PHYSICS

BOOKS - DC PANDEY PHYSICS (HINGLISH)

MOTION IN A PLANE

Example

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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

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 ?

    A. $110m$ $150m$

    B. $110m$ $50m$

    C. $50m$ $50m$

    D. $110m$ $110m$

Answer: B

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

A. $\dfrac{\pi}{2\sqrt{2}}$

B. $\dfrac{\pi}{2\sqrt{3}}$

C. $\dfrac{\pi}{2\sqrt{12}}$

D. $\dfrac{\pi}{3\sqrt{2}}$

Answer: A

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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 ?

A. $314 m$

B. $200 m$

C. $214 m$

D. $100m$

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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 $20 kmh^{-1}$. On his return trip along the same route, there is less traffic and the average speed is $40 kmh^{-1}$. 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 Y with a uniform speed v_d. The average speed for this round trip is :

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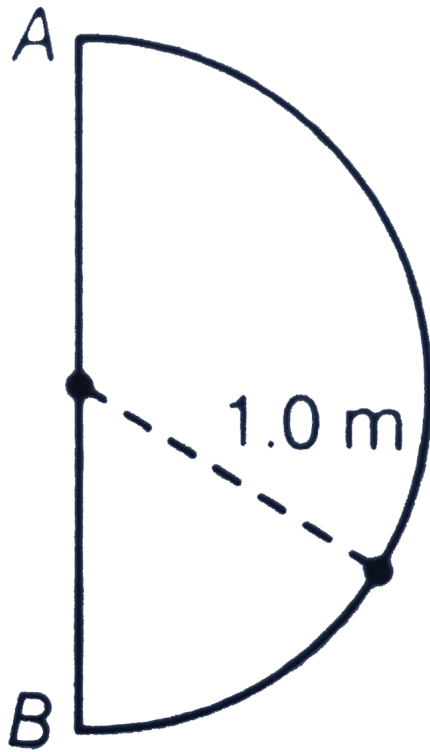
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11. A car covers the first half of the distance between two places at a speed of $40 kmh^{-1}$ and second half at $60 kmh^{-1}$ Calculate the average speed of the car.

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.

1.0 m

A. $3m/s$

B. $2m/s$

C. $1m/s$

D. $2.5m/s$

Answer: B

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 ?

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 ?

15. A car is moving along a straight (OP). It moves from $O \rightarrow P$ in $18\,\sec onds$ amd retuns from $P \rightarrow Q$ in 6 seconds, $where$OP=360 m and OQ=240 m What are the car the average velcoty and average speed of the car in going (a) from $O \rightarrow P$ and back to Q ?

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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 a particle moving in the positive direction of x-axis varies as $v = \alpha\sqrt{x}$ where α is positive constant. Assuming that at the moment $t = 0$, the particle was located at $x = 0$, find (i) the time

dependance of the velocity and the acceleration of the particle and (ii) 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 a body is proportional to the square of time. What type of motion this body has ?

A. projectile motion

B. uniform accelerated motion

C. Non uniform accelerated motion

D. none

Answer: B

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

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

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

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

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

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.

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.

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.

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

(ii) Can these be equal ?

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

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

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

27. Two cars start off a race with velocity $2ms^{-1}$ and $4ms^{-2}$ respectively. What is the length of the path if they reach the final point at the same

time ?

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

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?

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 $\dfrac{a_1 + a_2}{2}$.

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

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.

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

A. $\left(10\hat{i} + 7\hat{j}\right) m/s$ and $\left(12\hat{i} + 10\hat{j}\right) m$

B. $\left(10\hat{i} + 2\hat{j}\right) m/s$ and $\left(12\hat{i} + 10\hat{j}\right) m$

C. $\left(10\hat{i} + 7\hat{j}\right) m/s$ and $\left(12\hat{i} + 1\hat{j}\right) m$

D. $\left(1\hat{i} + 7\hat{j}\right) m/s$ and $\left(12\hat{i} + 10\hat{j}\right) m$

Answer: D

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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 $g = 10m/s^2$.

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 ?

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 $g = 10m/s^2$)

37. A Juggler throws balls into air. He throws one ball whenever the previous one is at is at its highest point. How high does the balls rise if he throws n balls each second ? Acceleration due to gravity is g.

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 $\dfrac{5}{3}h$.

39. A ball is thrown vertically upwards with a velocity of $20ms^{-1}$ from the top of a multistorey building. The height of the point from where the ball is thrown is 25 m from the ground. How long will it be before the ball hits the ground (Take, $g = 10ms^{-2}$) ?

40. A ball is thown upwards from the ground with an initial speed u. The is at a height of 80 m at two times, the interval being 6s. Find the value of u.

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.

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.

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 :-

44. From the top of a building, 16 m high water drop are falling at eqal intervals of time such that when the first drop reaches the ground, the fifth drop just starts. Find the distance between the successive drops at hat instant.

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 ?

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.

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.

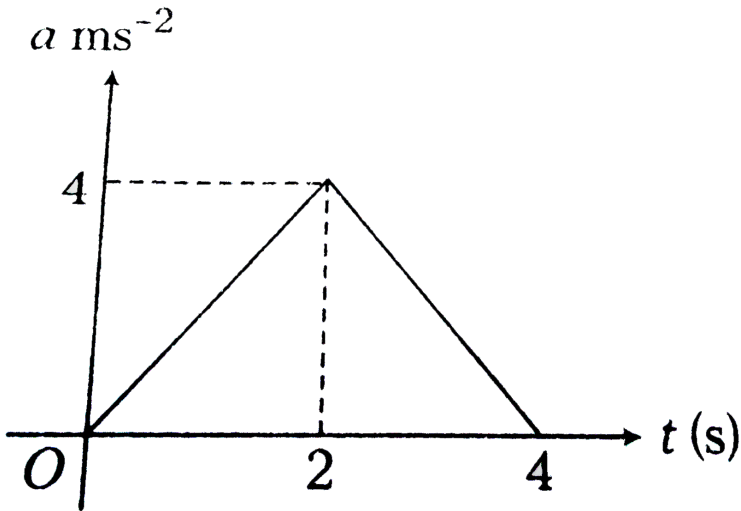**48.** With the help of the given velocity - time graph, find the

(i) displacement in first three seconds and

(ii) acceleration for the graph.
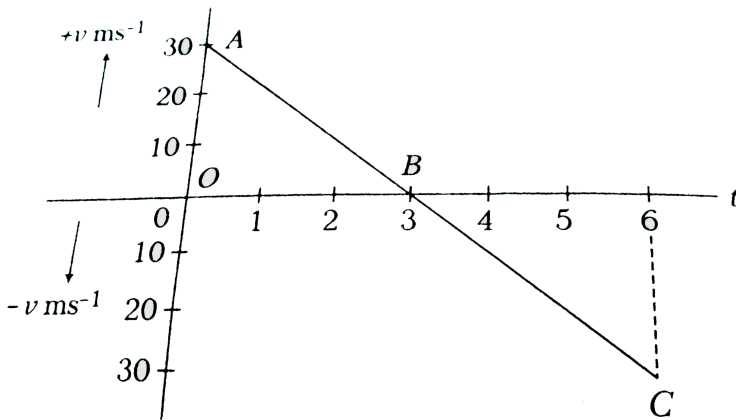
49. Acceleration - time graph of a particle moving in a straight line is shown in figure. Velocity of particle at time t = 0 is $2ms^{-1}$. Find velocity at the end of fourth second.
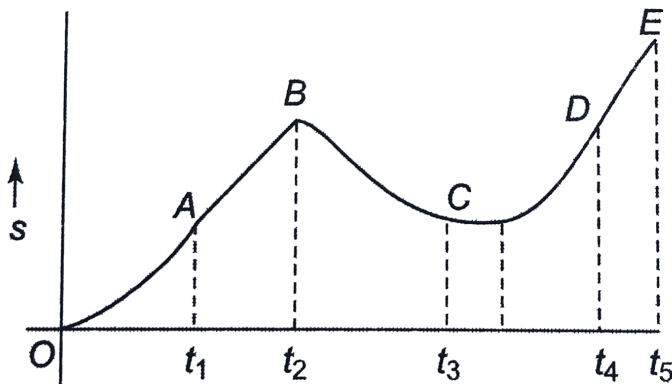
50. Displacement - time graph of particle moving in a straight line is as shown in figure. State whether the motion is accelerated or not. Describe the motion in detail. Given,

$s_0 = 20m$ and $t_0 = 4s$.
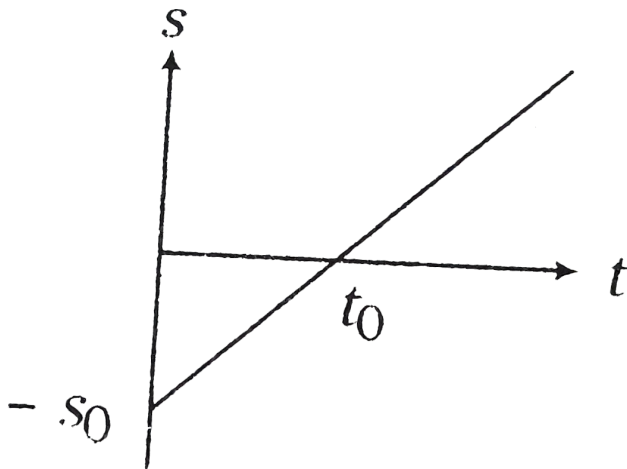
**51.** A particle is moving along the x-axis and its position-time graph is shown. Determine the sign of acceleration.

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.

