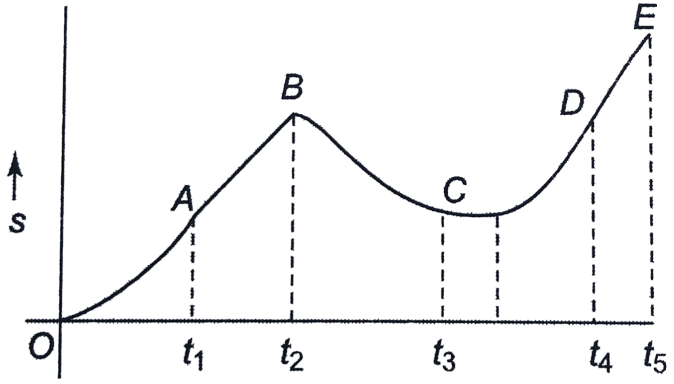
51. A particle is moving along the x-axis and its position-time graph is shown. Determine the sign of acceleration.



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52. 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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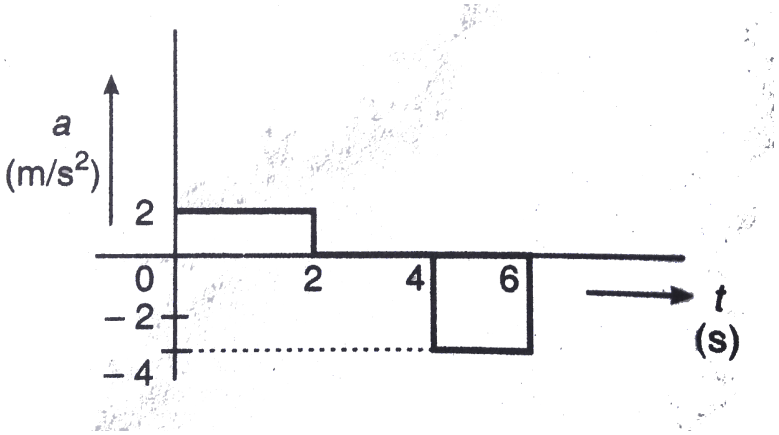
53. The acceleration versus time graph of a particle moving along a straight line is shown in the figure. Draw the respective velocity-

time graph Given $v = 0$ at $t = 0$.



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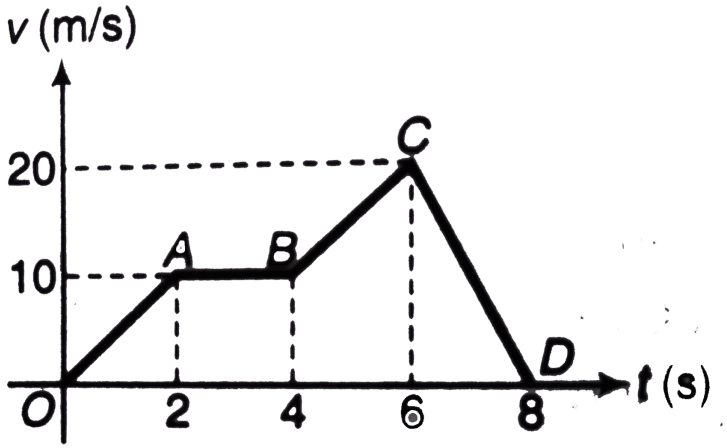
54. Velocity-time graph of a particle moving in a straight line is shown in figure. Plot the corresponding displacement-time graph

of the particle if at time $t = 0,$ displacement $s = 0.$



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55. A rocket is fired vertically upwards with a net acceleration of $4m/s^2$ and initial velocity zero. After $5s$ its fuel is finished and it decelerates with g. At the highest point its velocity becomes zero. Then, it accelerates downwards with acceleration g and return back to ground. Plot velocity-time and displacement -time graphs for the complete journey. Take $g = 10m/s^2.$

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56. Anoop is moving due east with a velocity of $1m/s$ and Dhyani is moving due west with a velocity of $2m/s$. what is the velocity of Anoop with respect to Dhyani?

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57. Two parallel rail tracks run north-south. On one track train A moves noth with a speed of $54kmh^{-1}$ and on the other track train B moves south with a speed of $90kmh^{-1}$. The velocity of train A with respect to train B is

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58. A man A moves due to East with velocity $6ms^{-1}$ and another man B moves in $N-30^{\circ}E$ with $6ms^{-1}$. Find the velocity of B

w.r.t. A.

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59. Buses A and B are moving in the same direction with speed $20ms^{-1}$ and $15ms^{-1}$ respectively. Find the relative velcoity of A w.r.t. B and relative velocity of B w.r.t. A.

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60. Car A has an acceleration of $2m/s^2$ due east and car B, $4m/s^2$. due north. What is the acceleration of car B with respect to car A?

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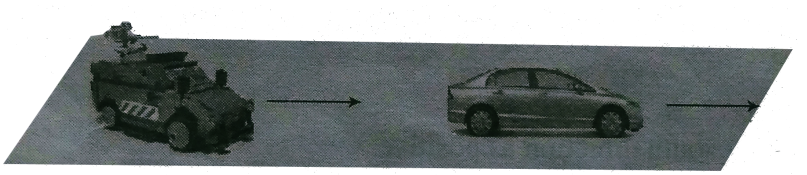
61. A police van moving on a highway with a speed of $30kmh^{-1}$ Fires a bullet at a thief's car speeding away in a same direction with a speed of $192kmh^{-1}$. If the muzzle speed of the buller is $150ms^{-1}$, with what speed does the bullet hit thief's car? .



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62. Delhi is at a distance of 200 km from Ambala. Car A set out from Ambala at a speed of $30kmh^{-1}$ and car B set out at the same time from Delhi at a speed of $20kmh^{-1}$. When they will meet each other ? What is the distance of that meeting point from Ambala ?

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63. Two cars are travelling towards each other on a straight road with velocities $10ms^{-1}$ and $12ms^{-1}$ respectively. When they are 150 m apart, both drivers apply their brakes and each car decelerates at $2ms^{-2}$ until it stops. How far apart will they be when they have come to rest?

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64. To a man walking at the rate of $3km/h$ the rain appear to fall vetically douwnwards. When he increases his speed $6km/h$ it appears to meet him at an angle of 45° with vertically. Find the speed of rain.

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65. A man crosses a river in a boat. If he cross the river in minimum time he takes $10\ \text{min}$ with a drift $120m$. If he crosses the river taking shortest path, he takes $12.5\ \text{min}$, find

(a) width of the river

(b) velocity of the boat with respect to water

(c) speed of the current

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66. A man wants to reach point B on the opposite bank of a river flowing at a speed as shown in figure. What minimum speed relative to water should the man have so that he can reach point B? In which direction should he swim?

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67. A man can row a boat with 4km/h in still water, if he is crossing a river where the current is 2 km/h.

(a) In what direction will his boat be holded, if he wants to reach a point on the other bank, directly opposite to starting point?

(b) If width of the river 4km, how long will the man take to cross the river, with the condition in part (a)?

(c) In what direction shou ld he heat the boat if he wants to cross the river in shorest time and what is this minimum time?

(d) How long will it take him to row 2 km up the stream and then back to his starting point?

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68. A boat moves relative to water with a velocity v which is n times less than the river flow velocity u. At what angle to the stream direction must the boat move to minimize drifting ?

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69. Car A and car B start moving simultaneously in the same direction along the line joining them. Car A moves with a constant acceleration $a = 4m/s^2$, while car B moves with a constant velocity $v = 1m/s$. At time $t = 0$, car A is $10m$ behind car B. Find the time when car A overtake car B.

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70. An open lift is moving upward with velocity $10m/s$. It has an upward acceleration of $2m/s^2$. A ball is projected upwards with velocity $20m/s$ relative to ground. Find

(a) time when ball again meets the lift

(b) displacement of lift and ball at that instant.

Take $g = 10m/s^2$

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71. Two ships A and B are $10km$ apart on a line running south to north. Ship A farther north is streaming west at $20km/h$ and ship B is streaming north at $20km/h$. What is their distance of closest approach and how long do they take to reach it?

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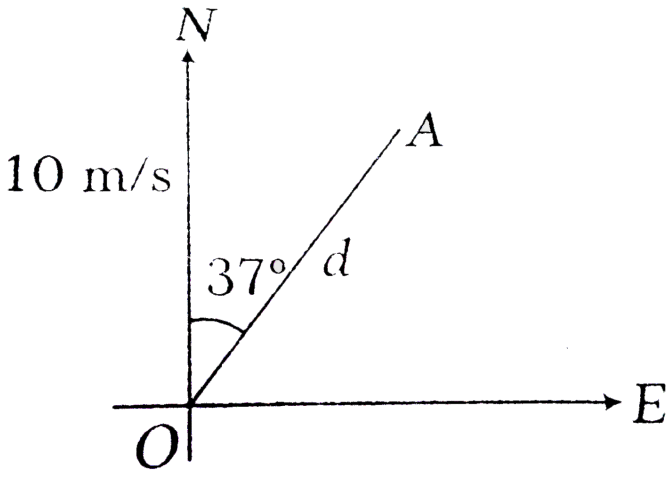
72. An aeroplane has to go from a point O to another point A, at distance d due 37° East of North. A wind is blowing due North at a speed of $10ms^{-1}$. The air speed of the plane is v. (i) Find the direction in which the pilot should head the plane to reach the

point A. (ii) Find the time taken by the plane to go from O to A.



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73. An aircraft flies at $400km/h$ in still air. A wind of $200\sqrt{2}km/h$ is blowing from the south towards north. The pilot wishes to travel from A to a point B north east of A. Find the direction he must steer and time of his journey if $AB = 1000km$.

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Check Point 3 1

1. Which of the following is a one-dimensional motion ?

A. Landing of an aircraft

B. Earth revolving around the sun

C. Motion of wheels of moving

D. Train running on a straight track

Answer: D

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2. A person moves towards East for 3 m, then towards North for 4 m and then moves vertically up by 5 m. What is his distance now from the starting point ?

A. $5\sqrt{2}m$

B. 5 m

C. 10 m

D. 20 m

Answer: A

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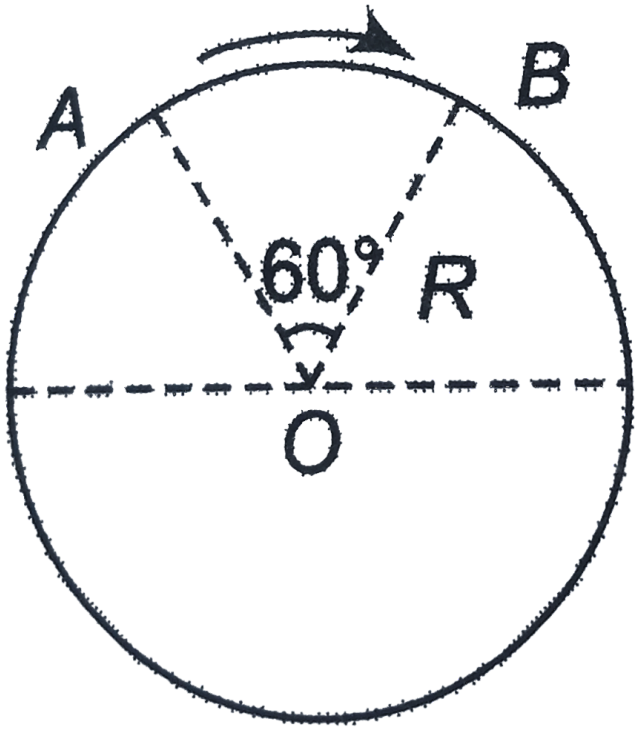
3. A particle moves in a of radius R from A to B, as shown in the figure. Find the distance and displacement covered.



A. $\frac{\pi R}{3}$

B. $\frac{\pi R}{2}$

C. $\frac{\pi R}{4}$

D. πR

Answer: A

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4. A person moves $30m$ north,, $then$20 m towards east and finally $30\sqrt{2}m$ in south-west direction. The displacement of the person from the origin will be

A. 10 m along North

B. 10 m long South

C. 10 m along West

D. Zero

Answer: C

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5. An aeroplane flies 400 m north and 300m south and then flies 1200 m upwards then net displacement is

A. 1200 m

B. 1300 m

C. 1400 m

D. 1500 m

Answer: A

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6. A wheel of radius $1m$ rolls forward half a revolution on a horizontal ground. The magnitude of the displacement of the point of the wheel initially on contact with the ground is.

A. 2π

B. $\sqrt{2}\pi$

C. $\sqrt{\pi^2+4}$

D. π

Answer: C

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7. The three initial and final position of a man on the X-axis are given as

(i) $(-8m, 7m)$ (ii) $(7m, -3m)$

(iii) $(-7m, 3m)$

Which pair gives the negative displacement ?

A. (i)

B. (ii)

C. (iii)

D. (i) and (iii)

Answer: B

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

A. $0, 2\pi r$

B. $2\pi r, 0$

C. $0, \pi r$

D. $\pi r, 0$

Answer: B

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9. A particle starts from the origin, goes along the X-axis to the point (20m, 0) and then returns along the same line to the point (-20m,0). Find the distance and displacement of the particle during the trip.

A. 40 m, 0

B. 40 m, 20 m

C. $40m, \ -20m$

D. $60m, \ -20m$

Answer: D

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10. The numerical ratio of displacement to the distance covered is always

A. less than one

B. equal to one

C. equal to or less than one

D. equal to or greater than one

Answer: C

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Check Point 3 2

1. A car moves for half of its time at $80km/h$ and for rest of time at $40km/h$. Total distance covered is $60km$. What is the average speed of the car

A. $60kmh^{-1}$

B. $80kmh^{-1}$

C. $120kmh^{-1}$

D. $180kmh^{-1}$

Answer: A

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2. During the first $18\ \min$ of a $60\ \min$ trip, a car has an average speed of $11ms^{-1}$. What should be the average speed for remaining $42\ \min$ so that car is having an average speed of $21ms^{-1}$ for the entire trip?

A. $25.3ms^{-1}$

B. $29.2ms^{-1}$

C. $31ms^{-1}$

D. $35.6ms^{-1}$

Answer: A

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3. A man walks on a straight road from his home to a market $2.5km$ away a speed of $5kmh^{-1}$. Finnding the market closed , he instantly turns and walks back home with a speed of $7.5kmh^{-1}$. The average speed of the man over the interval of time 0 to 50 min is equal to

A. $5kmh^{-1}$

B. $\frac{25}{4}kmh^{-1}$

C. $\frac{30}{4}kmh^{-1}$

D. $\frac{45}{8}kmh^{-1}$

Answer: D

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4. A particle is constrained to move on a straight line path. It returns to the starting point after 10 sec . The total distance covered by the particle during this time is 30 m . Which of the following statements about the motion of the particle is false

A. Displacement of the particle is zero

B. Average speed of the particle is $3ms^{-1}$

C. Displacement of the particle 30 m

D. Both (a) and (b)

Answer: D

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5. A $150m$ long train is moving with a uniform velocity of $45km/h$. The time taken by the train to cross a bridge of length 850 metres is.