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 $t = 0$.
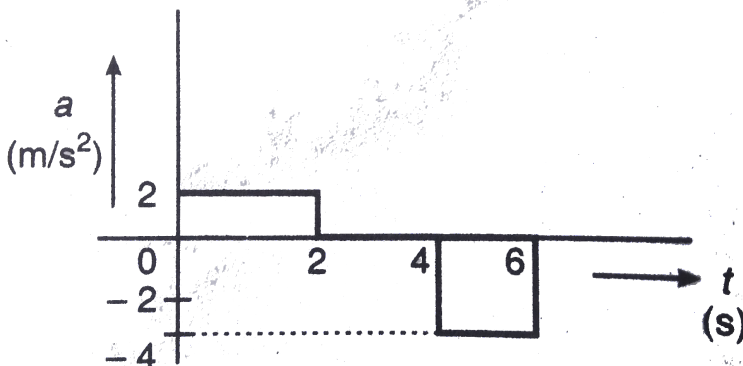
54. Velocity-time graph of a particle moving in a straight line is shown in figure. Plot the corresponding displacement-time graph of the particle if at time $t = 0$, displacement $s = 0$.
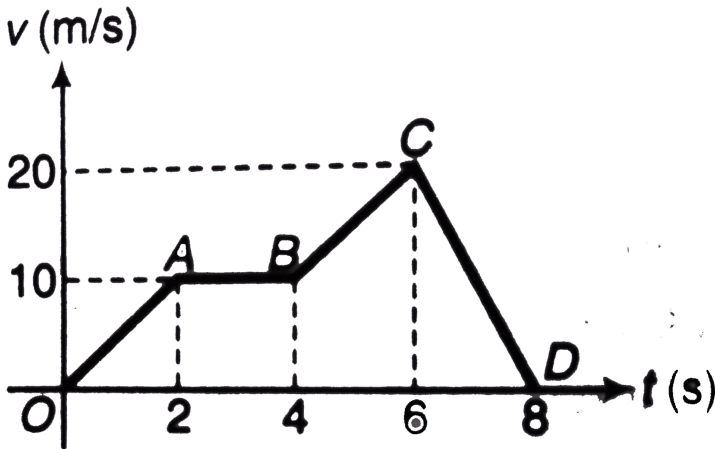
55. A rocket is fired vertically upwards with a net acceleration of $4m/s^2$ and initial velocity zero. After $5s$ its fuel is finished and it decelerates with g. At the highest point its velocity becomes zero. Then, it accelerates

downwards with acceleration g and return back to ground. Plot velocity-time and displacement -time graphs for the complete journey. Take $g = 10m/s^2$.

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?

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

58. A man A moves due to East with velocity $6ms^{-1}$ and another man B

moves in $N - 30°E$ 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.

A. $(15ms^{-1})\hat{i} \, (-5ms^{-1})\hat{i}$

B. $(5ms^{-1})\hat{i} \, (-15ms^{-1})\hat{i}$

C. $(5ms^{-1})\hat{i} \, (-5ms^{-1})\hat{i}$

D. $(5ms^{-1})\hat{i} \, (15ms^{-1})\hat{i}$

Answer: C

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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? .
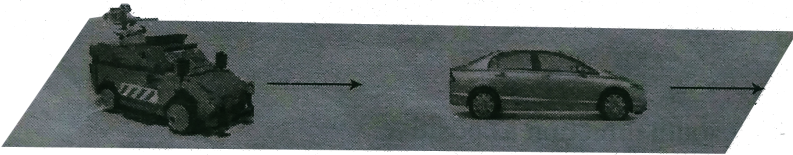
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62. Delhi is at a distance of 200 km from Ambala. Car A set out from Ambala at a speed of $30kmh^{-1}$ and car B set out at the same time from

Delhi at a speed of $20kmh^{-1}$. When they will meet each other ? What is the distance of that meeting point from Ambala ?

A. $4h$ $100km$

B. $2h$ $120km$

C. $4h$ $150km$

D. $4h$ $120km$

Answer: D

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

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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.

A. $13\sqrt{2}km/h$

B. $3\sqrt{2}km/h$

C. $5\sqrt{2}km/h$

D. $2\sqrt{2}km/h$

Answer: B

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

(a) width of the river

(b) velocity of the boat with respect to water

(c) speed of the current

A. $v_{br} = 2\dfrac{m}{\text{min}}$, $v_r = 12\dfrac{m}{\text{min}}$ and $w = 200m$.

B. $v_{br} = 20\dfrac{m}{\text{min}}$, $v_r = 125\dfrac{m}{\text{min}}$ and $w = 200m$.

C. $v_{br} = 20\dfrac{m}{\text{min}}$, $v_r = 12\dfrac{m}{\text{min}}$ and $w = 200m$

D. $v_{br} = 200\dfrac{m}{\text{min}}$, $v_r = 12\dfrac{m}{\text{min}}$ and $w = 200m$.

Answer: B

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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?

A. 120 , $\dfrac{2}{\sqrt{3}}h$, $1hr$, 90 , $\left(\dfrac{4}{3}\right)h$

B. 120 , $\dfrac{2}{\sqrt{5}}h$, $1hr$, 90 , $\left(\dfrac{4}{3}\right)h$

C. 120 , $\dfrac{2}{\sqrt{3}}h$, $1hr$, 90 , $\left(\dfrac{5}{3}\right)h$

D. 150 , $\dfrac{2}{\sqrt{3}}h$, $1hr$, 90 , $\left(\dfrac{4}{3}\right)h$

Answer: A

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 ?

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.

A. $2.5s$

B. $2s$

C. $3s$

D. $3.5s$

Answer: A

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.

(c) distance travelled by the ball upto that instant.

Take $g = 10m/s^2$

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?

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.
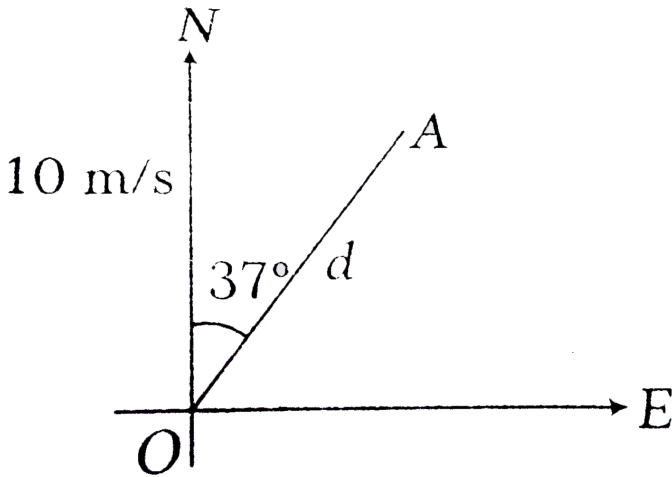
73. An aircraft flies at $400km/h$ in still air. A wind of $200\sqrt{2}km/h$ is blowing from the south towards north. The pilot wishes to travel from A

to a point B north east of A. Find the direction he must steer and time of his journey if $AB = 1000km$.

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

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. $\dfrac{\pi R}{3}$

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

C. $\dfrac{\pi R}{4}$
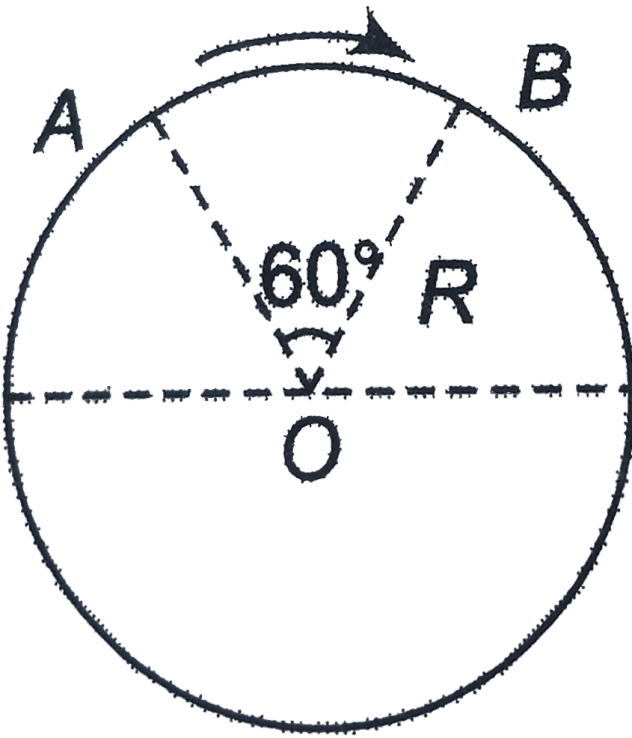
D. πR

Answer: A

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4. A person moves $30m$ north,, $then20$ 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

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

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 pont (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

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

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. $29.2 ms^{-1}$

C. $31 ms^{-1}$

D. $35.6 ms^{-1}$

Answer: A

3. A man walks on a straight road form his home to a market 2.5 km away with speed of 5 $\dfrac{km}{hr}$. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 $\dfrac{km}{hr}$. The average speed of the man over the intervel of time 0 to 40 min is equal to

A. $5 kmh^{-1}$

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

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

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

Answer: D

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

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

---

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. $\dfrac{7}{15} ms^{-1}$

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

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

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

Answer: C

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. $\dfrac{\pi R}{t}$

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

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

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

Answer: C

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 (in ms^{-1}) ?

B

20 m

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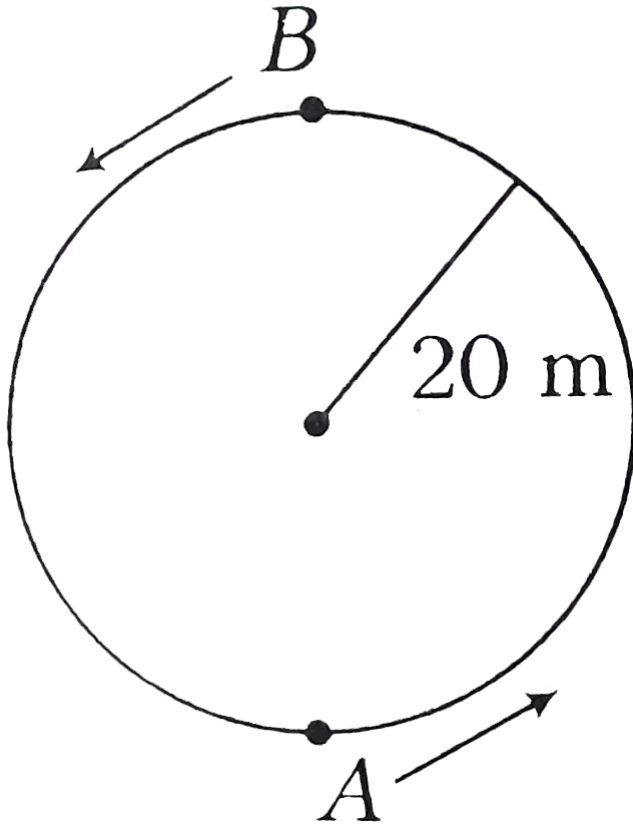
A. $\dfrac{10}{\pi}$

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

C. 10

D. None of these

Answer: D

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

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

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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

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

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

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

A. $0.67 ms^{-2}$

B. $1 ms^{-2}$

C. $1.25 ms^{-2}$

D. $1.5 ms^{-2}$

Answer: A

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

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. $13 ms^{-2}$

B. $10 ms^{-2}$

C. $27 ms^{-2}$

D. $37 ms^{-2}$

Answer: B

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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. $180 ms^{-2}$

B. $580 ms^{-2}$

C. $100 ms^{-2}$

D. $50 ms^{-2}$

Answer: C

9. The displacement (in metre) of a particle moving along x-axis is given by $x = 18t + 5t^2$. Calcate (i) the $\in s$ tan tan eousvelocity t=2 s (ii) avera $\geq$ velocitybetween t=2 s → t=3 s` (iii) instantaneous acceleration.