A. 56 s

B. 68 s

C. 80 s

D. 92 s

Answer: C

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6. The displacement of a particle starting from rest (at $t = 0$) is given by $s = 6t^2 - t^3$. The time in seconds at which the particle will attain zero velocity again, is

A. 2

B. 4

C. 6

D. 8

Answer: B

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7. An insect crawls a distance distance of 4 m along North in 10 s and then a distance of 3 m along East in 5 s. The average velocity of the insect is

A. $\frac{7}{15}ms^{-1}$

B. $\frac{1}{5}ms^{-1}$

C. $\frac{1}{3}ms^{-1}$

D. $\frac{4}{5} ms^{-1}$

Answer: C

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8. A point traversed 3/4 th of the circle of radius R in time t. The magnitude of the average velocity of the particle in this time interval is

A. $\frac{\pi R}{t}$

B. $\frac{3\pi R}{2t}$

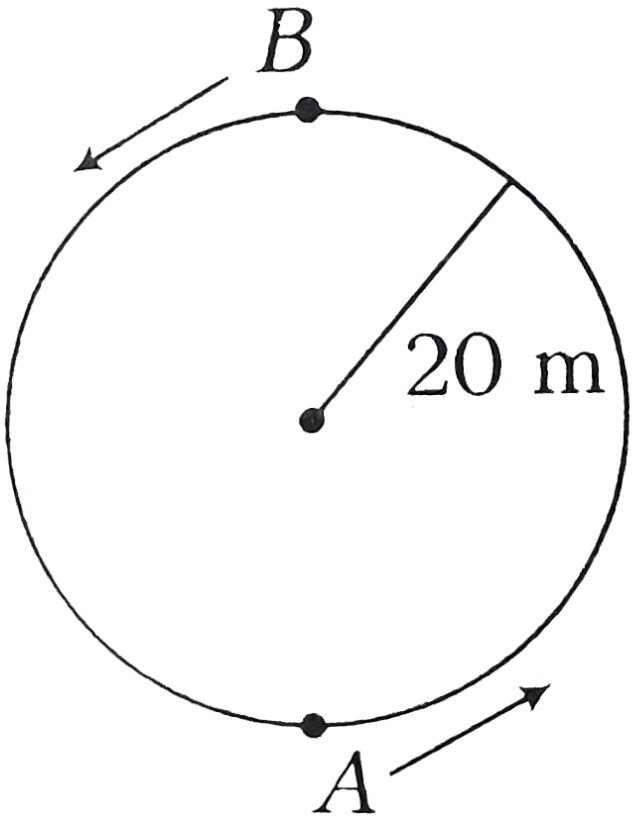
C. $\frac{R\sqrt{2}}{t}$

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

Answer: C

Watch Video Solution

9. A boy is running over a circular track with uniform speed of $10ms^{-1}$. What is the average velocity for movement of boy from A to B (in ms^{-1}) ?



A. $\frac{10}{\pi}$

B. $\frac{40}{\pi}$

C. 10

D. None of these

Answer: D

Watch Video Solution

10. The displacement x of an object is given as a funstion of time, $x = 2t + 3t^2$. The instantaneous velocity of the object at t = 2 s is

A. $16ms^{-1}$

B. $14ms^{-1}$

C. $10ms^{-1}$

D. $12ms^{-1}$

Answer: B

Watch Video Solution

Check Point 3 3

1. Acceleration of a particle changes when

A. direction of velocity changes

B. magnitude of velocity changes

C. Both (a) and (b)

D. speed changes

Answer: C

Watch Video Solution

2. If a particle moves with an acceleration, then which of the following can remain constant ?

A. Both speed and velocity

B. Neither speed nor velocity

C. Only the velocity

D. Only the speed

Answer: D

Watch Video Solution

3. The average velocity of a body moving with uniform acceleration after travelling a distance of $3.06m$ is $0.34ms^{-1}$. If the change in velocity of the body is $0.18ms^{-1}$ during this time, its uniform acceleration is .

A. $0.01ms^{-2}$

B. $0.02ms^{-2}$

C. $0.03ms^{-2}$

D. $0.04ms^{-2}$

Answer: B

Watch Video Solution

4. The displacement x of a particle at time t along a straight line is given by $x = \alpha - \beta t + \gamma t^2$. The acceleraion of the particle is

A. $-\beta$

B. $-\beta + 2\gamma$

C. 2γ

D. -2γ

Answer: C

Watch Video Solution

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

A. $0.67ms^{-2}$

B. $1ms^{-2}$

C. $1.25ms^{-2}$

D. $1.5ms^{-2}$

Answer: A

Watch Video Solution

6. A body is moving with velocity $30m/s$ towards east. After $10s$ its velocity becomes $40m/s$ towards north. The average acceleration of the body is.

A. $7ms^{-2}$

B. $\sqrt{7}ms^{-2}$

C. $5ms^{-2}$

D. $1ms^{-2}$

Answer: C

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7. The displacement (in metre) of a particle moving along X-axis is given by $x = 18t + 5t^2$. The average acceleration during the interval $t_1 = 2s$ and $t_2 = 4s$ is

A. $13ms^{-2}$

B. $10ms^{-2}$

C. $27ms^{-2}$

D. $37ms^{-2}$

Answer: B

Watch Video Solution

8. The distance traversed by a particle moving along a straight lne is given by $x = 180t + 50t^2$ metre. The acceleration of the particle is

A. $180ms^{-2}$

B. $580ms^{-2}$

C. $100ms^{-2}$

D. $50ms^{-2}$

Answer: C

Watch Video Solution

9. The displacement (in metre) of a particle moving along x-axis is given by $x = 18t + 5t^2$ Calculate (i) instantaneous acceleration.

A. $18ms^{-2}$

B. $10ms^{-2}$

C. $5ms^{-2}$

D. $1ms^{-2}$

Answer: B

Watch Video Solution

10. A particle velocity changes from $\left(2\hat{i}+3\hat{j}\right)ms^{-1}$ to $\left(2\hat{i}-3\hat{j}\right)ms^{-1}$ in 2 s. The acceleration in ms^{-2} is

A. $-\left(\hat{i}+5\hat{j}\right)$

B. $\left(\hat{i}+5\hat{j}\right)/2$

C. zero

D. $\left(-3\hat{j}\right)$

Answer: D

Watch Video Solution

Check Point 3 4

1. An object is moving velocity $10ms^{-1}$. A constant force acts for 4 s object and given it a speed of $2ms^{-1}$ in opposite direction.

The acceleration produced is

A. $3ms^{-2}$

B. $-3ms^{-2}$

C. $6ms^{-2}$

D. $-6ms^{-2}$

Answer: B

Watch Video Solution

2. Velocity of a body moving a straight line with uniform acceleration (a) reduces by $\frac{3}{4}$ of its initial velocity in time t_0. The total time of motion of the body till its velocity becomes zero is

A. $\frac{4}{3}t_0$

B. $\frac{3}{2}t_0$

C. $\frac{1}{3}t_0$

D. $\frac{8}{3}t_0$

Answer: A

Watch Video Solution

3. The distance travelled by a particle is proportional to the squares of time, then the particle travels with

A. uniform acceleration

B. uniform velocity

C. Both of these

D. speed changes

Answer: A

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Watch Video Solution

4. The displacement of a body in 8 s starting from rest with an acceleration of $20cms^{-2}$ is

A. 64 m

B. 64 cm

C. 640 cm

D. $0.064m$

Answer: C

Watch Video Solution

5. A particle starts with a velocity of $2m/s$ and moves in a straight line with a retardation of $0.1m/s^2$. The time that it takes to describe $15m$ is

A. 10 s

B. 20 s

C. 30 s

D. 40 s

Answer: A

Watch Video Solution

6. A particle starts from rest accelerates at $2m/s^2$ for $10s$ and then goes for constant speed for $30s$ and then decelerates at $4m/s^2$ till it stops. What is the distance travelled by it.

A. 750 m

B. 800 m

C. 700 m

D. 850 m

Answer: A

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7. The motion of a particle is described by the equation at $u = at$ .The distance travelled by the particle in the first 4 seconds

A. $4a$

B. $12a$

C. $6a$

D. $8a$

Answer: D

Watch Video Solution

8. A body is moving with uniform velocity of $8ms^{-1}$. When the body just crossed another body, the second one starts and moves with uniform acceleration of $4ms^{-2}$. The time after which two bodies meet will be :

A. 2 s

B. 4 s

C. 6 s

D. 8 s

Answer: B

Watch Video Solution

9. Two bodies A and B start from rest from the same point with a uniform acceleration od $2ms^{-2}$. If B starts one second later, then

the two bodies are separated , at the end of the next second, by

A. 1 m

B. 2 m

C. 3 m

D. 4 m

Answer: C

Watch Video Solution

10. The displacement of a particle moving in a straight line is described by the relation $s = 6 + 12t - 2t^2$. Here s is in metre and t in second. The distance covered by the particle in first $5s$ is

A. 20 m

B. 32 m

C. 24 m

D. 26 m

Answer: D

Watch Video Solution

11. A train accelerating uniormly from rest attains a maximum speed of $40ms^{-1}$ in $20s$. It travels at this speed for $20s$ and is brought to rest with uniform retardation i further $40s$. What is the average velocity during this period?

A. $80/3ms^{-1}$

B. $40ms^{-1}$

C. $25ms^{-1}$

D. $30ms^{-1}$

Answer: C

Watch Video Solution

12. A particle starts from rest and traverses a distance l with uniform acceleration, then moves uniformly over a further distance 2l and finally comes to rest after moving a further distance 3l under uniform retardation. Assuming entire motion to be rectilinear motion the ratio of average speed over the journey to the maximum speed on its ways is

A. $1/5$

B. $2/5$

C. $3/5$

D. $4/5$

Answer: C

Watch Video Solution

13. A body travelling with uniform acceleration crosses two point A and B with velocities $20ms^{-1}$ and $30ms^{-1}$ respectively. The speed of the body at the mid-point of A and B is.

A. $25ms^{-1}$

B. $25.5ms^{-1}$

C. $24ms^{-1}$

D. $10\sqrt{6}ms^{-1}$

Answer: B

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14. The velocity of a particle moving in the positive direction of X-axis varies as $v = 5\sqrt{x}$. Assuming that at t = 0, particle was at x = 0. What is the acceleration of the particle ?

A. $12.5ms^{-2}$

B. $7.5ms^{-2}$

C. $5ms^{-2}$

D. $2.5ms^{-2}$

Answer: A

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15. If a body starts from rest and travels 120 cm in the 6 second then what is the acceleration

A. $0.20ms^{-2}$

B. $0.027ms^{-2}$

C. $0.218ms^{-2}$

D. $0.03ms^{-2}$

Answer: C

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Check Point 3 5

1. Free fall on an object in vacuum is a case of motion with

A. uniform velocity

B. uniform acceleration

C. variable acceleration

D. constant momentum

Answer: B

Watch Video Solution

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

A. $5.84ms^{-1}$

B. $49ms^{-1}$

C. $\sqrt{98}ms^{-1}$

D. $98ms^{-1}$

Answer: B

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3. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

A. $ut - \left(gt^2/2\right)$

B. $(u + gt)t$

C. ut

D. $gt^2/2$

Answer: D

Watch Video Solution

4. A person throws balls into the air one after the other at an interval ofone second. The next ball is thrown when the velocityof the ball thrown earlier is zero. To what height the ball rise:

A. 2 m

B. 5 m

C. 8 m

D. 10 m

Answer: B

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5. An object thrown verticallly up from the ground passes the height 5 m twice in an interval of 10 s. What is its time of flight?

A. $52ms^{-1}$

B. $61ms^{-1}$

C. $45ms^{-1}$

D. $26ms^{-1}$

Answer: A

Watch Video Solution

6. If a stone is thrown up with a velocity of $9.8ms^{-1}$, then how much time will it take to come back ?

A. 1 s

B. 2 s

C. 3 s

D. 4 s

Answer: B

Watch Video Solution

7. A stone falls freely rest. The distance covered by it in the last second is equal to the distance covered by it in the first 2 s. The time taken by the stone to reach the ground is

A. 5 s

B. 12 s

C. 15 s

D. 8 s

Answer: A

Watch Video Solution

8. A stone is thrown vertically upwards with an initial speed u from the top of a tower, reaches the ground with a speed $3u$. The height of the tower is :

A. $3u^2 / g$

B. $4u^2 / g$

C. $6u^2 / g$

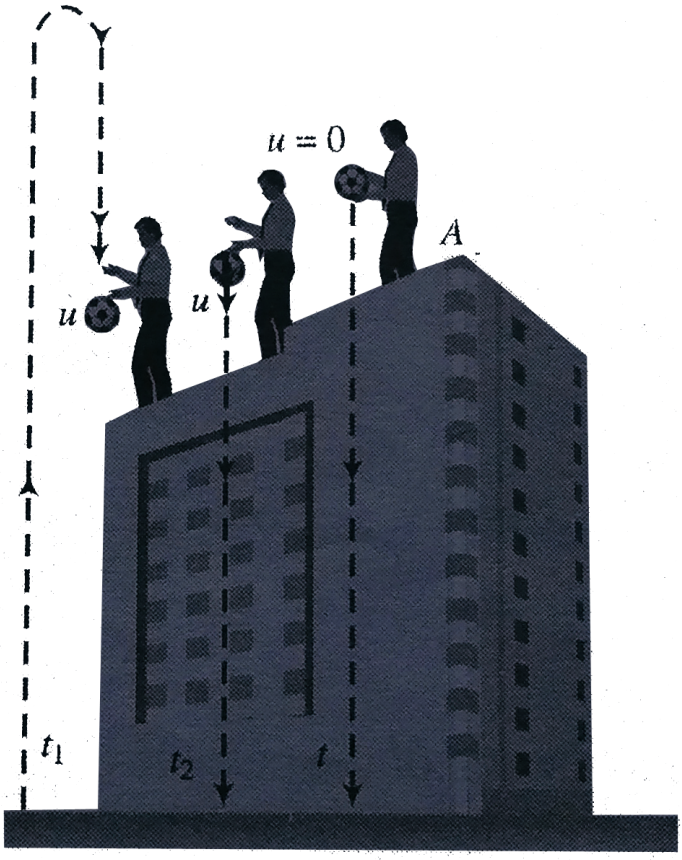
D. $9u^2 / g$

Answer: B

Watch Video Solution

9. A body is thrown vertically upwards from A. The top of a tower . It reaches the ground in time t_1. It it is thrown vertically downwards from A with the same speed it reaches the ground in time t_2, If it is allowed to fall freely from A. then the time it takes

to reach the ground.



A. $t = \dfrac{t_1 + t_2}{2}$

B. $t = \dfrac{t_1 - t_2}{2}$

C. $t = \sqrt{t_1 t_2}$

D. $t = \sqrt{\dfrac{t_1}{t_2}}$

Answer: C

Watch Video Solution

10. 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. $2\left(\frac{u}{g} - t_1\right)$

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

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

Answer: B

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11. A helicopter rises from rest on the ground vertically upwards with a constant acceleration g. A food packet is dropped from the helicopter when is at a height h. The time taken by the packet to reach the ground is close to [g is the acceeration due to gravity] :

A. $t_1 < t_2$

B. $t_1 = t_2$

C. $t_1 > t_2$

D. Data insfficient

Answer: C

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12. A particle (A) is dropped from a height and another particle (B) is thrown in horizontal direction with speed of 5 m/s from the

same height. The correct statement is

A. ball P reaches the ground first

B. ball Q reaches the ground first

C. Both reach the ground at the same time

D. the respective masses of the two balls will decide the time

Answer: C

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13. A particle is dropped from top of tower. During its motion it covers $\frac{9}{25}$ part of height of tower in last 1 sec. Then find height of the tower.

A. 100 m

B. $12.5m$

C. 145 m

D. $167.5m$

Answer: B

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14. A ball dropped from the top of a tower covers a distance $7x$ in the last second of its journey, where x is the distance covered in the first second. How much time does it take to reach to ground?.

A. 3 s

B. 4 s

C. 5 s

D. 6 s

Answer: B

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15. A body falls from a height $h = 200m$ (at New Delhi). The ratio of distance travelled in each $2\,\text{sec}$ during $t = 0$ to $t = 6$ seconds of the journey is.

A. $1:4:9$

B. $1:2:4$

C. $1:3:5$

D. $1:2:3$

Answer: C

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16. A stone is thrown vertically upwards. When stone is at a height half of its maximum height, its speed is $10m/s$, then maximum height attained by the stone is $(g = 10m/s^2)$

A. 16 m

B. 10 m

C. 20 m

D. 40 m

Answer: B

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17. When a ball is thrown up vertically with velocity v_0, it reaches a maximum height of h. If one wishes to triple the maximum height then the ball should be thrown with velocity

A. $\sqrt{3}v_0$

B. $3v_0$

C. $9v_0$

D. $3/2v_0$

Answer: A

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18. A man in a balloon rising vertically with acceleration $4.9m/s^2$ of releases a ball 2 sec after the balloon is let go from the ground. The greatest height above ground reached by the ball is : $(g = 9.8m/s^2)$

A. $14.7m$

B. $19.6m$

C. $9.8m$

D. $24.5m$

Answer: A

Watch Video Solution

19. A body freely falling from the rest has velocity v after it falls through a height h the distance it has to fall down for its velocity to become double is

A. 8 h

B. 6 h

C. 4 h

D. 5 h

Answer: C

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20. Two balls are dropped from heights h and $2h$ respectively from the earth surface. The ratio of time of these balls to reach the earth is.

A. $1:\sqrt{2}$

B. $\sqrt{2}:1$

C. $2:1$

D. $1:2$

Answer: A

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21. An aeroplane is moving with a velocity u. It drops a packet from a height h. The time t taken by the packet in reaching the ground will be

A. $\sqrt{\left(\frac{2g}{h}\right)}$

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

C. $\sqrt{\left(\frac{h}{2g}\right)}$

D. $\sqrt{\left(\frac{2h}{g}\right)}$

Answer: D

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22. For a particle moving along a straight line, the displacement x depends on time t as $x = \alpha t^3 + \beta t^2 + \gamma t + \delta$. The ratio of its initial acceleration to its initial velocity depends

A. only on α and γ

B. only on β and γ

C. only on α and β

D. only on α

Answer: B

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23. The acceleration of a particle is increasing linearly with time t as bt. The particle starts from the origin with an initial velocity v_0. The distance travelled by the particle in time t will be

A. $v_0 t + \frac{1}{6} b t^3$

B. $v_0 t + \frac{1}{3} b t^3$

C. $v_0 t + \frac{1}{3} b t^2$

D. $v_0 t + \frac{1}{2} b t^2$

Answer: A

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24. The acceleration a in ms^{-2} of a particle is given by $a = 3t^2 + 2t + 2$, where t is the time. If the particle starts out with a velocity $v = 2ms^{-1}$ at $t = 0$, then find the velocity at the end of $2s$.

A. $12ms^{-1}$

B. $14ms^{-1}$

C. $16ms^{-1}$

D. $18ms^{-1}$

Answer: C

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25. A particle is moving such that $s = t^3 - 6t^2 + 18t + 9$, where s is in meters and t is in meters and t is in seconds. Find the minimum velocity attained by the particle.

A. $29ms^{-1}$

B. $5ms^{-1}$

C. $6ms^{-1}$

D. $12ms^{-1}$

Answer: C

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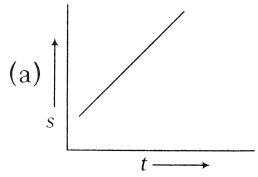
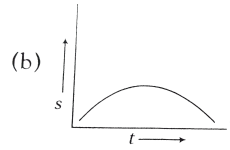
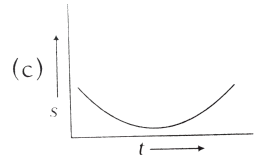
Check Point 3 6

1. Which of the following graph represents uniform motion

A. 

B. 

C. 

D. None of these

Answer: A

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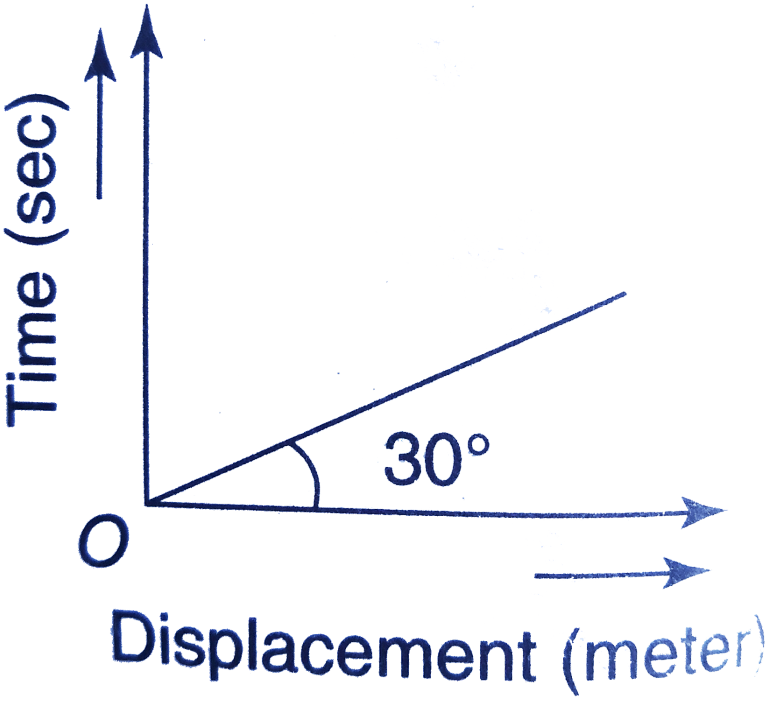
2. From the following displacement-time graph find out the velocity of a moving body.



A. $\frac{1}{\sqrt{3}} ms^{-1}$

B. $3ms^{-1}$

C. $\sqrt{3} ms^{-1}$

D. $\frac{1}{3} ms^{-1}$

Answer: C

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3. The distance time graph of a particle at time t makes angle 45° with respect to time axis. After $1s$, if makes angle 60° with respect to time axis. What is the acceleration of the particle?

A. $\sqrt{3}-1$

B. $\sqrt{3}+1$

C. $\sqrt{3}$

D. 1

Answer: A

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4. The graph between displacement and time for a particle moving with uniform acceleration is a

A. straight line with a positive slope

B. parabola

C. ellipse

D. straight line parallel to time axis

Answer: B

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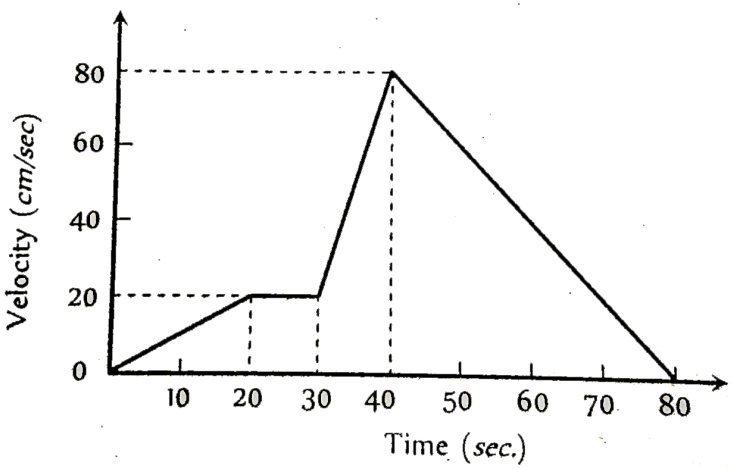
5. The $v - t$ graph of a moving object is given in figure. The maximum acceleration is



A. $1cms^{-2}$

B. $2cms^{-2}$

C. $3cms^{-2}$

D. $6cms^{-2}$

Answer: D

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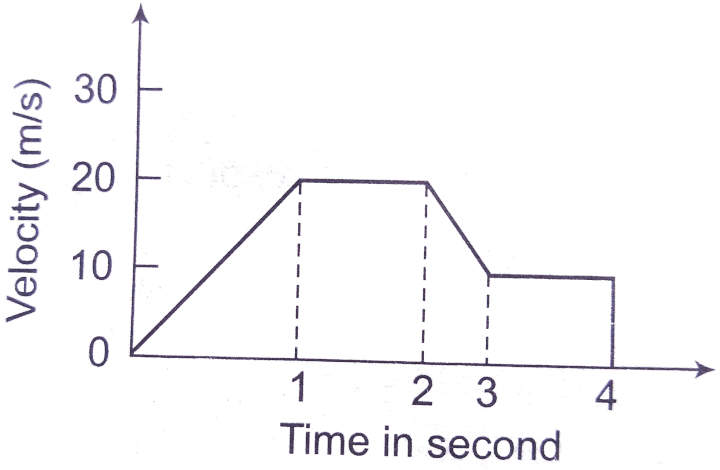
6. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled by the particle in four seconds is.



A. 60 m

B. 55 m

C. 25 m

D. 30 m

Answer: B

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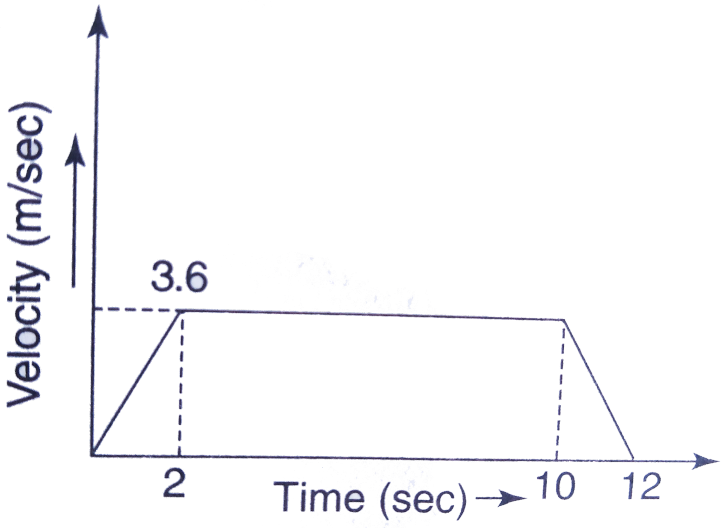
7. A lift is going up. The variation in the speed of the lift is as given in the graph in the graph. What is the height to which the lift takes the passengers ?



A. $3.6m$

B. $28.8m$

C. $36.0m$

D. Cannot be calculated from the above graph

Answer: C

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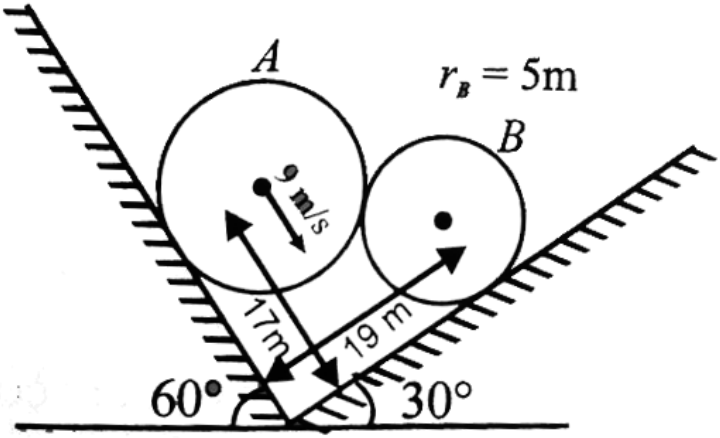
8.



System is shown in the figure. Velocity of sphere A is 9 $\frac{m}{s}$. Find the speed of sphere B.

A. 8m, 16m

B. 16m, 32m

C. 16m, 16m

D. 8m, 18m

Answer: A

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9. The x-t equation is given as $x = 2t + 1$. The corresponding v-t graph is

A. a straight line passing through origin

B. a straight line not passing through origin

C. a parabola

D. None of the above

Answer: B

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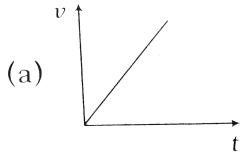
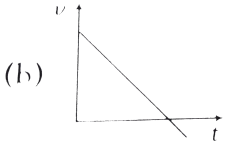
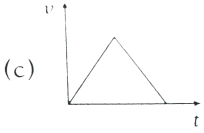
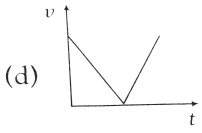
Watch Video Solution

10. Which of the following graph correctly represents velocity-time relationship for a particle released from rest to fall freely under gravity ?

A. 

B. 

C. 

D. 

Answer: A

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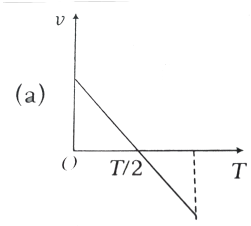
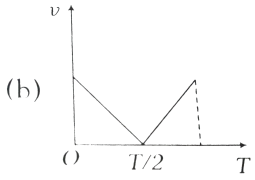
11. A particle is thrown vertically upwards with a velocity v. It returns to the ground in time T. which of the following graphs correctly represents the motion ?

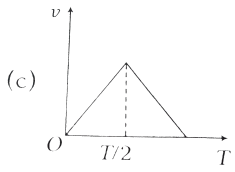
A.



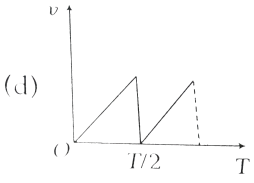
B.



C.



D.



Answer: A

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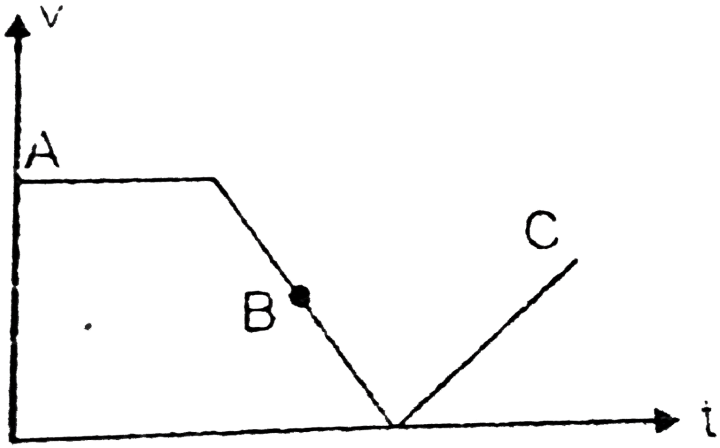
12. The velocity time graph of a body is shown in fig. it indicates that :



A. the is zero

B. there is at force towards motion

C. there is a force which opposes motion

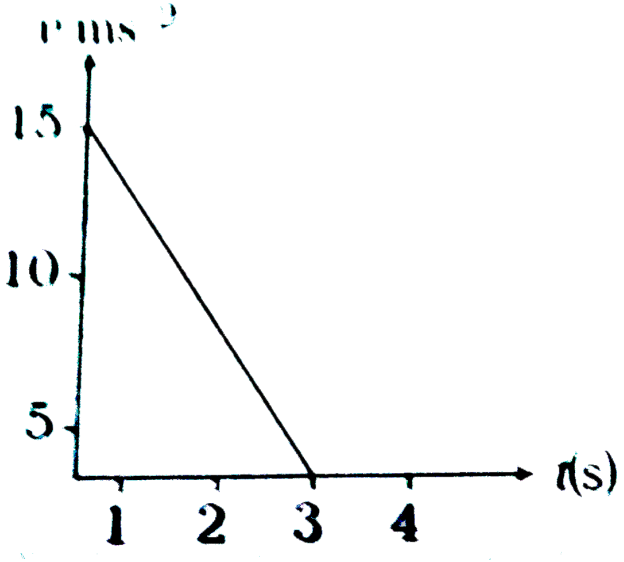
D. there is only gravitational force

Answer: C

Watch Video Solution

13. The velocity - time graph is shown in the figure, for a particle.

The acceleration of particle is



A. $22.5ms^{-2}$

B. $5ms^{-2}$

C. $-5ms^{-2}$

D. $-3ms^{-2}$

Answer: C

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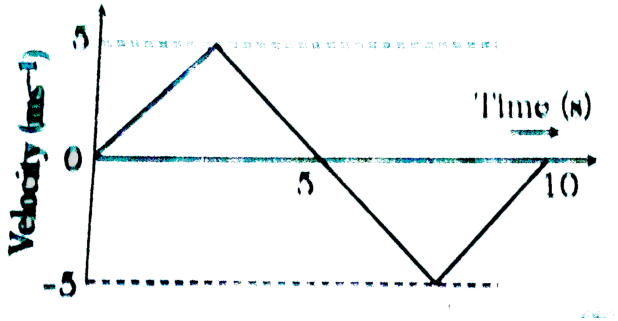
14. The v-t plot of a moving object ios shown in the figure. The average velocity of the object during the first 10 s is



A. zero

B. $2.5ms^{-1}$

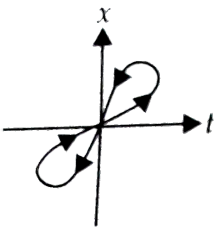
C. $5ms^{-1}$

D. $2ms^{-1}$

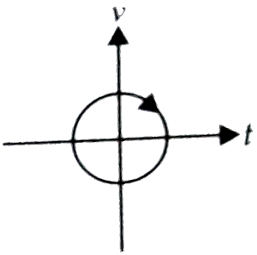
Answer: A

Watch Video Solution

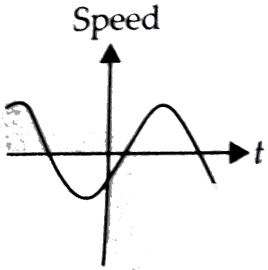
15. Which of the following graphs cannot possibly represent one dimensional motion of a particle?