A. $18ms^{-2}$

B. $10ms^{-2}$

C. $5ms^{-2}$

D. $1ms^{-2}$

Answer: B

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

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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

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

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

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

C. $\dfrac{}{3}t_0$

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

Answer: A

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

    A. 64 m

    B. 64 cm

    C. 640 cm

D. $0.064m$

Answer: C

---

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

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

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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

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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

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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

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

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

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. $7.5 ms^{-2}$

C. $5 ms^{-2}$

D. $2.5 ms^{-2}$

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. $0.20 ms^{-2}$

B. $0.027 ms^{-2}$

C. $0.218 ms^{-2}$

D. $0.03 ms^{-2}$

Answer: C

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

    A. uniform velocity

    B. uniform acceleration

    C. variable acceleration

    D. constant momentum

Answer: B

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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

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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. A body thrown vertically up from the ground passes the height of 102 m twice in an interval of 10 s. What was its initial velocity ?

A. $52ms^{-1}$

B. $61 ms^{-1}$

C. $45 ms^{-1}$

D. $26 ms^{-1}$

Answer: A

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

A. 1 s

B. 2 s

C. 3 s

D. 4 s

Answer: B

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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

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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

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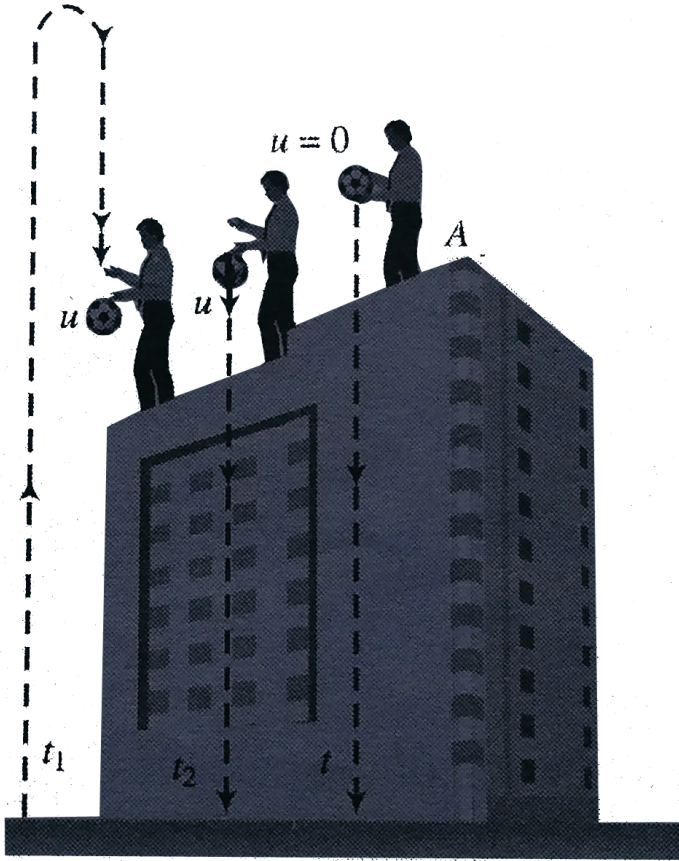
A. $t = \dfrac{t_1 + t_2}{2}$

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

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

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

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

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

Answer: B

11. A helicopter, moving vertically upwards, releases a packet when it is a certain height the ground. The packet initially moves upwards for a time

t_1 and then falls dowanwards for a time t_2 until it reaches the ground. Then

A. $t_1 < t_2$

B. $t_1 = t_2$

C. $t_1 > t_2$

D. Data insfficient

Answer: A

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12. A ball P is dropped vertically and another ball Q is thrown horizontally with the same velocities from the same height and at the same time. If air resistance is neglected, then

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 under gravity from rest from a height $h(g = 9.8m/\sec^2)$ and it travels a distance $9h/25$ in the last second, the height h is.

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 $2\sec$ 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 $10ms^{-1}$, then the maximum height attained by the stone is $(g = 10ms^{-2})$

A. 16 m

B. 10 m

C. 20 m

D. 40 m

Answer: B

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

18. A man in a balloon rising vertically with an accelration fo $4.9ms^{-2}$ released a ball $2 \sec onds$ after the balloon is let fo from the fround. The greatst height above the ground reached by the ball is .

A. $14.7m$

B. $19.6m$

C. $9.8m$

D. $24.5m$

Answer: A

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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

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

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

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

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

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

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. $v_0 t + \dfrac{1}{6} bt^3$

B. $v_0 t + \dfrac{1}{3} bt^3$

C. $v_0 t + \dfrac{1}{3} bt^2$

D. $v_0 t + \dfrac{1}{2} bt^2$

Answer: A

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

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)
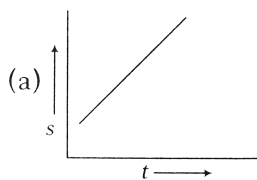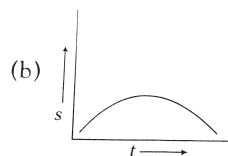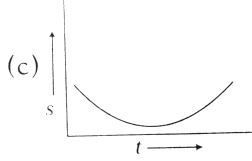
C.

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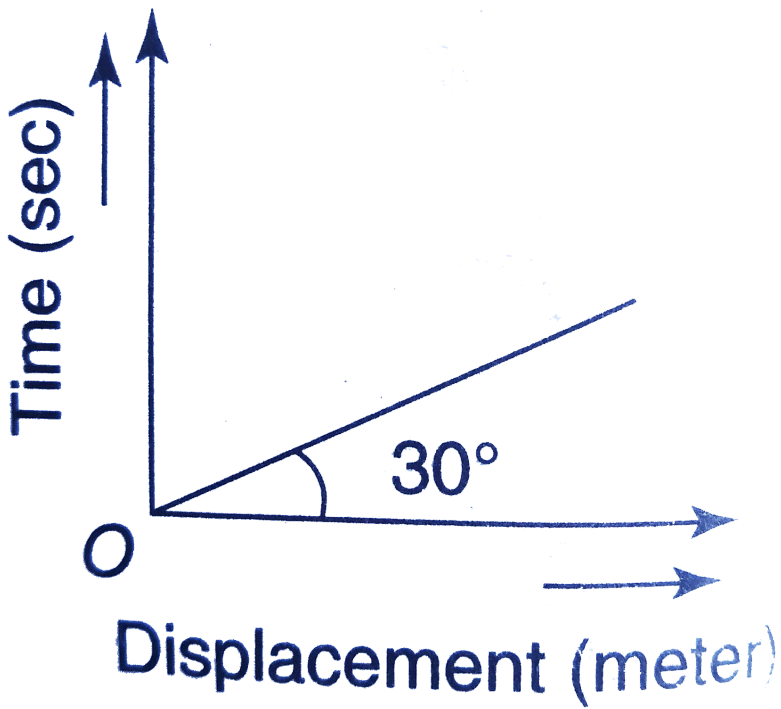
A. $\dfrac{1}{\sqrt{3}} ms^{-1}$

B. $3 ms^{-1}$

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

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

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
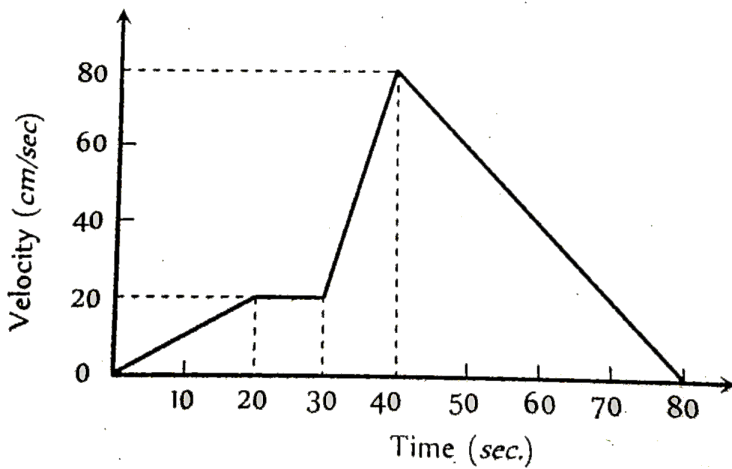
A. $1cm^{-2}$

B. $2cm^{-2}$

C. $3cm^{-2}$

D. $6cm^{-2}$

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.
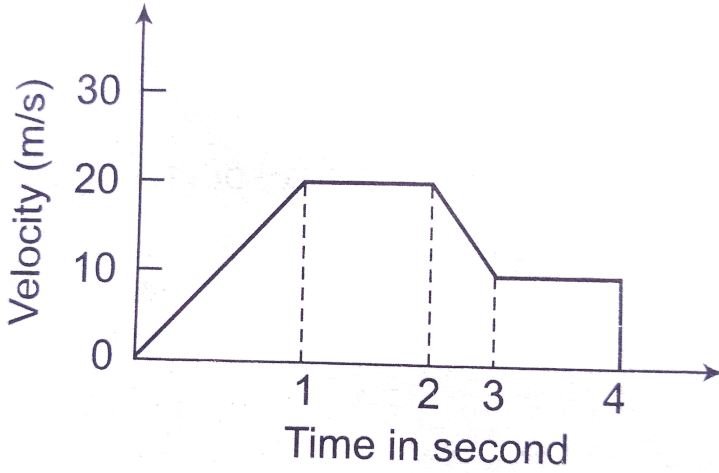
A. 60 m

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 ?
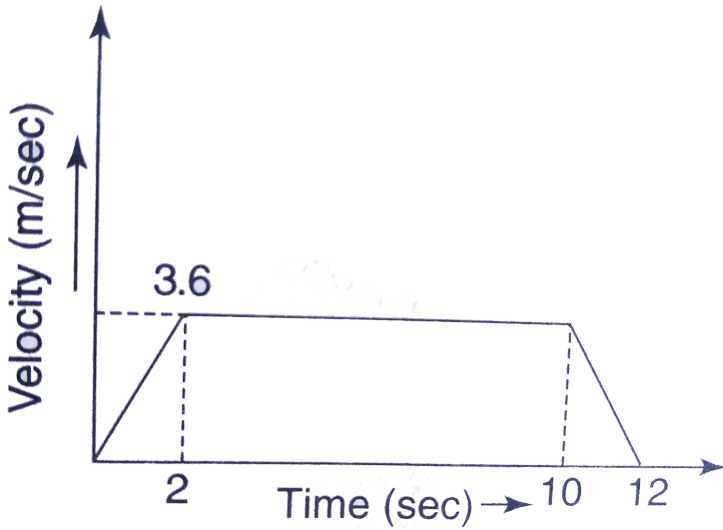
A. $3.6m$