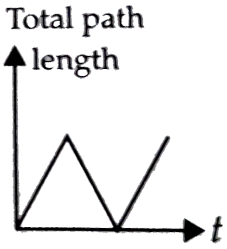
(i)



(ii)



(iii)



(iv)

A. I and II

B. II and III

C. II and IV

D. All four

Answer: D

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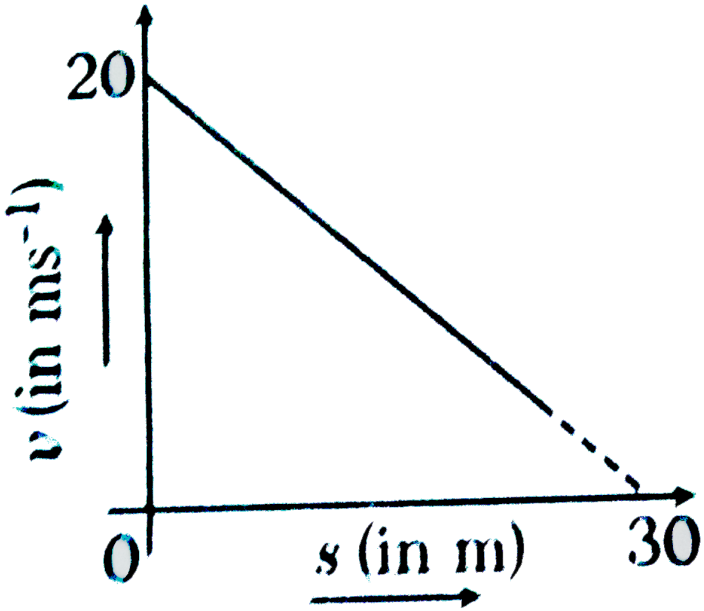
16. If the velocity v of particle moving along a straight line decreases linearly with its displacement s from $20ms^{-1}$ to a value approaching zero at s = 30 m, then acceleration of the particle at

v=10ms^(-1)` is



A. $\frac{2}{3}ms^{-2}$

B. $-\frac{2}{3}ms^{-2}$

C. $\frac{20}{3}ms^{-2}$

D. $-\frac{20}{3}ms^{-2}$

Answer: D

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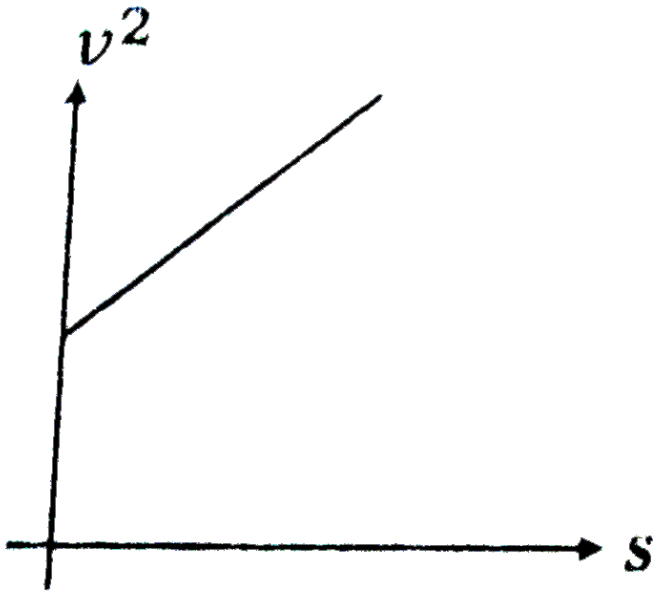
17. v^2 versus s-graph of a particle moving in a straight line is shown in the figure. From the graph some conculsions are drawn. State which statement is wrong ?



A. The given graph shown a uniformly accelerated motion

B. Initial velocity of particle is zero

C. Corresponding s-t graph will be a parabola

D. None of the above

Answer: B

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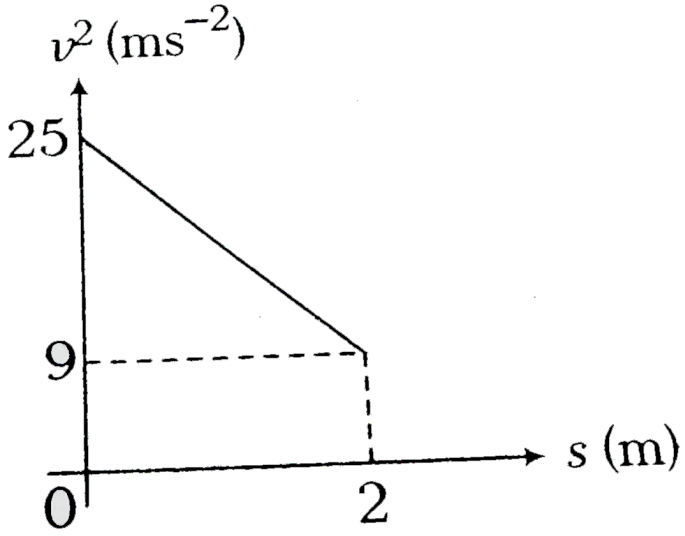
18. A graph between the square of the velocity of a particle and the distance s moved by the particle is shown in the figure. The acceleration of the particle is



A. $-8ms^{-2}$

B. $-4ms^{-2}$

C. $-16ms^{-2}$

D. None of these

Answer: B

Watch Video Solution

19. The area under acceleration-time graph represents the

A. distance travelled

B. change in acceleration

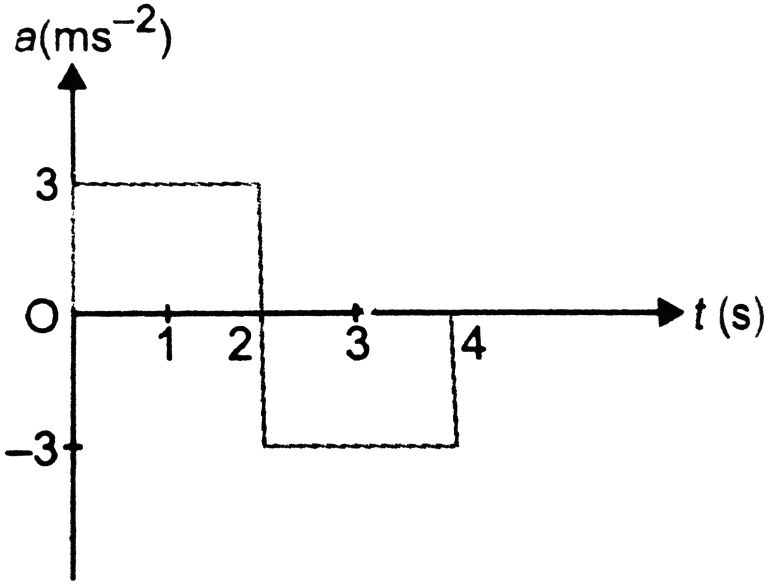
C. force acting

D. change in velocity

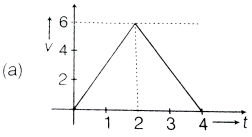
Answer: D

Watch Video Solution

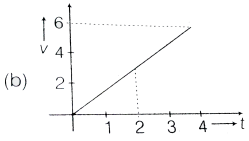
20. A particle starts from rest at $t = 0$ and undergoes and acceleration (a) in ms^{-2} with time (t) in seconds which is shown in Fig. 2 (DF) .16 . Which one of the following plot represents velocity (v) (in ms^{-1}) verses time (in seconds) ?



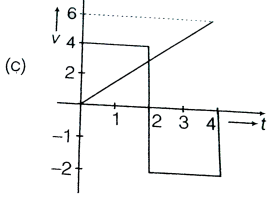
A.



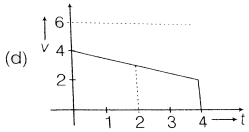
B.



C.



D.



Answer: A

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Check Point 3 7

1. A train is moving due east and a car is moving due north with equal speeds. A passenger in the train finds that the car is moving towards

A. East-North direction

B. West-North direaction

C. South-East direction

D. None of these

Answer: B

Watch Video Solution

2. A 100 m long train crosses a man travelling at $5kmh^{-1}$, in opposite direction, in $7.2s$ then the velocity of train is

A. $40ms^{-1}$

B. $25ms^{-1}$

C. $20ms^{-1}$

D. $45ms^{-1}$

Answer: D

Watch Video Solution

3. Two bodies are held separated by $9.8m$ vertically one above the other. They are released simultaneously to fall freely under gravity. After 2 s the relative distance between them is

A. $4.9m$

B. $19.6m$

C. $9.8m$

D. $392m$

Answer: C

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4. A particle (A) moves due North at $3kmh^{-1}$ and another particle (B) moves due West at $4kmh^{-1}$. The relative velocity of A with respect to B is $(\tan 37^\circ = 3/4)$

A. $5kmh^{-1}$, 37° North of East

B. $5kmh^{-1}$, 37° East of North

C. $5\sqrt{2}kmh^{-1}$, 53° East of North

D. $5\sqrt{2}kmh^{-1}$, 53° North of East

Answer: B

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5. A man standing on a road has to hold his umbrella at 30^0 with the vertical to keep the rain away. The throws the umbrella and starts running at 10 km/h. He finds that raindrops are hitting his

head vertically. Find the speed of raindrops with respect to a. the road, b. the moving man.

A. $10\sqrt{3}kmh^{-1}$

B. $20kmh^{-1}$

C. $\frac{20}{\sqrt{3}}kmh^{-1}$

D. $\frac{10}{\sqrt{3}}kmh^{-1}$

Answer: B

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6. A stationary man observes that the rain is falling vertically downwards. When he starts running a velocity of $12kmh^{-1}$, he observes that the rain is falling at an angle 60° with the vertical. The actual velocity of rain is

A. $12\sqrt{3}kmh^{-1}$

B. $6\sqrt{3}kmh^{-1}$

C. $4\sqrt{3}kmh^{-1}$

D. $2\sqrt{3}kmh^{-1}$

Answer: C

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7. A boy is runing on the plane road with velocity v with a long hollow tube in his hand. The water is falling vertically downwards with velocity u. At what angle to the verticaly, he must inclined the tube the water drops enter it without touching its sides ?

A. $\tan^{-1}\left(\frac{v}{u}\right)$

B. $\sin^{-1}\left(\frac{v}{u}\right)$

C. $\tan^{-1}\left(\frac{u}{v}\right)$

D. $\cos^{-1}\left(\frac{v}{u}\right)$

Answer: A

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8. The width of river is 1 km. The velocity of boat is 5 km/hr. The boat covered the width of river with shortest possible path in 15 min. Then the velocity of river stream is:

A. $4.5kmh^{-1}$

B. $4kmh^{-1}$

C. $.5kmh^{-1}$

D. $3kmh^{-1}$

Answer: D

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9. A particle of mass m moving in the x direction with speed 2v is hit by another particle of mass 2m moving in the y direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to

A. $\sqrt{2}v$ towards South-West

B. $\sqrt{2}v$ towards North-West

C. $\sqrt{2}v$ towards South-East

D. v towards North-East

Answer: B

Watch Video Solution

10. A river is flowing from west to east at a speed of $5m/s$. A man on the south bank of the river capable of swimming at $10m/s$ in a still water wants to swim, across the river in a shortest time. He should swim in a direction

A. due North

B. 30° East of North

C. 30° West of North

D. 60° East of North

Answer: A

Watch Video Solution

11. A man can swim at the rate of $5kmh^{-1}$ in still water A. One km wide river flows at the rate of $3kmh^{-1}$. The man wishes to swim

across the river directly opposite to the starting point. How much time will be take to cross the river

A. 127°

B. 143°

C. 120°

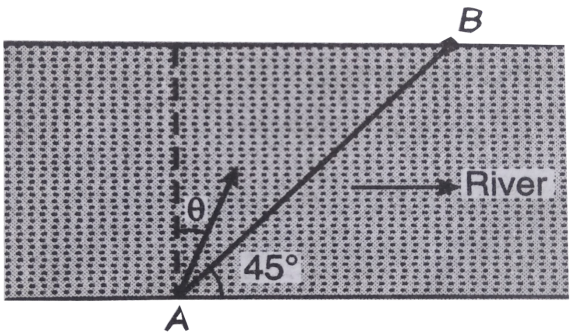
D. 150°

Answer: A

Watch Video Solution

12. Given $|V_br| = 4m/s =$ magnitude of velocity of boatman with respect to river, $v_r = 2m/s$ in the directior shown. Boatman wants to reach from point A to point B. At what angle θ should he

row his boat ?



A. $u, 45^\circ$ North-West

B. $u, 45^\circ$ North-East

C. $\frac{u}{\sqrt{2}}, 45^\circ$ North-West

D. $\frac{u}{\sqrt{2}}, 45^\circ$ North-East

Answer: C

Watch Video Solution

13. Two trains are each 50 m long moving parallel towards each other at speeds $10ms^{-1}$ and $15ms^{-1}$ respectively, at what time will they pass each other ?

A. 8 s

B. 4 s

C. 2 s

D. 6 s

Answer: B

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14. A man is 25 m behind a bus, when bus starts accelerating at $2ms^{-2}$ and man starts moving with constant velocity of $10ms^{-1}$. Time taken by him to board the bus is

A. 2 s

B. 3 s

C. 4 s

D. 5 s

Answer: D

Watch Video Solution

15. A ball is dropped from the top of a building 100 m high. At the same instant another ball is thrown upwards with a velocity of $40ms^{-1}$ from the bottom of the building. The two balls will meet after.