B. $28.8m$

C. $36.0m$

D. Cannot be calculated from the above graph

Answer: C

8. The velocit-time graph of a body moving in a straight line is shown in Fig. 2 (d) . 32. Find the displacement and the distance travelled by the body in $6 \sec onds$.
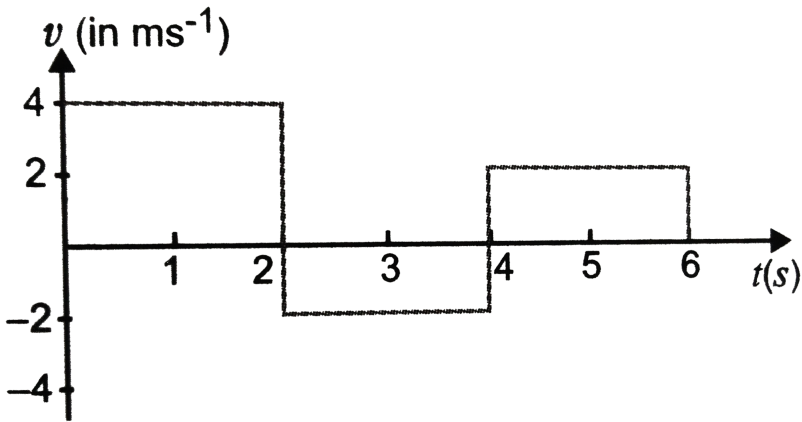
A. 8m, 16m

B. 16m, 32m

C. 16m, 16m

D. 8m, 18m

Answer: A

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

(a)

A.

(b)

B.

(c)

C.

(d)

D.
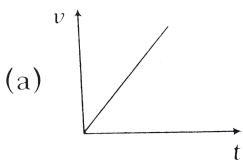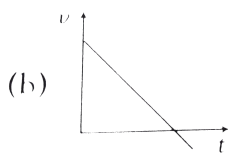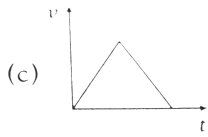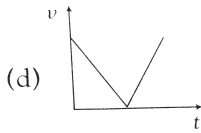
Answer: A

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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)

A.

B. (b)

C. (c)

D. (d)
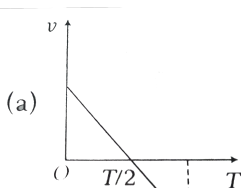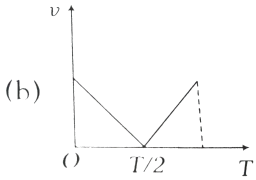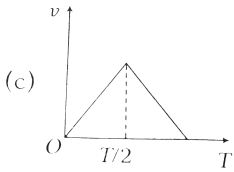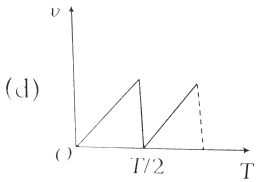
Answer: A

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12. The following figure shows the velocity-time graph of a body. According to this, at the point B:
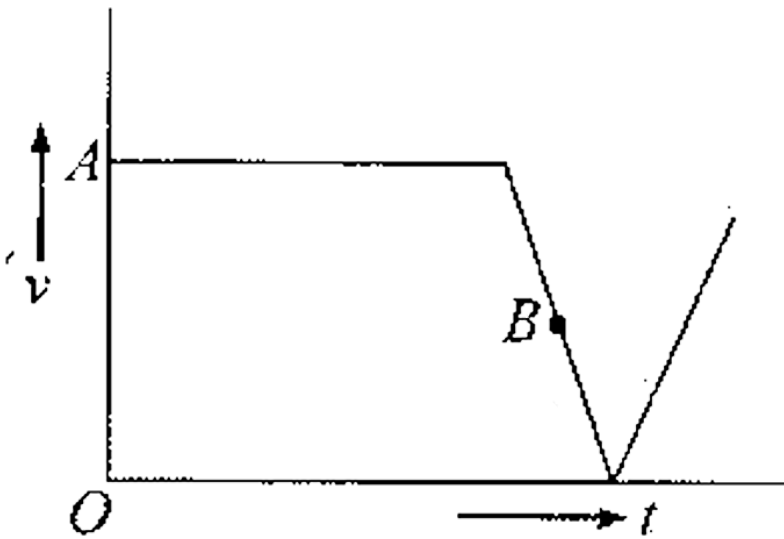
A. the is zero

B. there is at force towards motion

C. there is a force which opposes motion

D. there is only gravitational force

Answer: C

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13. The velocity - time graph is shown in the figure, for a particle. The acceleration of particle is
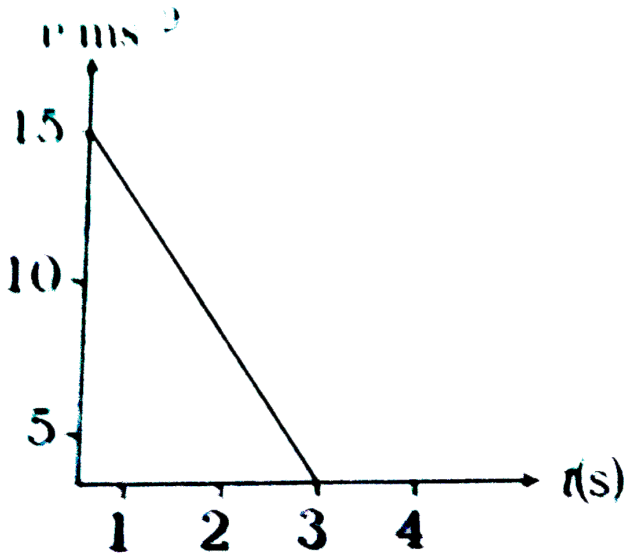
A. $22.5ms^{-2}$

B. $5ms^{-2}$

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

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

Answer: C

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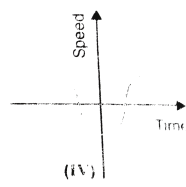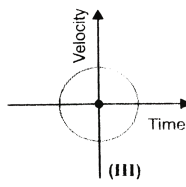**14.** The v-t plot of a moving object ios shown in the figure. The average velocity of the object during the first 10 s is
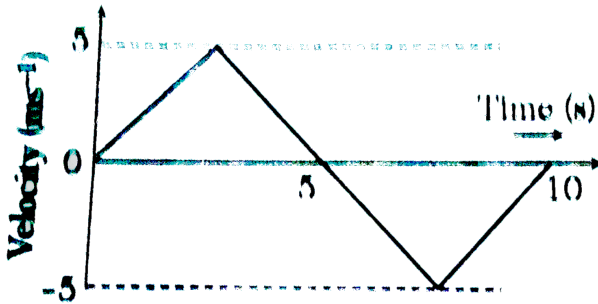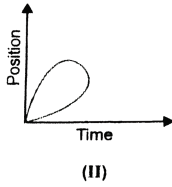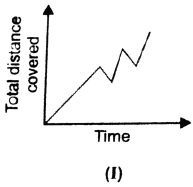

A. zero

B. $2.5ms^{-1}$

C. $5ms^{-1}$

D. $2ms^{-1}$

Answer: A

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

(I)   (II)   (III)   (IV)

A. I and II

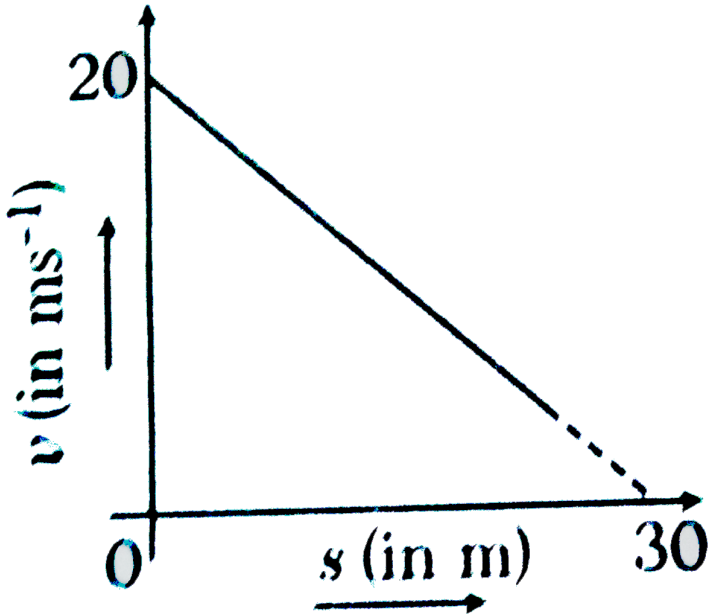B. II and III

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

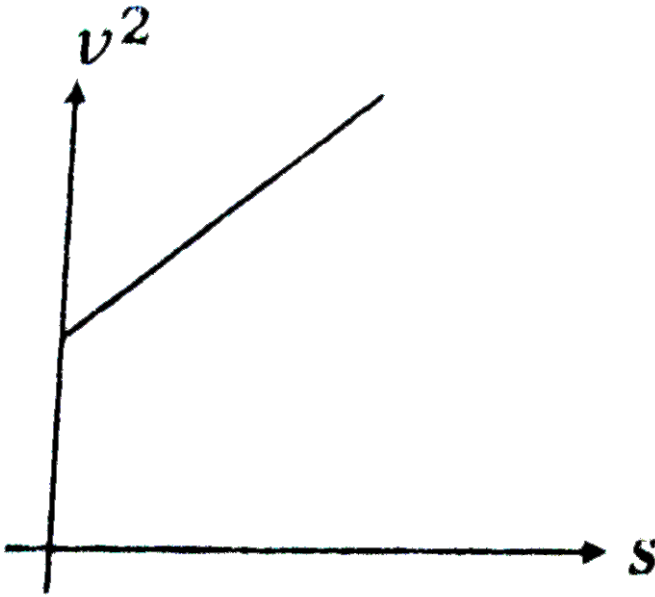A. $\dfrac{2}{3}ms^{-2}$

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

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

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

Answer: D

▶ Watch Video Solution

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 ?
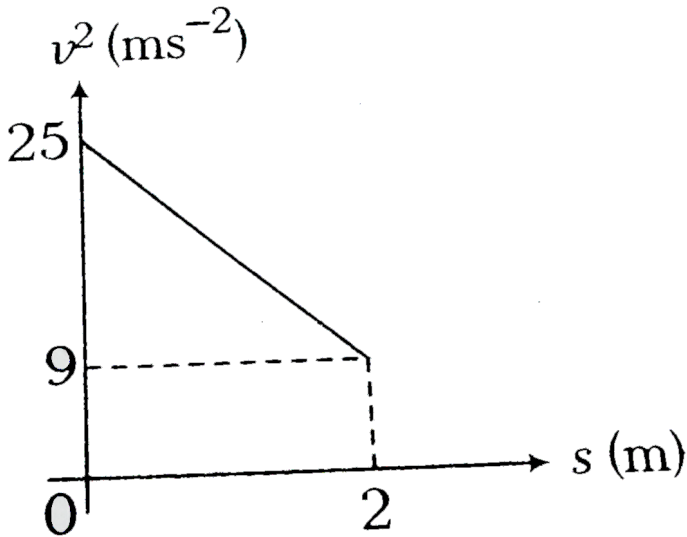