A. 5 s

B. $2.5s$

C. 2 s

D. 3 s

Answer: B

Watch Video Solution

A Taking It Together

1. A bo walks to his school at a distance of 6 km with constant speed of $2.5kmh^{-1}$ and walks back with a constant speed of $4kmh^{-1}$. His average speed for round trip expressed in kmh^{-1}, is

A. 24/13

B. 40/13

C. 3

D. $1/2$

Answer: B

Watch Video Solution

2. A man walks on a straight road from his home to market 2.5 km away with speed of 5 km/h Finding the market closed, he instantly turns and walks back with a speed of 7.5 km/h. What is the magnitude of average velocity and average speed of the man over the interval of time (i) 0 to 30 min (ii) 0 to 50 min (iii) 0 to 40 min ?

A. $5kmh^{-1}$

B. $\frac{25}{4}kmh^{-1}$

C. $\frac{30}{4}kmh^{-1}$

D. $\frac{45}{8} kmh^{-1}$

Answer: C

Watch Video Solution

3. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3} ms^{-2}$, in the third second is.

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

B. $\frac{19}{3} / (m)$

C. 6 m

D. 4 m

Answer: A

Watch Video Solution

4. A particle is moving along x-direction with a constant acceleration a. The particle starts from $x = x_0$ position with initial velocity u. We can define the position of the particle with time by the relation

$$x = x_0 + ut + \frac{1}{2}at^2$$

plot the position of the particle in relation with time is following situations

(i) If initial position of the particle is on negativ x-axis, initial velocity is positive and acceleration is negative.

(ii) If initial position is positive, initial velocity is negative and acceleration is positive.

A. 12

B. 9

C. 10

D. 1.8

Answer: B

Watch Video Solution

5. A particle moves along x-axis as $x = 4(t-2) + a(t-2)^2$

Which of the following is true?

A. The initial velocity of particle is 4

B. The acceleration of particle is 2a

C. The particle is at origin at t = 0

D. None of the above

Answer: B

Watch Video Solution

6. A car moving with a velocity of 10m/s can be stopped by the application of a constant force F In a distance of 20m. If the velocity of the car is 30m/s. It can be stopped by this force in

A. $\frac{20}{3}m$

B. 20 m

C. 60 m

D. 180 m

Answer: D

Watch Video Solution

7. A vehicle travels half the distance (L) with speed V_1 and the other half with speed V_2, then its average speed is .

A. $\frac{v_1 + v_2}{2}$

B. $\frac{2v_1 + v_2}{v_1 + v_2}$

C. $\frac{2v_1v_2}{v_1 + v_2}$

D. $\frac{L(v_1 + v_2)}{v_1v_2}$

Answer: C

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8. The x and y coordinates of a particle at any time t are given by $x = 7t + 4t^2$ and $y = 5t$, where x and t is seconds. The acceleration of particle at $t = 5$s is

A. zero

B. $8ms^{-2}$

C. $20ms^{-2}$

D. $40ms^{-2}$

Answer: b

Watch Video Solution

9. A body A starts from rest with an accceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the 5^{th} seconds, after the start of A, then the ratio $a_1 : a_2$ is equal to

A. $5:9$

B. $5:7$

C. $9:5$

D. $9:7$

Answer: A

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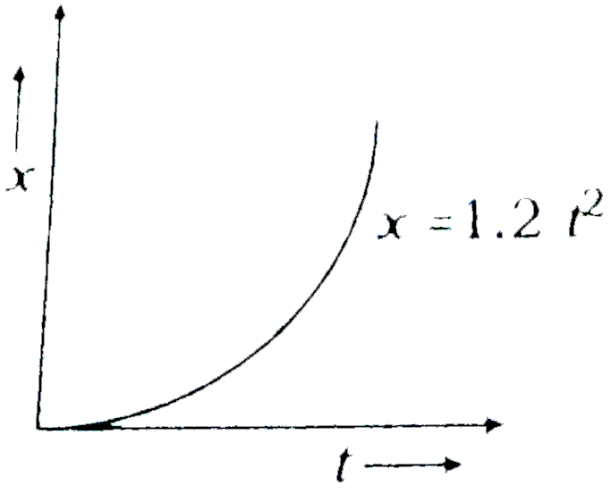
10. Figure given shows the distance - time graph of the motion of a car. It follows from the graph that the car is



A. at rest

B. in uniform motion

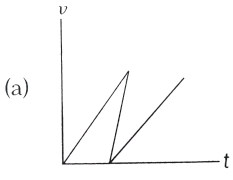
C. in non-uniform acceleration

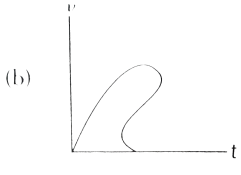
D. uniformly accelerated

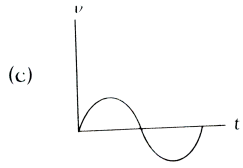
Answer: D

Watch Video Solution

11. Which of the following speed - time $(v - t)$ graph is physically possible ?

A. 

B. 

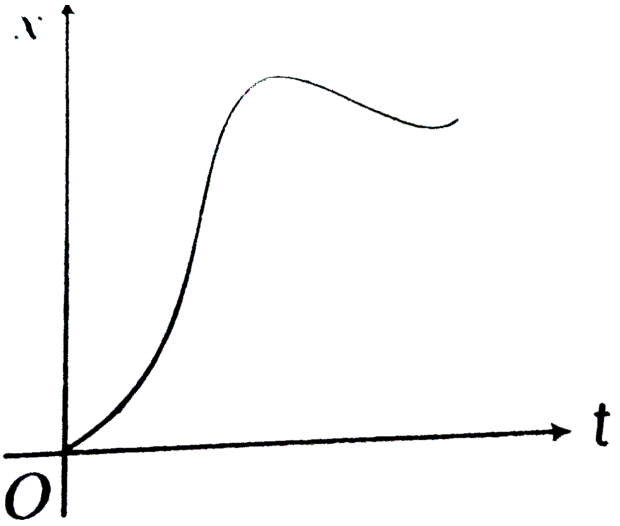
C. 

D. All of these

Answer: C

Watch Video Solution

12. The displacement (x)-time (t) graph of a particle is shown in figure. Which of the following is correct ?



A. Particle starts with zero velocity and variable acceleration

B. Particle starts with non-zero velocity and variable acceleration

C. Particle starts with zero velocity and uniform acceleration

D. Particle starts with non-zero velocity and uniform acceleration

Answer: A

Watch Video Solution

13. The velocity of body is given as $v = 20 + 0.1t^2$. The body is undergoing

A. uniform acceleration

B. Uniform retardation

C. Non-uniform acceleration

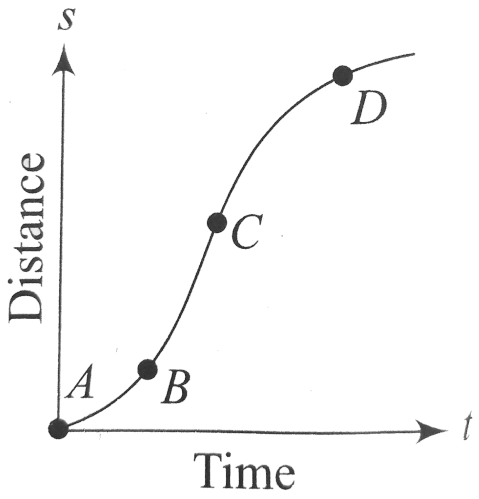
D. Zero acceleration

Answer: C

Watch Video Solution

Watch Video Solution

14. A particle shows distance-time curve as given in this figure. The maximum instantaneous velocity of the particle is around the point.



(a) B (b) C (c) D (d) A

A. A

B. B

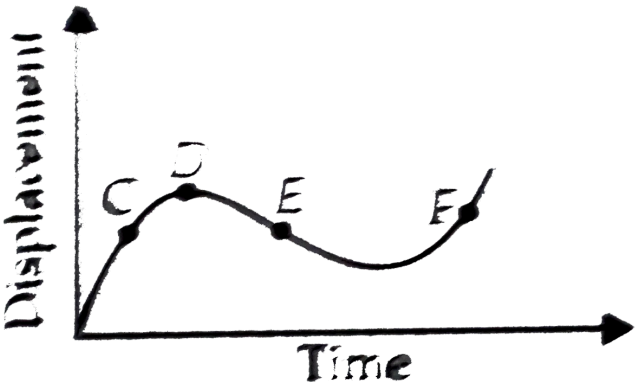
C. C

D. D

Answer: C

Watch Video Solution

15. The displacement-time graph of a moving particle is as shown in the figure. The instantaneous velocity of the particle is negative at the point



A. E

B. F

C. C

D. D

Answer: A

Watch Video Solution

16. The velocity v of a particle as a function of its position (x) is expressed as $v = \sqrt{c_1 - c_2 x}$, where c_1 and c_2 are positive constants. The acceleration of the particle is

A. c_2

B. $-\frac{c_2}{2}$

C. $c_1 - c_2$

D. $\frac{c_1 + c_2}{2}$

Answer: B

Watch Video Solution

17. A person walks up a stalled 15 m long escalator in 90 s. When standing on the same escalator, now moving, the person is carried up in 60 s. How much time would it take that person to walk up the moving escalator? Does the answer depend on the length of the escalator?

A. 27 s

B. 50 s

C. 18 s

D. 36 s

Answer: D

Watch Video Solution

18. A car starts moving along a line, first with acceleration a=5 ms^{-2} starting from rest then uniformly and finally decelerating at the same rate a, comes to rest.The total time of motion is $\tau = 25s$. The average velocity during the time is equal to lt v gt =72 km/hr.How long does the partial move uniformly ?

A. 10 s

B. 12 s

C. 20 s

D. 15 s

Answer: D

Watch Video Solution

19. The displacement of a particle moving in a straight line depends on time as $x = \alpha t^3 + \beta t^2 + \gamma t + \delta$. The ratio of initial acceleration to its initial velocity depends

A. The particle never returns to its starting point

B. The particle comes to rest after time $\frac{2\alpha}{3\beta}$

C. The initial velocity of the particle is zero

D. The initial acceleration of the particle is zero

Answer: D

Watch Video Solution

20. A starts from rest, with uniform acceleration a. The acceleration of the body as function of time t is given by the

equation a = pt, where p is a constant, then the displacement of the particle in the time interval t = 0 to $t = t_1$ will be

A. $\frac{1}{2}pt_1^3$

B. $\frac{1}{3}pt_1^2$

C. $\frac{1}{2}pt_1^2$

D. $\frac{1}{2}pt_1^3$

Answer: D

Watch Video Solution

21. A ball is dropped on the floor from a height of 10m. It rebounds to a height of 2.5m. If the ball is in contact with the floor for 0.01sec, the average acceleration during contace is : $\left(g = 9.8m/s^2\right)$

A. $2414ms^{-2}$

B. $1735ms^{-2}$

C. $3120ms^{-2}$

D. $4105ms^{-2}$

Answer: A

Watch Video Solution

22. Particle A is moving along X-axis. At time t = 0, it has velocity of $10ms^{-1}$ and acceleration $-4ms^{-2}$. Particle B has velocity of $20ms^{-1}$ and acceleration $-2ms^{-2}$. Initially both the particles are at origion. At time t = 2 distance between the particles are at origin. At time t = 2 s distance between the particles is

A. 24 m

B. 36 m

C. 20 m

D. 42 m

Answer: A

Watch Video Solution

23. At a metro station, a girl walks up a stationary escalator in time t_1. If she remains stationary on the escalator, then the escalator take her up in time t_2. The time taken by her to walk up on the moving escalator will be

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

B. $\frac{t_1 t_2}{(t_2 - t_1)}$

C. $\frac{t_1 t_2}{(t_2 + t_1)}$

D. $t_1 - t_2$

Answer: C

Watch Video Solution

24. The displacement of a body along X-axis depends on time as $\sqrt{x} = t + 1$. Then the velocity of body.

A. increases with time

B. decreases with time

C. independent of time

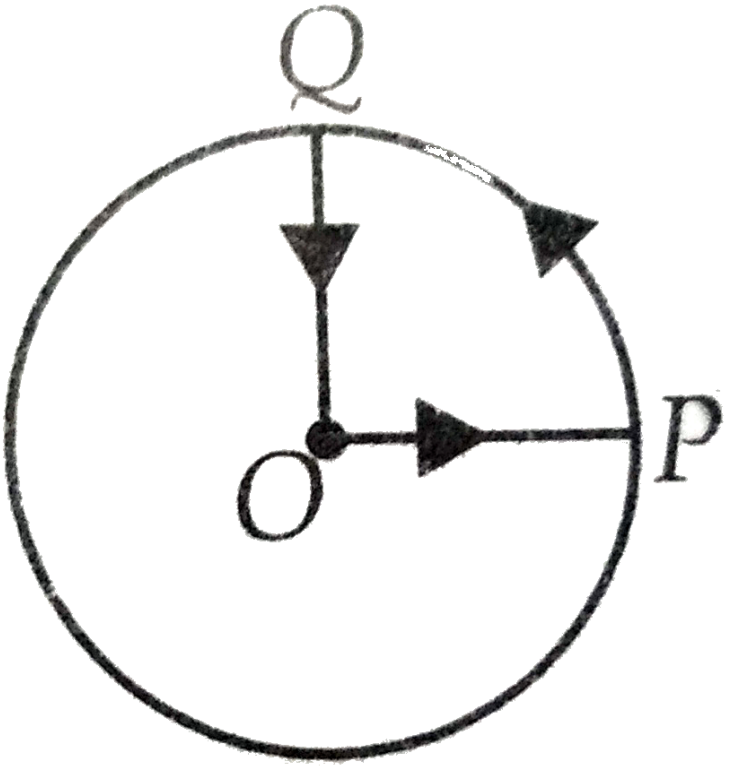
D. None of these

Answer: A

Watch Video Solution

25. A cyclist starts from the centre O of a circular park of radius 1 km. reaches the edge P of the park, then cycles along the circumference and returns to the centre along QO as shown in the figure.

IF the rounds trip takes ten minutes, the net displacement and average speed of the cyclist (in metre and kilometre per hour) is



A. 0, 1

B. $\frac{\pi + 4}{2}, 0$

C. $21.4, \frac{\pi + 4}{2}$

D. $0, 21.4$

Answer: D

Watch Video Solution

26. A particle moves along a straight line OX. At a time t(in second), the distance x (in metre) of the particle from O is given by

$x = 40 + 12t - t^3$

How long would the particle travel before coming to rest ?

A. 24m

B. 40m

C. 56m

D. 16m

Answer: C

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27. Two boys are standing at the ends A and B of a ground where AB = a. The boy at B starts running in a direction perpendicular to AB with velocity v_1 . The boy at A starts running simultaneously with velocity v and catches the other in a time t, where t is

A. $a/\sqrt{v^2+v_1^2}$

B. $\sqrt{a^2/\left(v^2-v_1^2\right)}$

C. $a/(v-v_1)$

D. $a/(v+v_1)$

Answer: B

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28. A bullet emerges from a barrel of length $1.2m$ with a speed of $640ms^1$. Assuming constant acceleration, after the gun is fired is

A. 4m

B. 40m

C. 400us

D. 1s

Answer: B

Watch Video Solution

29. From the top of a tower, 80m high from the ground a stone is thrown in the horizontal direction with a velocity of $8ms^1$. The stone reaches the ground after a time t and falls at a distance of d from the foot of the tower. Assuming $g = 10ms^2$, the time t and distance d are given respectively by

A. 6s,64m

B. 6s,48m

C. 4s,32m

D. 4s,16m

Answer: C

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30. A boggy of uniformly moving train is suddenly detached from train and stops after covering some distance. The distance covered by the boggy and distance covered by the train in the same time has relation

A. Both will be equal

B. First will be half of second

C. First will be 1/4 of second

D. No definite ratio

Answer: B

Watch Video Solution

31. A man is 45 m behind the bus when the bus starts acceleration from rest with acceleration $2.5\frac{m}{s^2}$. With what minimum velocity

should man start running to catch the bus?