A. The given graph shown a uniformly accelerated motion

B. Initial velocity of particle is zero

C. Corresponding s-t graph will be a parabola

D. None of the above

Answer: B

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

---

19. The area under acceleration-time graph gives

A. distance travelled

B. change in acceleration

C. force acting

D. change in velocity

Answer: D
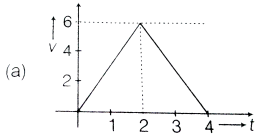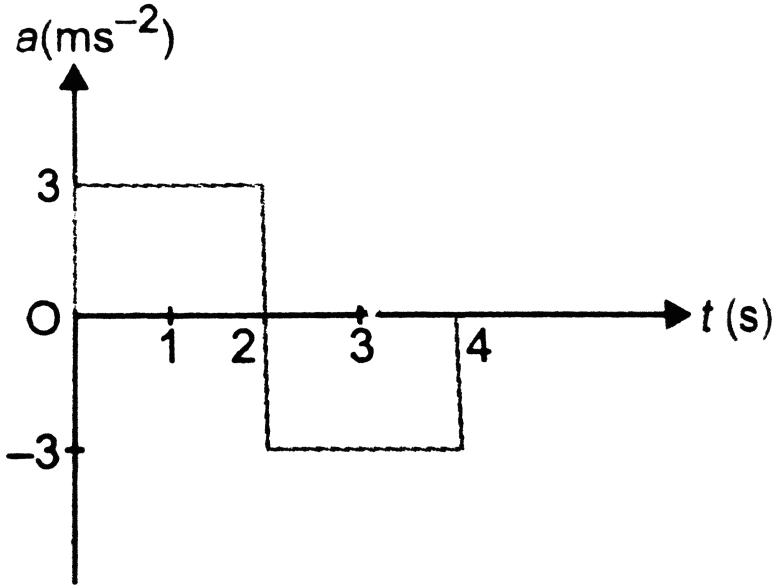

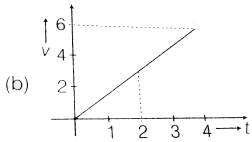20. A particle starts from rest at $t = 0$ and undergoes and acceleration

(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) ?

$a(ms^{-2})$

3

O — 1 2   3 |4 — t (s)

-3

(a)

A.

(b)

B.

(c)

C.

(d)

D.
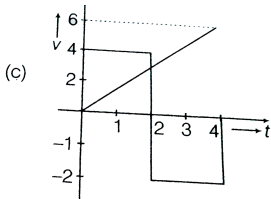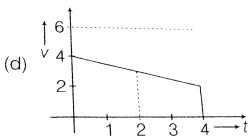
Answer: A

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

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

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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

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 $(\tan 37° = 3/4)$

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

5. A man standing on a road has to hold his umbrella at $30°$ with the vertical to keep the rain away. He throws the umbrella and starts running at 10km/hr. He finds that rain drop are hitting his head vertically. Find the speed of rain drops with respect to (a) road (b) the moving man.

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

B. $20kmh^{-1}$

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

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

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

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 water angle to the verticaly, he must inclined the tube the water drops enter it without touching its sides ?

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

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

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

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

Answer: A

---

8. The speed of boat is $5kmh^{-1}$ in still water. It crosses a river of width 1 km along the shortest possible path in 15 min. Then, velocity of river will be

A. $4.5kmh^{-1}$

B. $4kmh^{-1}$

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

D. $3kmh^{-1}$

Answer: D

9. A ship X moving due North with speed v observes that another ship Y is moving due West with speed v. The actual velocity of Y is

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

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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

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11. The rowing speed of a man relative to water is $5kmh^{-1}$ and the speed of water flow is $3kmh^{-1}$. At angle to the river flow should he head if he wants to reach a point on the other bank, directly opposite to starting point ?
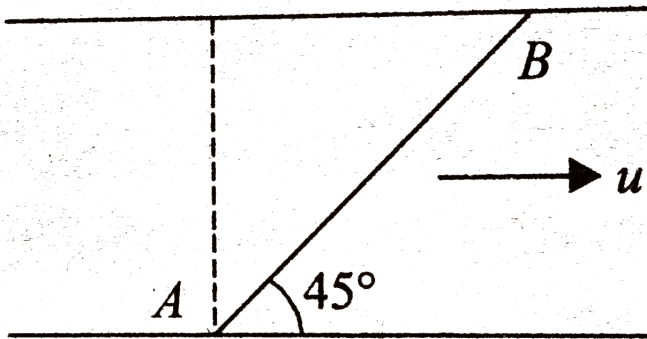
A. $127°$

B. $143°$

C. $120°$

D. $150°$

Answer: A

12. A man wants to reach point B on the opposite bank of a river flowing at a speed u as shown in (Fig. 5.193). What minimum speed relative to water to water should the man have so that he can reach directly to point B ? In which direction should he swim ?

A. u, $45°$ North-West

B. u, $45°$ North-East

C. $\dfrac{u}{\sqrt{2}}$, $45°$ North-West

D. $\dfrac{u}{\sqrt{2}}$, $45°$ 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

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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

A Taking It Together

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

A. 24/13

B. 40/13

C. 3

D. $1/2$

Answer: B

2. A man walks on a straight road form his home to a market 2.5 km away with speed of 5 $\frac{km}{hr}$. Finding the market closed, he instantly turns and walks back home with a speed of 7.5 $\frac{km}{hr}$. The average speed of the man over the intervel of time 0 to 40 min is equal to

A. $5 kmh^{-1}$

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

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

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

Answer: C

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 moves in a straight line with a constant acceleration. It passing through a distance 135 m in t second. The value of t (in second) is

A. 12

B. 9

C. 10

D. 1.8

Answer: B

> ▶ **View Text 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. $\dfrac{20}{3} m$

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

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

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

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

Answer: C

> ▶ Watch Video Solution

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: A

> ▶ Watch Video Solution

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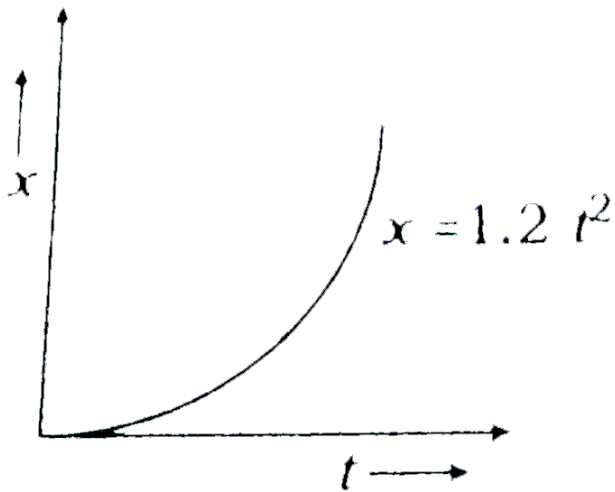
A. $5:9$

B. $5:7$

C. $9:5$

D. $9:7$

Answer: B

▶ **Watch Video Solution**

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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
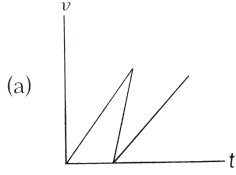
$x = 1.2\ t^2$

A. at rest

B. in uniform motion
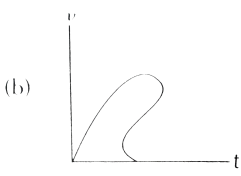
C. in non-uniform acceleration

D. uniformly accelerated
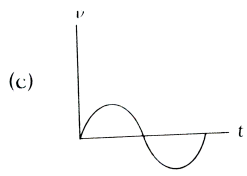
Answer: D

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11. Which of the following speed - time $(v - t)$ graph is physically not possible ?
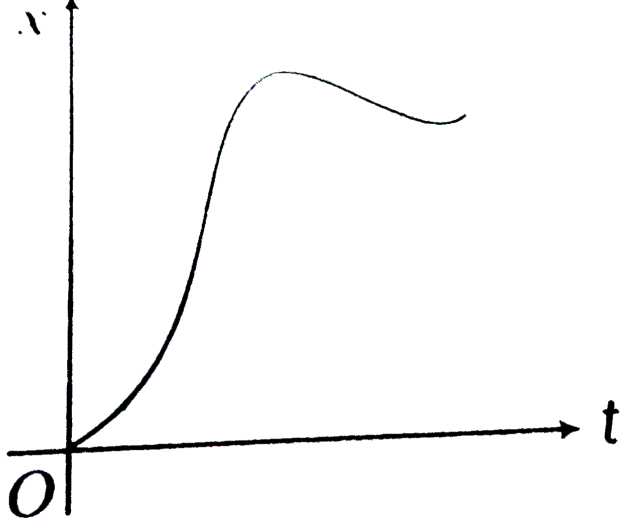
(a)

A.

(b)

B.

(c)

C.

D. All of these

Answer: D

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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

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13. The velocity fo a body depends on time according to equation, $v = 2.0 + 0.1t^2$. The body is undergoing.
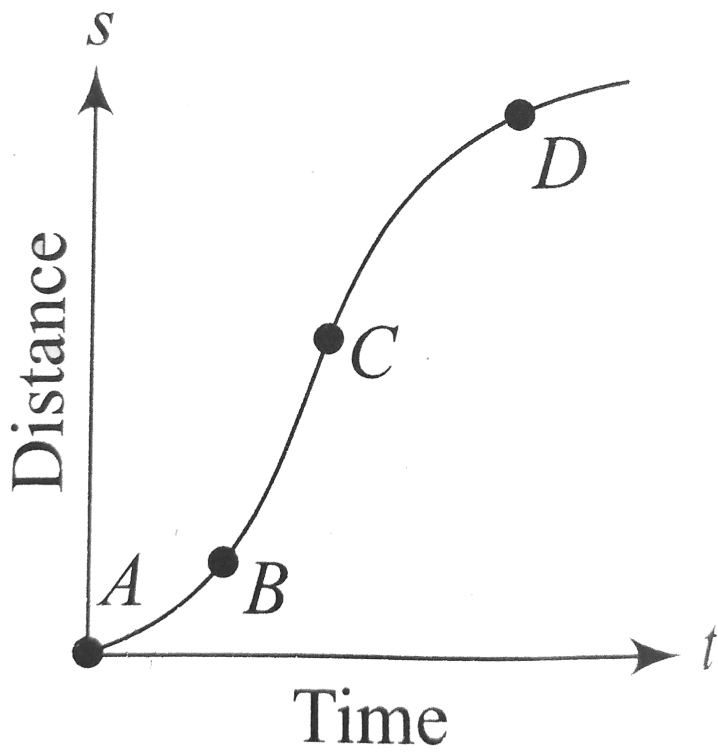
A. uniform acceleration

B. Uniform retardation

C. Non-uniform acceleration

D. Zero acceleration

Answer: C

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

A. A

B. B

C. C

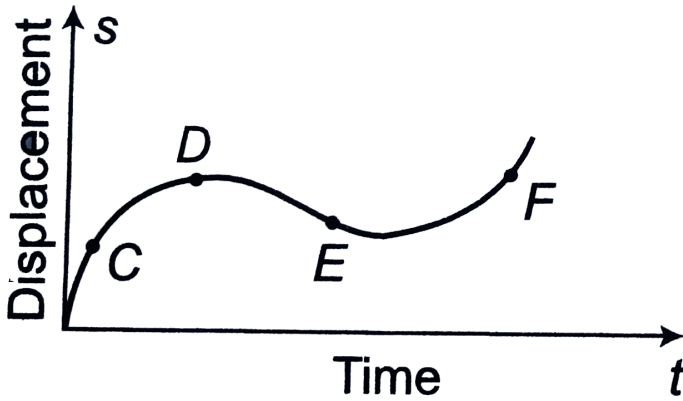D. D

Answer: C

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15. The displacement-time graph of moving particle is shown below

The instantaneous velocity of the particle in negative at the point

A. E

B. F

C. C

D. D

Answer: A

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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. $-\dfrac{c_2}{2}$

C. $c_1 - c_2$

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

Answer: B

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

A. 27 s

B. 50 s

C. 18 s

D. 36 s

Answer: D

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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

---

19. The displacement (x) of a particle depends on time t as $x = \alpha t^2 - \beta t^3$. Choose the incorrect statements from the following.

    A. The particle never returns to its starting point

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

    C. The initial velocity of the particle is zero

    D. The initial acceleration of the particle is zero

Answer: D

---

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

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21. A ball is dropped onto the floor from a height of 10 m. It rebounds to a height of 5 m. If the ball was in contact with the floor for $0.01s$, what was its average acceleration during contact ? (Take $g = 10ms^{-2}$)

A. $2414ms^{-2}$

B. $1735ms^{-2}$

C. $3120ms^{-2}$

D. $4105ms^{-2}$

Answer: A

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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

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 the moving escalator will be.

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

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

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

D. $t_1 - t_2$

Answer: C

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

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25. A cyclist starts from the centre O of a circular park of radius 1km, reaches the edge P of the park, then cycles along the PQ circumference and returns to the centre along OQ as shown in fig. If the round trip taken ten minute, the net displacement and average speed of the cyclist

(in kilometer and kilometer per hour) is
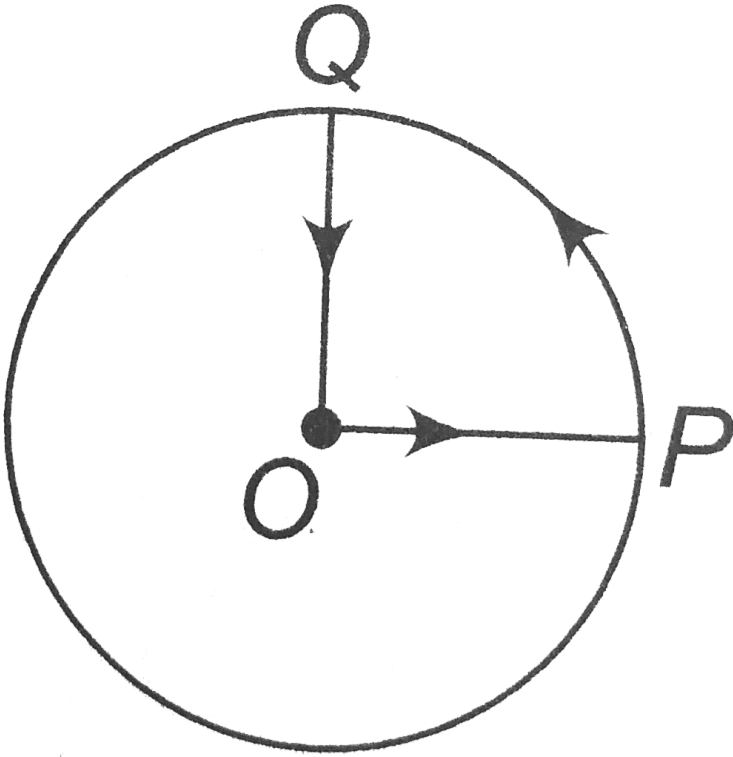
A. 0, 1

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

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

D. 0, 21.4

Answer: D

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26. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metre) of the particle 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

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 boy in a time t, where t is :

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

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

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

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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

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

---

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:
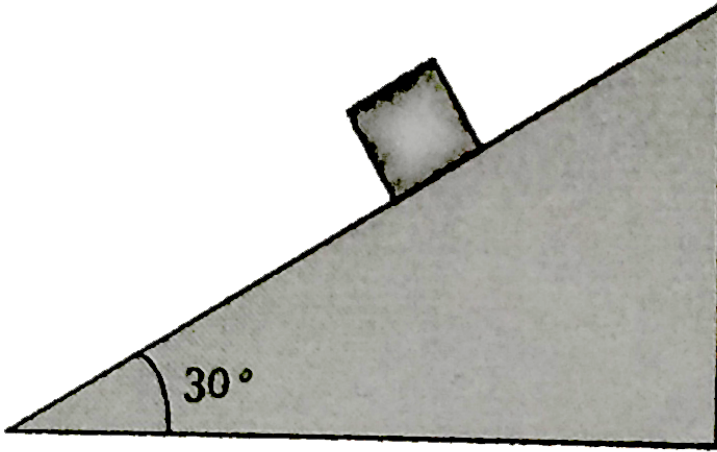
A. 20m

B. 18m

C. 16m

D. 25m

Answer: B

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. $\dfrac{1}{2}s$

B. 2 s

C. 4 s

D. 1 s

Answer: B

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35. A particle move a distance x in time t according to equation $x = (t + 5)^{-1}$. The acceleration of particle is alphaortional 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 straight upward with a speed v from a point h meter above the ground. The time taken for the ball to strike the ground is

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

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

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

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

Answer: D

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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

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38. A stone is allowed to fall freely from rest. The ratio of the time taken to fall through the first metre and the second metre distance is

A. $\sqrt{2} - 1$

B. $\sqrt{2} + 1$

C. $\sqrt{2}$

D. None of these

Answer: B

▶ **Watch Video Solution**

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39. Which of the following represents uniformly accelerated motion ?

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

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

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

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

Answer: C

40. A particle moves along a straight line. Its position at any instant is given by $x = 32t - \dfrac{8t^3}{3}$ 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

41. A point moves in a straight line so it's displacement x meter at time t second is given by $x^2 = 1 + t^2$. It's 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

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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

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43. The ration of the distance traversed, in successive intervals of time by a body, falling from rest, are

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

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

C. $1 : 4 : 7 : 10 : 13 : ...$
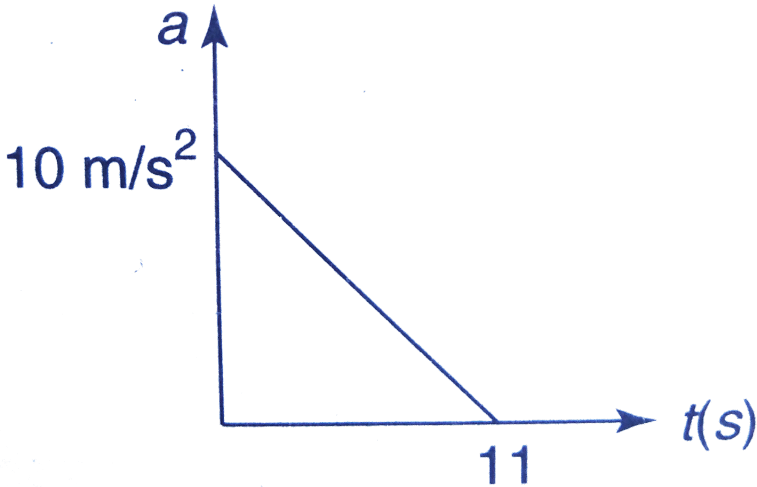
D. None of the above

Answer: A

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

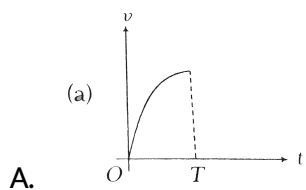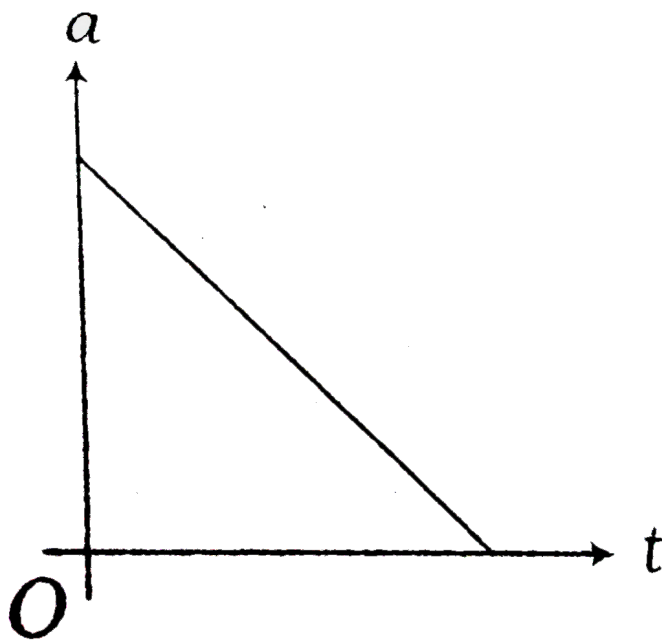The maximum speed of the particle will be.
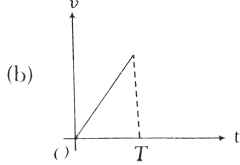

A. $110 ms^{-1}$

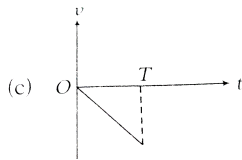B. $55 ms^{-1}$

C. $550 ms^{-1}$

D. $660 ms^{-1}$

Answer: B

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)

A.