A. $12ms^{-1}$

B. $14ms^{-1}$

C. $15ms^{-1}$

D. $16ms^{-1}$

Answer: C

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32. A body moves for a total of nine second starting from rest with uniform acceleration and then with uniform retardation, which is twice the value of acceleration and then stop. The duration of uniform acceleration is

A. 3s

B. 4.5s

C. 5s

D. 6s

Answer: D

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33. 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. 20m

B. 18m

C. 16m

D. 25m

Answer: B

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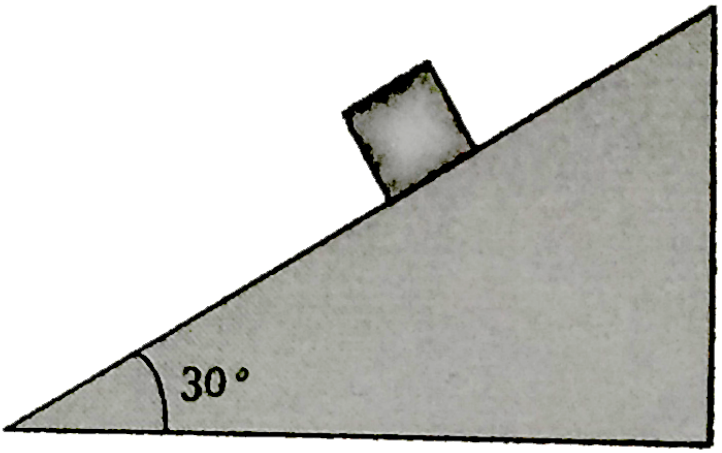
34. The time taken by a block of wood (initially at rest) to slide down a smooth inclined plane 9.8 m long (angle of inclination is 30°) is



A. $\frac{1}{2}s$

B. 2 s

C. 4 s

D. 1 s

Answer: B

Watch Video Solution

35. A particle move a distance x in time t according to equation $x = (t+5)^{-1}$. The acceleration of particle is proportional to.

A. $(\text{velocity})^{3/2}$

B. $(\text{distance})^{2}$

C. $(\text{distance})^{-2}$

D. $(\text{velocity})^{2/3}$

Answer: A

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36. A ball is thrown upwards with a speed u from a height h above the ground.The time taken by the ball to hit the ground is

A. $\frac{v}{g}\sqrt{1-\frac{2hg}{v^2}}$

B. $\frac{v}{g}\sqrt{1+\frac{2hg}{v^2}}$

C. $\sqrt{1+\frac{2hg}{v^2}}$

D. $\frac{v}{g}\left[1+\sqrt{1+\frac{2hg}{v^2}}\right]$

Answer: D

Watch Video Solution

37. The position of a particle along X-axis at time t is given by $x = 2 + t - 3t^2$. The displacement and the distance travelled in

the interval, t = 0 to t = 1 are respectively

A. 2, 2

B. $-2, 2.5$

C. 0, 2

D. $-2, 2.1$

Answer: D

Watch Video Solution

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

A. $\sqrt{2}-1$

B. $\sqrt{2}+1$

C. $\sqrt{2}$

D. None of these

Answer: B

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39. What is nature of trajectory of a particle having a uniformly accelerated motion in a plane?

A. $x = \sqrt{\frac{t+a}{b}}$

B. $x = \frac{t+a}{b}$

C. $t = \sqrt{\frac{x+a}{b}}$

D. $x = \sqrt{t+a}$

Answer: C

Watch Video Solution

40. A particle moves along a straight line. Its position at any instant is given by $x = 32t - \frac{8t^3}{3}$ where x is in metres and t in seconds. Find the acceleration of the particle at the instant when particle is at rest.

A. $-16ms^{-2}$

B. $-27.6ms^{-2}$

C. $32ms^{-2}$

D. $16ms^{-2}$

Answer: B

Watch Video Solution

41. A point moves in a straight line so its displacement x meter at time t second is given by $x^2 = 1 + t^2$. Its acceleration in ms^{-2} at

time t second is .

A. 1/x

B. $1/x^3$

C. $-1/x^2$

D. $-1/x^3$

Answer: B

Watch Video Solution

42. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$. Where a, b, α and β positive constant.

The velocity of the particle will.

A. go on decreasing with time

B. be independent of α and β

C. drop to zero when $\alpha = \beta$

D. go on increasing with time

Answer: D

Watch Video Solution

43. Galileo's law of odd number: The distances traversed, during equal intervals of time, by a body falling from rest, stand to one another in the same ratio as the odd number beginning with unity [namelly, $1:3:5:7$....]. Prove it.

A. 1 : 3 : 5 : 7 : 9 : ...

B. 2 : 4 : 6 : 8 : 10 : ...

C. 1 : 4 : 7 : 10 : 13 : ...

D. None of the above

Answer: A

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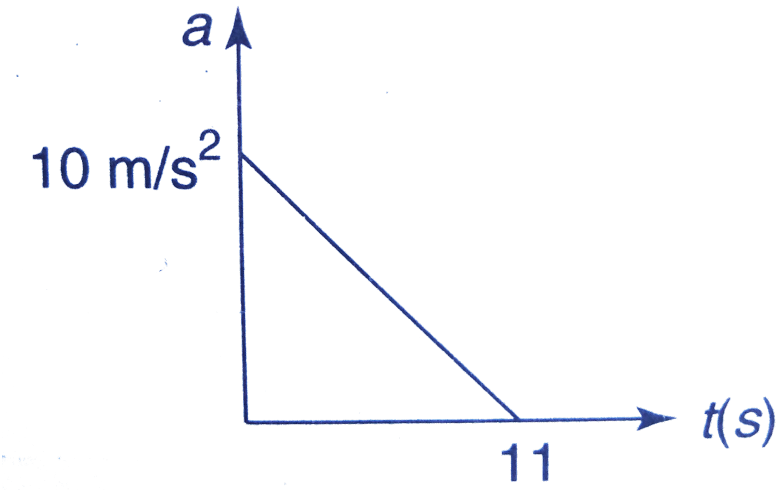
44. A particle starting from rest. Its acceleration (a) versus time (t) is as shown in the figure.

The maximum speed of the particle will be.



A. $110ms^{-1}$

B. $55ms^{-1}$

C. $550ms^{-1}$

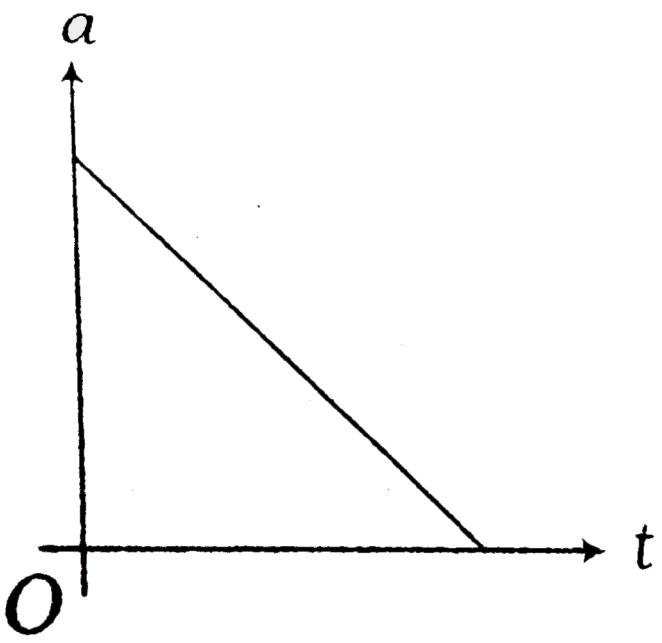
D. $660ms^{-1}$

Answer: B

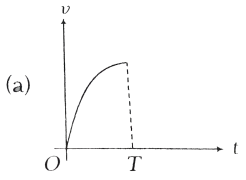
Watch Video Solution

45. The acceleration (a)-time(t) graph for a particle moving along a straight from rest is shown in figur. Which of the following

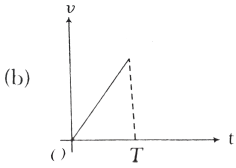
graph is the best representation of its velocity (v) with time (t) ?



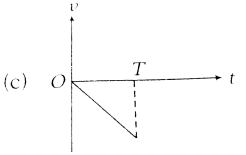
A.

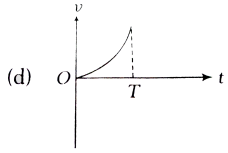


B.



C.



D. 

Answer: A

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46. A particle moving with uniform acceleration has average velocities ν_1, ν_2 and ν_3 over the successive intervals of time t_1, t_2 and t_3 respectively. The value of $\frac{\nu_1 - \nu_2}{\nu_2 - \nu_3}$ will be

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

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

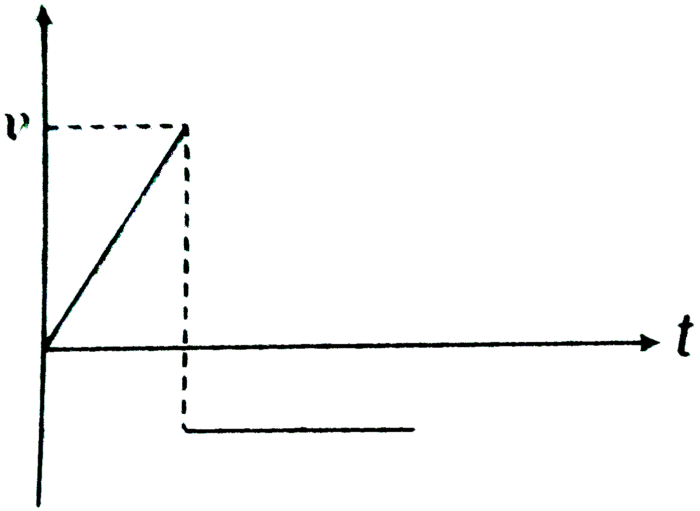
C. $(i\psi lon_1 - v_2) : (v_2 - v_3) = (t_1 - t_2) : (t_1 - t_3)$

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

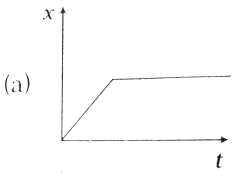
Answer: B

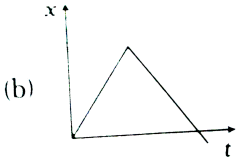
Watch Video Solution

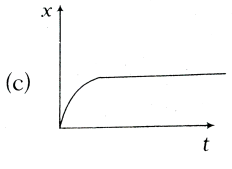
47. The velocity-time graph for a particle moving along X-axis is shown in the figure. The corresponding displacement-time graph is correctly shown by

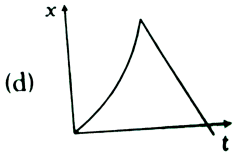


A.



B. 

C. 

D. 

Answer: D

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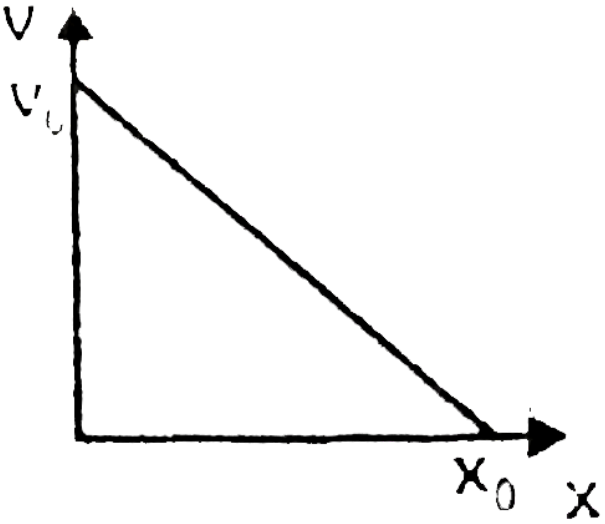
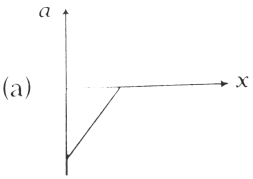
48. The given graph shows the variation of velocity with displacement. Which one of the graph given below correctly

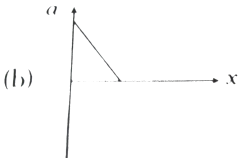
represents the variation of acceleration with displacement :-



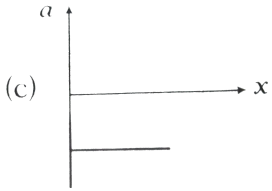
A.



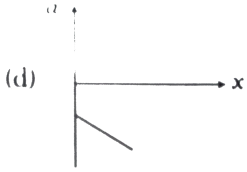
B.



C.



D.



Answer: A

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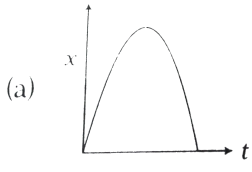
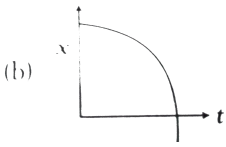
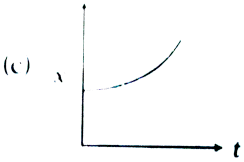
49. The displacement x of a particle in a straight line motion is given by $x = 1 - t - t^2$. The correct representation of the motion is

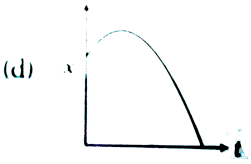
A.



B.



C. 

D. 

Answer: B

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50. The verical of point above the ground is twice that of Q. A particle is projected downward with a speed of $5ms^{-1}$ from P and at the same time another particle is projected upward with the same speed from W. Both particle reach the ground simultaneously, then

A. PQ = 30 m

B. time of flight of stones = 3 s

C. Both (a) and (b) are correct

D. Both (a) and (b) are wrong

Answer: C

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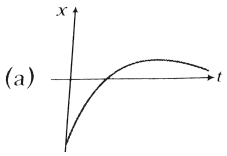
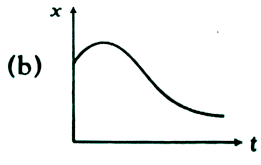
51. Among the four graphs, there is only one graph for which average velocity over the time interval (0, T) can vanish for a suitably chosen T. Which one is it?

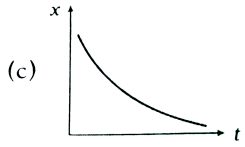
A.



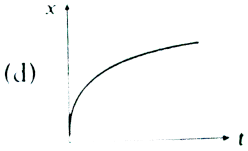
B.



C.



D.



Answer: B

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52. A lift is coming from $8th$ floor and is just about to reach $4th$ floor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the following is correct ?

A. $x < 0, v < 0, a > 0$

B. $x > 0, v < 0, a < 0$

C. $x > 0, v < 0, a < 0$

D. $x > 0, v > 0, a < 0$

Answer: A

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53. In one dimensional motion, instantaneous speed v satisfies $(0 \leq v < v_0)$ then

A. The displacement in time T must always take non-negative values

B. The displacement x in time T satisfies $-v_0 T < x < v_0 T$

C. The acceleration is always a non-negative number

D. The motion has no turning points

Answer: B

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54. The displacement of a particle is moving by $x = (t-2)^2$ where x is in metres and t in second. The distance covered by the particle in first 4 seconds is.