(b)

B.

(c)
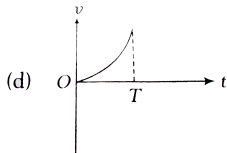

C.

(d)

D.

Answer: A

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

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

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

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

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

Answer: B

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)

A.

(b)

B.

(c)

C.

(d)

D.
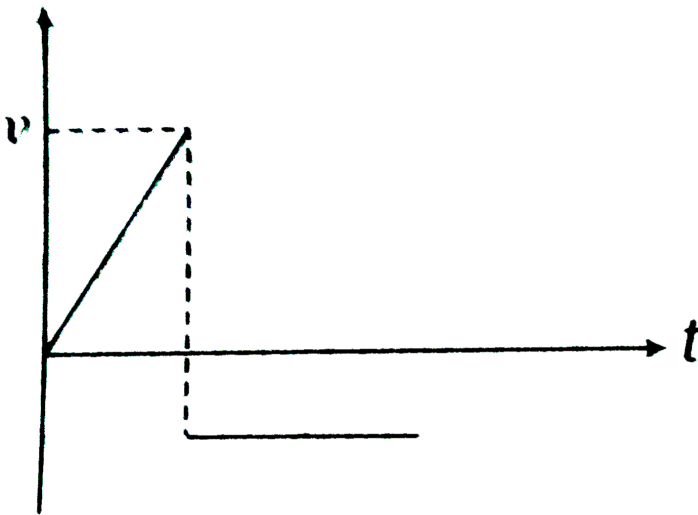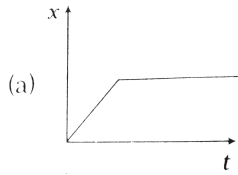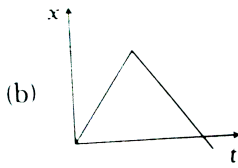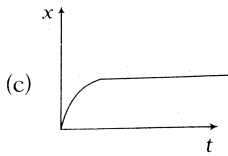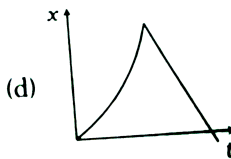
Answer: D

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

of acceleration with displacement ?

v

v_0

x_0

x

A.

(a)

a

x

B.

(b)

a

x

C.

(c)

a

x

D.
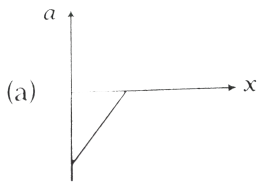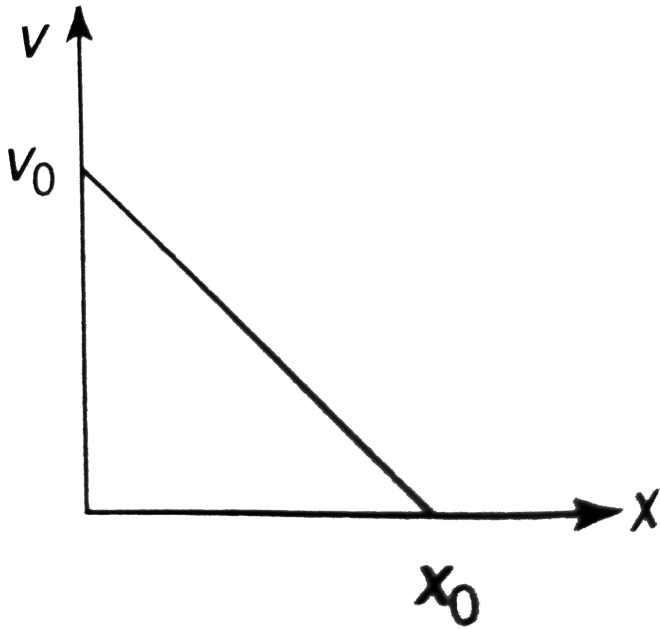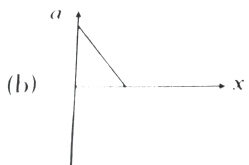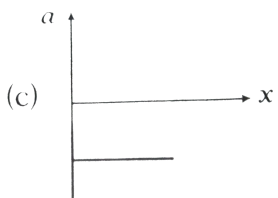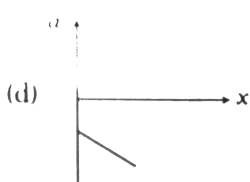
Answer: A

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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.
(a)

B.
(b)
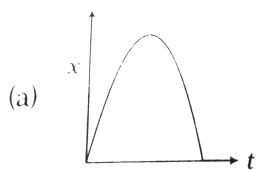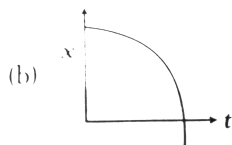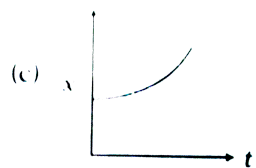
C.
(c)

D.
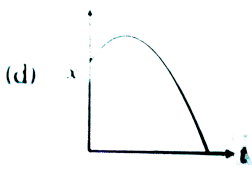
Answer: B

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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

51. Among the four graphs shown in the figure 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.

(a)

B.

(b)

C.

(c)

D.
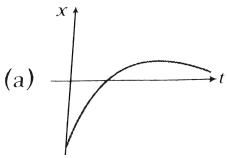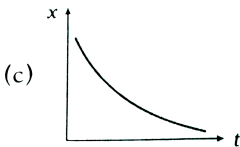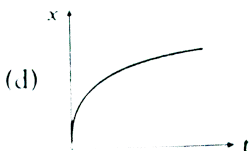
(d)

Answer: B

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 $(0 \leq v < v_0)$.

    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

55. A partachutist after bailing out falls 50 m without friction. When parachute opens, it decelerates at $2ms^{-2}$. At what height did he bail out

A. 293 m

B. 111 m

C. 91 m

D. 182 m

Answer: A

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

$v \ (\text{ms}^{-1})$

4

0

2

x (m)
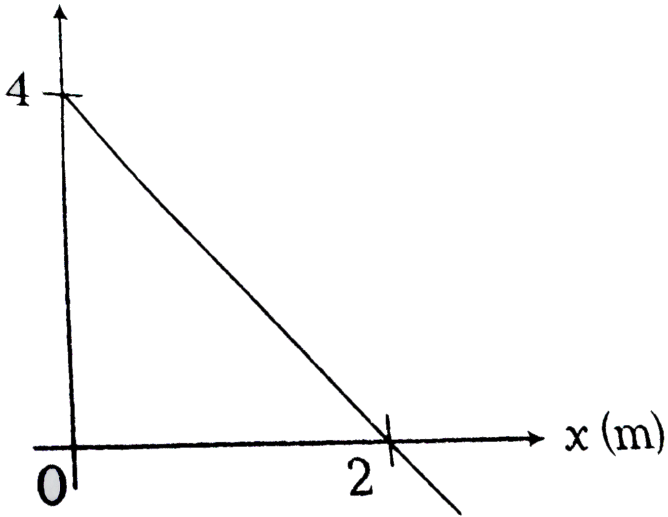
A. $a^2 = x + 3$

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 $15 km/h.$ 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. $\dfrac{15\sqrt{3}}{2} k \dfrac{m}{h}$

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

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

Answer: A

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

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

62. A ball is dropped vertically from a height d above the ground . It hits the ground and bounces up vertically to a height $(d)/(2)$. $Neg \le ct \in g \subset sequentmotion$ and $air resis \tan ce, its velocity$ $v varies with the height h$` above the ground as

(a)

A.

(b)

B.

(c)

C.

(d)

D.
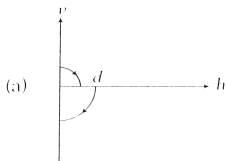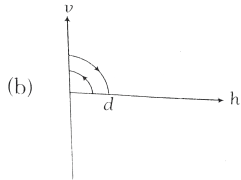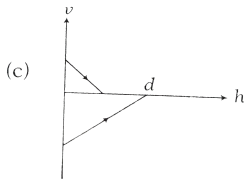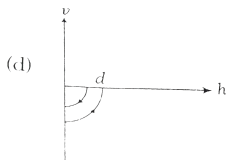
Answer: A

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

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

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

D. None of these

Answer: C

64. A boat which has a speed of $5km$ per hour in still water crosses a river of width 1 km along the shortest possible path in fifteen minutes. The velocity of the river water in km per hour is :-

A. 1 km/h

B. 3 km/h

C. 4 km/h

D. 5 km/h

Answer: B

65. Two car A and B travelling in the same direction with velocities v_1 and $v_2(v_1 > v_2)$. When the car A is at a distance d ahead of the car B, the driver of the car A applied the brake producing a uniform retardation a. There wil be no collision when.

A. $d < \dfrac{(v_1 - v_2)^2}{2a}$

B. $d < \dfrac{v_1^2 - v_2^2}{2a}$

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

D. $d > \dfrac{v_1^2 - v_2^2}{2a}$

Answer: C

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 ball is thrown vertically up with a velocity u. It passes three points A, B and C in its upward journey with velocities $\dfrac{u}{2}, \dfrac{u}{3}$ and $\dfrac{u}{4}$, respectively. Find $\dfrac{AB}{BC}$.

A. 1

B. 2

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

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

Answer: D

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

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

A. $\dfrac{1}{2} f_0 T$

B. $f_0 T$

C. $\dfrac{1}{2} f_0 T^2$

D. $f_0 T^{-2}$

Answer: A

69. The position x of a particle with respect to time t along the x-axis is given by $x = 9t^2 - t^3$ where x is in meter and t in second. What will be the position of this particle when it achieves maximum speed along the positive x direction

A. 24 m

B. 32 m

C. 54 m

D. 81 m

Answer: C

70. Two particles P and Q simultaneously start moving from point A with velocities $15m/s$ and $20m/s$ respectively. The two particles move with

acceleration equal in magnitude but opposite in direction. When P overtakes Q at point B then its velocity is $30m/s$, the velocity of Q at point B will be

A. $30ms^{-1}$

B. $5ms^{-1}$

C. $20ms^{-1}$

D. $15ms^{-1}$

Answer: B

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71. A body falling from a high mimaret travels 40 meters in the last 2 seconds of its fall to ground. Height of minaret in meters is (take $g = 10\frac{m}{s^2}$)

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 $\dfrac{S_n}{S_{n+1}}$ is:

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

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

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

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

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

A. t

B. $t^{1/2}$

C. t^3

D. t^2

Answer: D

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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 $(g = 9.8m/s^2)$

The bolt's free fall time is

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

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

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

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

Answer: D

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B Meical Entrance Special Format Questions Assertion And Reason

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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

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

4. Assertion : In the equation, $s = u + at - \dfrac{1}{2}a$ 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 $v_{av} = \dfrac{r_1 - r_2}{t}$.

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

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

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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

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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

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 $21.5m$.

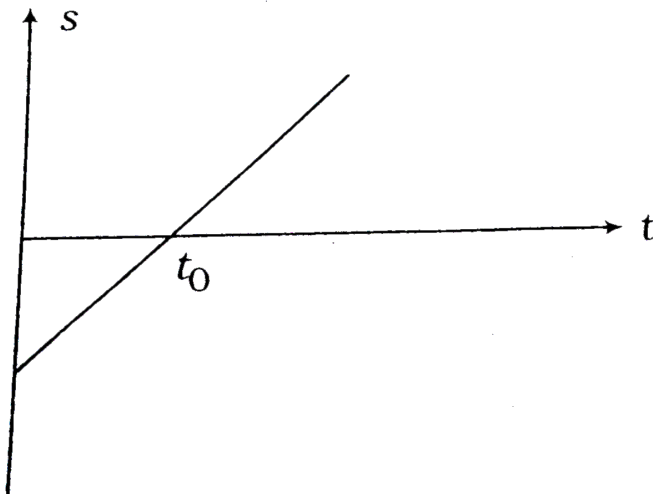Reason : The equation $v = u + at$ can be applied to obtain v if a is constant.

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

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.

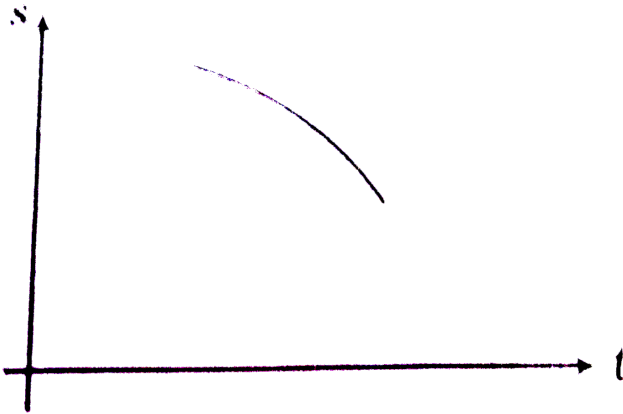Reason : Relative velocity between them is zero as their speeds are same.

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

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

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

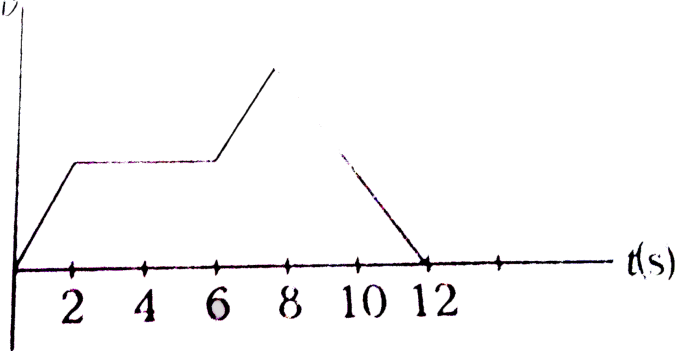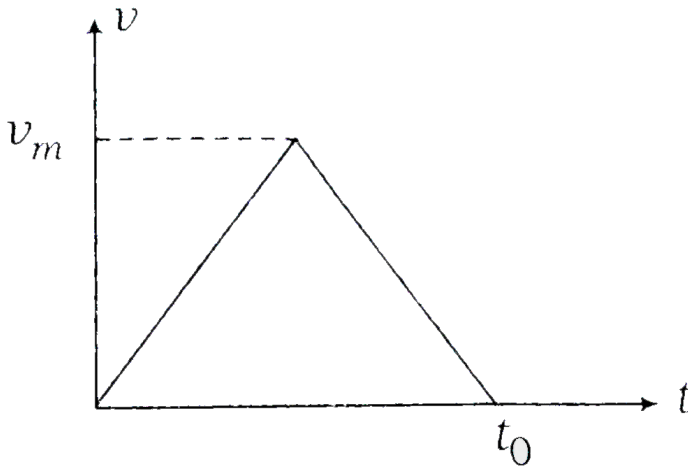Reason : Average velocity in the given interval is $\frac{1}{2}v_m$.

    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

1. Match the following columns.

	Column I		Column II
(A)	d v/dt	(p)	Acceleration
(B)	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

2. In the s-t equation $(s = 10 + 20t - 5t^2)$ 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

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:
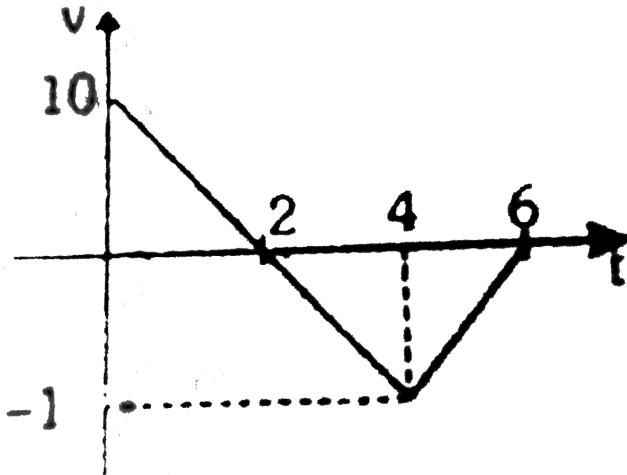
	Column I		Column II
(A)	Change in velocity	(p)	$-5/3SI$unit
(B)	Average acceleration	(q)	$-20SI$unit
(C)	Total displacement	(r)	$-10SI$unit
(D)	Acceleration ay t=3s	(s)	$-5SI$unit

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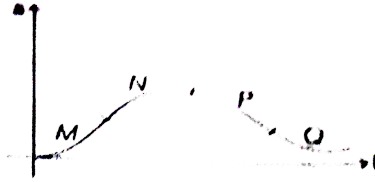
Table-1		Table-2	
(A) M		(P)	A^{-1}
(B) N		(Q)	R^{-1}
(C) P		(R)	A
(D)		(S)	R

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

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

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

Answer: B

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

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

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 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
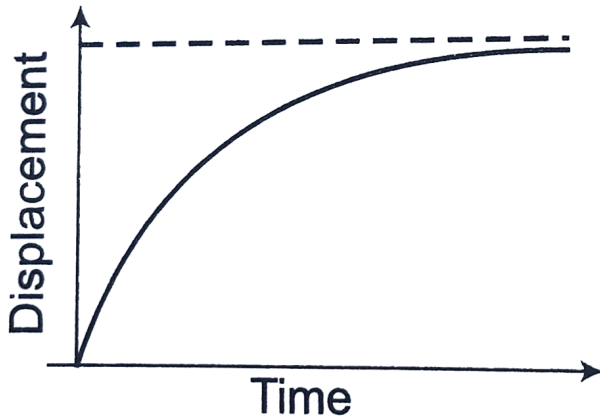
C. 7 u

D. 8 u

Answer: C

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

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
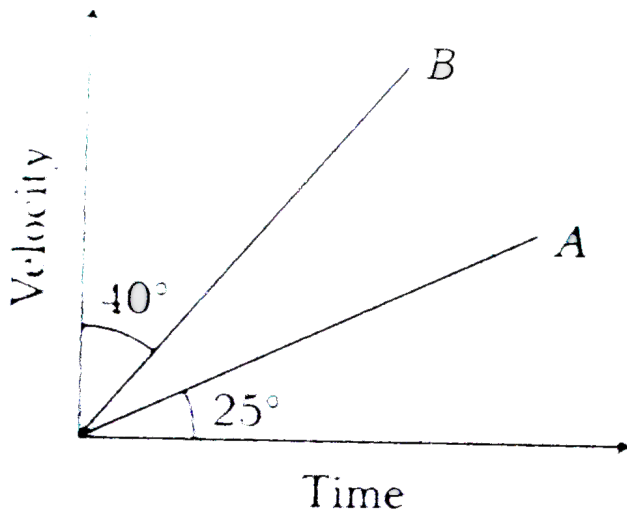
    A. 200 m

    B. 300 m

    C. 500 m

    D. 250 m

Answer: D

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. $\sin 25°$ to $\sin 50°$

B. $\tan 25°$ to $\tan 40°$

C. $\cos 25°$ to $\cos 50°$

D. $\tan 25°$ to $\tan 50°$

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 $\left(\overrightarrow{V}_{av}\right)$ from $t = 0$ to $t = 5s$ is

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

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

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

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

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

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 streaing 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

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

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. $\dfrac{v}{2}$

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

C. v

D. $2v$

Answer: C

---

17. A motorcyclist 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

---

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

---

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. $h_1 = \dfrac{h_2}{3} = \dfrac{h_3}{5}$

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

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

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

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 $10\sec$ the velocity changes to $5m/s$ northwards. The average acceleration in this time is.

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

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

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

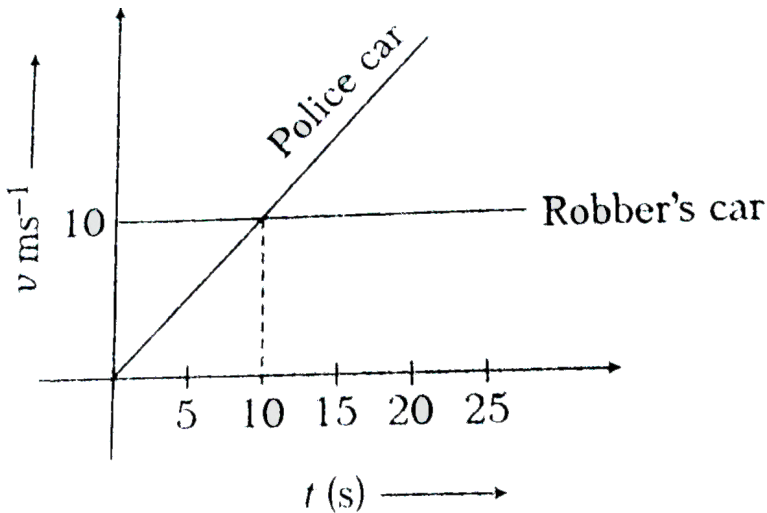D. $\sqrt{2}m/s^2$ (North-East)

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

represent the positions of particles 1 and 2, respectiely, as function of

time t, $r_1(t)$ and $r_2(t)$ are in metre 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 metre 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. b_0

B. b_1

C. b_2

D. $2b_2$

Answer: D

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