A. 4 m

B. 8 m

C. 12 m

D. 16 m

Answer: B

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55. A driver having a definite reaction time is capable of stopping his car over a distance of 30 m on seeing a red traffic signal, when

the speed of the car is 72 km/hr andover a distance of 10 m when the speed is 36 km/hr. Find the distance over which he can stop the car if it were running at a speed of 54 km/hr. Assume that his reaction time and the deceleration of the car remains same in all the three cases.

A. 293 m

B. 111 m

C. 91 m

D. 182 m

Answer: A

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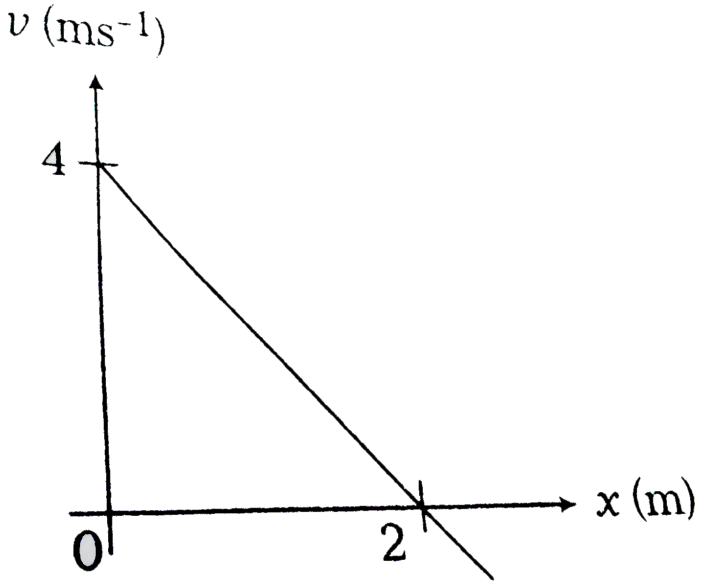
56. The velocity (v) of a particle moving along X-axis varies with its position x as shown in figure. The acceleration (a) of particle

varies with position (x) as



A. $a^2 = x + 3$

B. $a = 2x^2 + 4$

C. $2a = 3x + 5$

D. $a = 4x - 8$

Answer: D

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57. A car A moves along north with velocity 30 km/h and another car B moves along east with velocity 40 km/h. The relative velocity of A with respect to B is

A. 50 km/h North - East

B. 50 km/h North-West

C. 50 km/h at angle $\tan^{-1}(3/4)$ North of West

D. 50 km/h at angle $\tan^{-1}(3/4)$ West of North

Answer: C

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58. Rain is falling vertically downward with velocity $4m/s$. A man is moving horizontally with velocity $3m/s$, the velocity of rain with respect to man is

A. 5 m/s at an angle $\tan^{-1}(4/3)$ with horizontal

B. 5 m/s at an angle $\tan^{-1}(3/4)$ with vertical

C. 5 m/s at an angle $\tan^{-1}(4/3)$ with vertical

D. Both (a) and (b)

Answer: D

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59. A ship is travelling due east at a speed of $15km/h$. Find the speed of a boat heading 30° east of north if it appears always due north from the ship.

A. 30 km/h

B. $\frac{15\sqrt{3}}{2}k\frac{m}{h}$

C. $10\sqrt{3}k\frac{m}{h}$

D. $20k\frac{m}{h}$

Answer: A

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60. A man takes $3h$ to cover a certain distance along the flow and takes $6h$ to cover the same distance opposite to flow. In how much time, he will cross this distance in still water.

A. $3.5h$

B. 4 h

C. $4.5h$

D. 5 h

Answer: B

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61. A river $500m$ wide is flowing at a rate of $4m/s$. A boat is sailing at a velocity of $10m/s$ with respect to the water, in a direction perpendicular to the river. The time taken by the boat to reach the opposite bank

A. 30 s

B. 40 s

C. 50 s

D. 60 s

Answer: C

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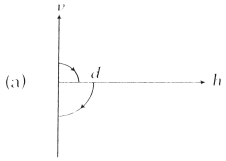
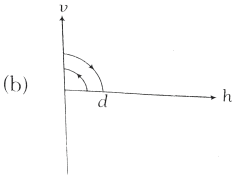
62. A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height d/2. Neglecting subsequent motion and air resistance, its velocity v varies with the heiht h above the ground as

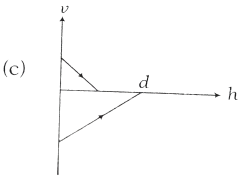
A.



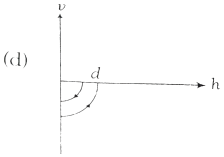
B.



C.



D.



Answer: A

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63. 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. $d > \left(\frac{v_1 - v_2}{2\alpha} \right)$

B. $d < \frac{(v_1 - v_2)^2}{2\alpha}$

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

D. None of these

Answer: C

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64. The width of river is 1 km. The velocity of boat is 5 km/hr. The boat covered the width of river with shortest possible path in 15 min. Then the velocity of river stream is:

A. 1 km/h

B. 3 km/h

C. 4 km/h

D. 5 km/h

Answer: B

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65. 

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

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

Answer: C

Watch Video Solution

66. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap, the instant the first drop touches the ground. How far above the ground is the second drop at that instant. $\left(g = 10ms^{-2}\right)$

A. $2.50m$

B. $3.75m$

C. $4.00m$

D. $1.25m$

Answer: B

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67. A man in a lift ascending with an upward acceleration a throws a ball vertically upwards with a velocity v with respect to himself and catches it after t_1 seconds. After wards when the lift is descending with the same acceleration a acting downwards the man again throws the ball vertically upwards with the same velocity with respect to him and catches it after t_2 seconds?

A. 1

B. 2

C. $\frac{10}{7}$

D. $\frac{20}{7}$

Answer: D

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68. 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 constants. 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. $\frac{1}{2}f_0T$

B. f_0T

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

D. f_0T^{-2}

Answer: A

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69. The position x of a particle w.r.t. time t along x-axis is given by a $x = 9t^2 - t^3$, where x is in metre and t in sec. What will be the position of this particle when it achieves maximum speed along the +x direction ?

A. 24 m

B. 32 m

C. 54 m

D. 81 m

Answer: C

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70. Two particles P and Q simulaneously 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 B then its velocity is $30m/s$. Find velocity of Q at point B (in m/s).

A. $30ms^{-1}$

B. $5ms^{-1}$

C. $20ms^{-1}$

D. $15ms^{-1}$

Answer: B

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71. A body dropped from top of a tower falls through $40m$ during the last two seconds of its fall. The height of tower in m is (g= 10 m//s^2)`

A. 60

B. 45

C. 80

D. 50

Answer: B

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72. 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

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73. 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 $v = \alpha\sqrt{x}$. The displacement of the particle varies with time as

A. t

B. $t^{1/2}$

C. t^3

D. t^2

Answer: D

Watch Video Solution

74. A body falls freely from the top of a tower. It covers 36% of the total height in the lkast second before striking the ground level. The height of the tower is

A. 50 m

B. 75 m

C. 100 m

D. 125 m

Answer: D

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75. An elevator car whose floor to ceiling distance is equal to $2.7m$ starts ascending with constant acceleration $1.2m/s^2$, 2 sec after

the start a bolt begins falling from the ceiling of the car. Answer the following question $\left(g = 9.8m/s^2\right)$

The bolt's free fall time is

A. $\sqrt{\frac{2.7}{9.8}}s$

B. $\sqrt{\frac{5.4}{9.8}}s$

C. $\sqrt{\frac{5.4}{8.6}}s$

D. $\sqrt{\frac{5.4}{11}}s$

Answer: D

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B Meical Entrance Special Format Questions Assertion And Reason

1. Assertion : Acceleration of a moving particle can change its direction without any change in direction of velocity.

Reason : If the direction of change in velocity vector changes, the direction of acceleration vector also changes.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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2. Assertion : An object may have varying speed without having varying velocity.

Reason : If the velocity is zero at an instant, the acceleration may not be zero at that instant.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

Watch Video Solution

3. Assertion : Magnitude of average velocity is equal to average speed, if velocity is constant.

Reson : If velocity is constant, then there is no change in the direction of motion.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

4. Assertion : In the equation, $s = u + at - \frac{1}{2}a$ where, s is the distance travelled by uniformly accelerated body in tth second.

Reason : The above equation is dimensionally incorrect.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

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5. Assertion : A body is momentarily at rest at the instant it reverses the direction.

Reason : A body cannot have acceleration if its velocity is zero at a given instant of time.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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6. Assertion : The average velocity of a particle having initial and final velocity v_1 and v_2 is $v_1 + v_2 / 2$.

Reason : If r_1 and r_2 be the initial and final displacement in time t, then $v_{av} = \frac{r_1 - r_2}{t}$.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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7. Assertion : The $v - t$ graph perpendicular to time axis is not possible in particle.

Reason : Infinite acceleration cannot be realised in particle.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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8. Assertion : If velocity - time equation of a particle moving in a straight line is quadratic in time, then displacement - time equation cannot be linear.

Reason : If displacement - time is quadratic in time, then velocity - time is linear.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

9. Assertion : Distance between two particles moving with consant velocities always remains constant.

Reason : In the above case, relative motion between them is uniform.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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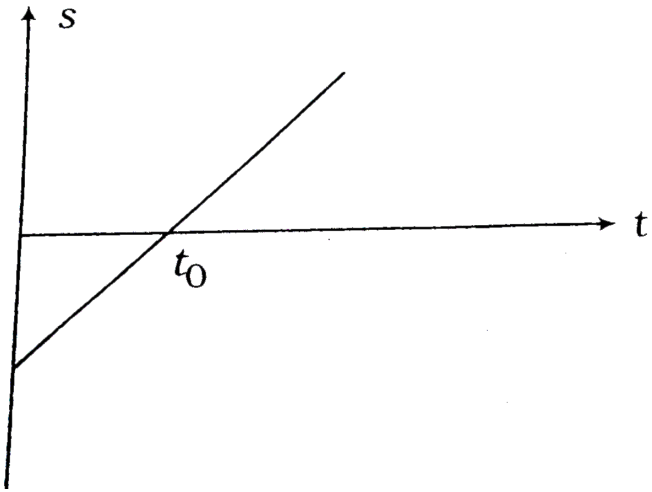
10. Assertion : In the s-t diagram as shown in figure, the body starts moving in positive direction but not form s = 0.



Reason : At $t = t_0$, velocity of body changes its direction of motion.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

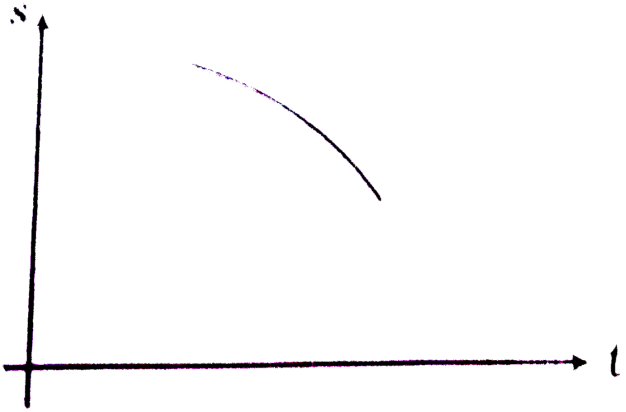
C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

Watch Video Solution

11. Assertion : In the s-t graph as shown in figure, velocity of particle is negative and acceleration is positive.



Reason : Slope of s-t graph is negative and increasing in magnitude.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

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12. Assertion : A body of mass 4 kg has an initial velocity $5\hat{i}ms^{-1}$. It is subjected to a force of $4\hat{j}N$. The displacement of body from origin after 4 s will be $21.5m$.

Reason : The equation $v = u + at$ can be applied to obtain v if a is constant.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

13. Assertion : Particle A is moving Eastwards and particle B Northwards with same speed. Then, velocity of A with respect to B is in South-East direction.

Reason : Relative velocity between them is zero as their speeds are same.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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14. Assertion : On a curved path, average speed of a particle can never be equal to average velocity.

Reason : Average speed is total distance travelled divided by total time. Whereas average velocity is, final velocity plus initial velocity divided by two.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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15. Assertion : If a particle is thrown upwards, then distance travelled in last second of upward journey is independent in last second of upward journey is independent of the velocity of projection.

Reason : In last second, distance travelled is $4.9m$. (Taken, $g = 9.8ms^{-2}$)

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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16. Assertoin : If acceleration of a particle moving in a straight line varies as $a \propto t^n$, then $S \propto t^{n+2}$

Reason : If a-t graph is a straight line, then s-t graph may be a parabola.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

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17. Assertion : A lift is ascending with decreasing speed means acceleration of lift is downwards.

Reason : A body always moves in the direction of its acceleration.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

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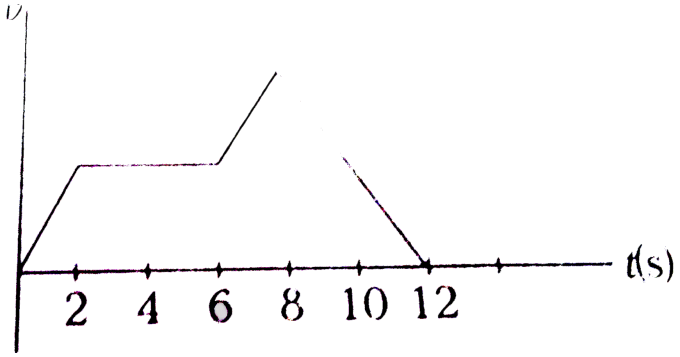
18. Assertion : A body is moving along a straight line such the its velocity varies with a time as shown in figure. Magnmitude of displacement of the body from t = 0 to t = 12 s is the same as the

distance travelled by it in the given time duration.



Reason : For unidirectional motion of a body,

|displacement|=distance

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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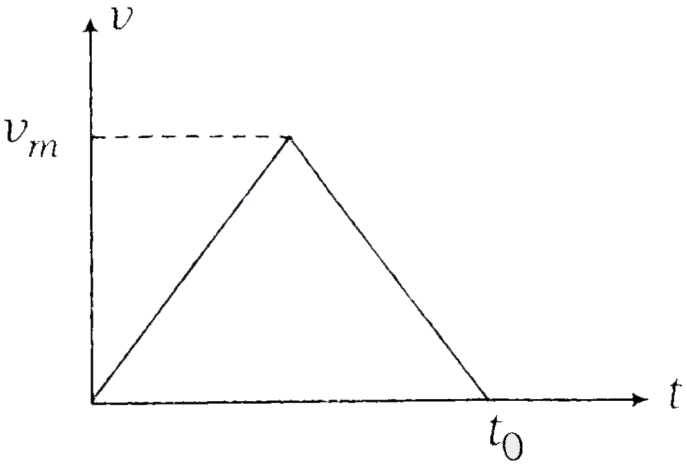
19. Assertion : In the $v - t$ diagram as shown in figure, average velocity between the interval t = 0 and $t = t_0$ is independent of t_0



Reason : Average velocity in the given interval is $\frac{1}{2}v_m$.

A. If both Assertion and Reason are correct and Reason is the correct explanation of assertion.

B. If both Assertion and Reason are correct but Reason in not the correct explanation of Assertion.

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

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B Meical Entrance Special Format Questions Mathch The Columns

1. Match the following columns.

	Column I		Column II
(A)	$\mathrm{d\,v/dt}$	(p)	Acceleration
(B)	$\mathrm{d|v|/dt}$	(q)	Magnitude of acceleration
(C)	$\frac{dr}{dt}$	(r)	Velocity
(D)	$\left\|\frac{dr}{dt}\right\|$	(s)	Magnitude of velocity
		(t)	Rate of change of speed

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2. In the s-t equation $\left(s = 10 + 20t - 5t^2\right)$ match the following columns.

	Column I		Column II
(A)	Distancec travelled in 3s	(p)	-20 units
(B)	Displacement 1 s	(q)	15 units
(C)	Initial acceleration	(r)	25 units
(D)	Velocity at 4 s	(s)	-10 units

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3. Velocity of a particle is in negative direction with constant acceleration in positive direction. Then match the following:

Table-1	Table-2
(A) Velocity-time graph	(P) Slope → negative
(B) Acceleration-time graph	(Q) Slope → positive
(C) Displacement-time graph	(R) Slope → zero
	(S) | Slope | → increasing
	(T) | Slope | → decreasing
	(U) | Slope | → constant

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4. Match the following columns.

	Column I		Column II
(A)	Constant positive acceleration	(p)	Speed may increase
(B)	Constant negative acceleration	(q)	Speed may decrease
(C)	Constant displacement	(r)	Speed is zero
(D)	Constant slope of a-t graph	(s)	Speed must increase
		(t)	Speed must decrease

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5. For the velocity time graph shown in figure, in a time interval from $t = 0$ to $t = 6s$ match the following

Table-1		Table-2	
(A)	Change in velocity	(P)	$-\frac{5}{3}$ SI unit
(B)	Average acceleration	(Q)	– 20 SI unit
(C)	Total displacement	(R)	– 10 SI unit
(D)	Acceleration at $t = 3$ s	(S)	– 5 SI unit

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6. Let us call a motion, A when velocity is positive and increasing A^{-1} when velocity is negative and increasing R when velocity is positive and decreasing and R^{-1} when velociyt is negative and decreasing. Now match the following two tales for the given $s-t$ graph

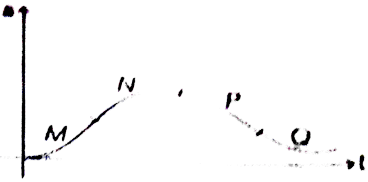

Table-1		Table-2	
(A)	M	(P)	A^{-1}
(B)	N	(Q)	R^{-1}
(C)	P	(R)	A
(D)	Q	(S)	R

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C Medical Entrances Gallery

1. If the velocity of a particle is $v = At + Bt^2$, where A and B are constant, then the distance travelled by it between $1s$ and $2s$ is :

A. $3A + 7B$

B. $\frac{3}{2}A + \frac{7}{3}B$

C. $\frac{A}{2} + \frac{B}{3}$

D. $\frac{3}{2}A + 4B$

Answer: B

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2. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$v(x) = \beta x^{-2n}$

where β and n are constant and x is the position of the particle. The acceleration of the particle as a function of x is given by.

A. $-2n\beta^2 x^{-2n-1}$

B. $-2n\beta^2 x^{-4n-1}$

C. $-2\beta^2 x^{-2n+1}$

D. $-2n\beta^2 x^{-4n+1}$

Answer: B

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3. The ball is dropped from a bridge $122.5m$ above a river, After the ball has been falling for 2 s, a second ball is thrown straight down after it. What must its initial velocity be so that both hit the water at the same time ?

A. $40ms^{-1}$

B. $55.5ms^{-1}$

C. $26.1ms^{-1}$

D. $9.6ms^{-1}$

Answer: C

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4. A ball is thrown vertically upwards from the ground with a speed of $25.2ms^{-1}$. How long does it take to reach its highest point and how high does it rise ? (Take $g = 9.8ms^{-2}$)

A. $2.75s, 3.24m$

B. $25.7s, 34.2m$

C. $2.57s, 32.4m$

D. $27.5s, 3.42m$

Answer: C

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5. A particle moves in an XY-plane in such a way that its x and y-coordinates vary with time according to

$x(t) = t^3 - 32t, y(t) = 5t^2 + 12$

Find the acceleration of the particle, if t = 3 s.

A. $9\hat{i} + 5\hat{j}$

B. $18\hat{i} + 10\hat{j}$

C. $18\hat{i} - 5\hat{j}$

D. $-18\hat{i} + 10\hat{j}$

Answer: B

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6. A point moving with constant acceleration from A to B in the straight line AB has velocities u and v at A and B respectively. Find its velocity at C, the mid point of AB. Also show that if the time from A to C is twice that from C to B, then $v = 7u$.

A. 5 u

B. 6 u

C. 7 u

D. 8 u

Answer: C

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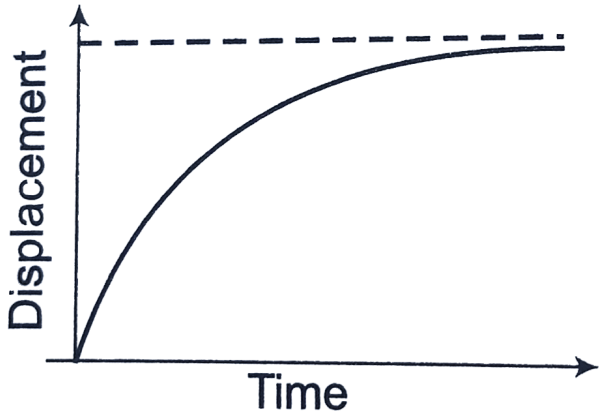
7. The displacement-time graph of a particle is as shown below. It indicates that



A. the velocity of the particle is constant throughout

B. the acceleration of the particle is constant throughout

C. the particle starts with a constant velocity and is accelerated

D. the motion is retarded and finally the particle stops

Answer: D

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8. A car starts from rest and accelerates uniformly to a speed of $180 kmh^{-1}$ in 10 s. The distance covered by the car in the time interval is

A. 200 m

B. 300 m

C. 500 m

D. 250 m

Answer: D

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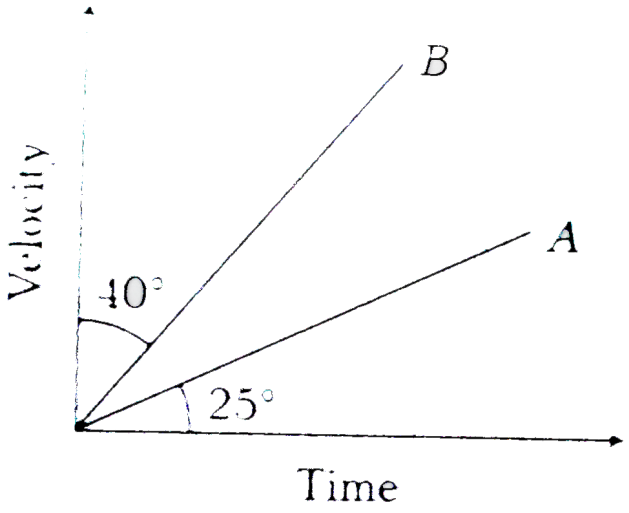
9. The velocity - time graph for two bodies A and B are shown in figure. Then, the acceleration of A and B are in the ratio



A. $\sin 25^\circ$ to $\sin 50^\circ$

B. $\tan 25^\circ$ to $\tan 40^\circ$

C. $\cos 25^\circ$ to $\cos 50^\circ$

D. $\tan 25^\circ$ to $\tan 50^\circ$

Answer: D

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10. A particle is moving such that its position coordinates (x, y) are $(2m, 3m)$ at time $t = 0$, $(6m, 7m)$ at time $t = 2s$, and $(13m, 14m)$ at time $t = 5s$.

Average velocity vector $\left(\vec{V}_{av}\right)$ from $t = 0$ to $t = 5s$ is

A. $\frac{1}{5}\left(13\hat{i} + 14\hat{j}\right)$

B. $\frac{7}{3}\left(\hat{i} + \hat{j}\right)$

C. $\left(\hat{i} + \hat{j}\right)$

D. $\frac{11}{5}\left(\hat{i} + \hat{j}\right)$

Answer: D

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11. A ball thrown vertically upwards after reaching a maximum height h returns to the starting point after a time of 10 s. Its

displacement after 5 s is

A. h

B. 2h

C. 10h

D. 20h

Answer: A

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12. A police jeep is chasing with, velocity of $45km/h$ a thief in another jeep moving with velocity $153km/h$. Police fires a bullet with muzzle velocity of $180m/s$. The velocity it will strike the car of the thief is.

A. $150ms^{-1}$

B. $27ms^{-1}$

C. $450ms^{-1}$

D. $250ms^{-1}$

Answer: A

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13. A particle moves with constant acceleration along a straight line streaming from rest. The percentage increase in its displacement during the 4th second compared to that in the 3rd second is

A. $33\ \%$

B. $40\ \%$

C. $66\ \%$

D. $77\ \%$

Answer: B

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14. A car covers the first half of the distance between two places at a speed of $40kmh^{-1}$ and second half at $60kmh^{-1}$ Calculate the average speed of the car.

A. $40kmh^{-1}$

B. $48kmh^{-1}$

C. $50kmh^{-1}$

D. $60kmh^{-1}$

Answer: B

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15. A particle starts moving from rest under uniform acceleration it travels a distance x in the first two seconds and a distance y in the next two seconds. If $y = nx$, then $n =$

A. y = 3x

B. y = 4x

C. y = x

D. y = 2x

Answer: A

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16. At time t = 0, two bodies A and B at the same point. A moves with constant velocity v and B starts from rest and moves with

constant acceleration. Relative velocity of B w.r.t. A when the bodies meet each other is

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

B. $\frac{v}{3}$

C. v

D. $2v$

Answer: C

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17. A motorclist drives from A to B with a uniform speed of $30kmh^{-1}$ and returns back with a speed of $20kmh^{-1}$. Find its average speed.

A. $25kmh^{-1}$

B. $24kmh^{-1}$

C. $50kmh^{-1}$

D. $10kmh^{-1}$

Answer: B

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18. A body starts from rest and moves with constant acceleration for t s. It travels a distance x_1 in first half of time and x_2 in next half of time, then

A. $x_2 = x_1$

B. $x_2 = 2x_1$

C. $x_2 = 3x_1$

D. $x_2 = 4x_1$

Answer: D

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19. The acceleration of a moving body can be found from

A. area under velocity - time graph

B. area under displacement - time graph

C. slope of distance - time graph

D. slope of velocity - time graph

Answer: D

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20. A stone falls freely under gravity. It covered distances h_1, h_2 and h_3 in the first 5 seconds. The next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is :

A. $h_1 = 2h_2 = 3h_3$

B. $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

C. $h_2 = 3h_1$ and $h_3 = 3h_2$

D. $h_1 = h_2 = h_3$

Answer: B

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21. The motion of a particle in straight line is an example of

A. constant velocity motion

B. uniformly acceleration motion

C. non-uniformly acceleration motion

D. zero velocity motion

Answer: B

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22. The velocity-time graph of particle comes out to be a non-linear curve. The motion is

A. uniform velocity motion

B. uniformly accelerated motion

C. non-uniform accelerated motion

D. Nothing can be said about the motion

Answer: C

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23. A person reaches on a point directly opposite on the other bank of a river.The velocity of the water in the river is $4m/s$and the velocity of the person in still water is $5m/s$.If the width of the river is $84.6m$, time taken to cross the river in seconds is

A. 28.2

B. 9.4

C. 2

D. 84.6

Answer: A

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24. A body is thrown vertically upward from a point A 125 m above the ground. It goes up to a maximum height of 250 m above the ground and passes through A on its downward journey. The velocity of the body when it is at a height of 70 m above the ground is $\left(g = 10m/s^2\right)$

A. $50ms^{-1}$

B. $60ms^{-1}$

C. $80ms^{-1}$

D. $20ms^{-1}$

Answer: B

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25. A particle is moving eastwards with velocity of $5m/s$. In $10\,\text{sec}$ the velocity changes to $5m/s$ northwards. The average acceleration in this time is.

A. $\frac{1}{\sqrt{2}}m/s^2$ (North-West)

B. $\frac{1}{\sqrt{2}}m/s^2$ (North-East)

C. $\sqrt{2}m/s^2$ (North-West)

D. $\sqrt{2}m/s^2$ (North-East)

Answer: C

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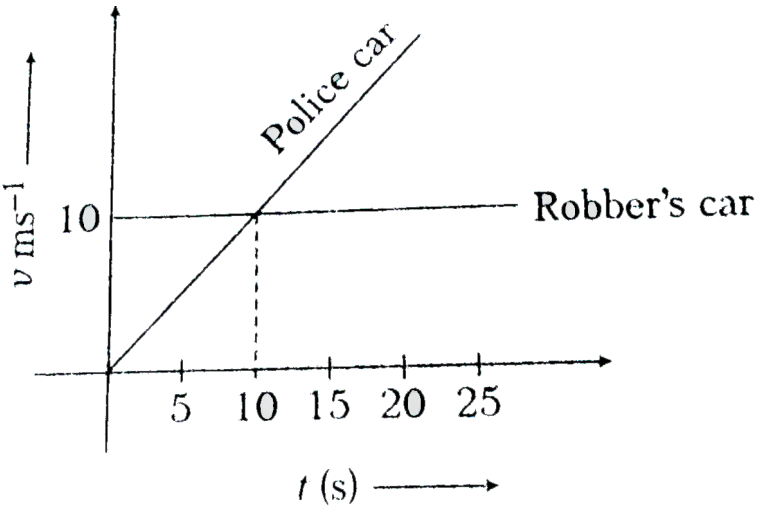
26. The velocity-time graph of robber's car and a chasing police car are shown in the following graph. Police car crosses the

robber's car in time



A. 10 s after it starts

B. 1 s after it starts

C. 20 s after it starts

D. Never crosses

Answer: C

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27. Initial speed of an α particle inside a tube of length 4m is $1kms^{-1}$, if it is accelerated in the tube and comes out with a speed of $9kms^{-1}$, then the time for which the particle remains inside the tube is

A. $8 \times 10^{-3}s$

B. $8 \times 10(-4)s$

C. $80 \times 10^{-3}s$

D. $800 \times 10^{-3}s$

Answer: B

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28. A body X is projected upwards with a velocity of $98ms^{-1}$, after 4s, a second body Y is also projected upwards with the same

initial velocity . Two bodies will meet after

A. 8 s

B. 10 s

C. 12 s

D. 14 s

Answer: C

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29. Let $r_1(t) = 3t\hat{i} + 4t^2\hat{j}$

and $r_2(t) = 4t^2\hat{i} + 3t\hat{j}$

represent the positions of particles 1 and 2, respectively, as function of time t, $r_1(t)$ and $r_2(t)$ are in meter and t in second. The relative speed of the two particle at the instant t = 1s, will be

A. 1 m/s

B. $3\sqrt{2}m/s$

C. $5\sqrt{2}m/s$

D. $7\sqrt{2}m/s$

Answer: C

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30. The motion of a particle along a straight line is described by equation : $x = 8 + 12t - t^3$ where x is in meter and t in second. The retardation of the particle when its velocity becomes zero is.

A. $24ms^{-2}$

B. zero

C. $6ms^{-2}$

D. $12ms^{-2}$

Answer: D

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31. A scooter starts from rest have an acceleration of $1ms^{-2}$ while a car 150 m behind it starts from rest with an acceleration of $2ms^{-2}$. After how much time the car catches up with the scooter ?

A. $\sqrt{700}s$

B. $\sqrt{300}s$

C. $\sqrt{150}s$

D. None of the above

Answer: B

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32. The displacement x of a particle along a straight line at time t is given by $x = a_0 + a_1 t + a_2 t^2$. The acceleration of the particle is

A. a_0

B. a_1

C. a_2

D. $2a_2$

Answer: D

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