PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

GENERAL KINEMATICS AND MOTION IN ONE DIMENSION

General Kinematics

1. The definition of average velocity is.

A. the average acceleration multiplied by the time.

B. distance travelled divided by the time

C. $\frac{1}{2}$ (final velocity + initial velocity)

D. displacemnt divided by the time

Answer: D

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2. A particle moves along a straight line path. After some time it comes to rest. The motion is with constant acceleration whose direction with respect to the direction of velocity is :

A. positive throughout motion

B. negative throughout motion

C. first positive then negative

D. first negative then positive

Answer: B

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3. A particle moves with a uniform velocity. Which of the following statements about the motion of particle is correct ?

A. Its acceleration is zero

B. Its speed is zero

C. Its speed may be variable

D. Its acceleration is opposite to the velocity

Answer: A

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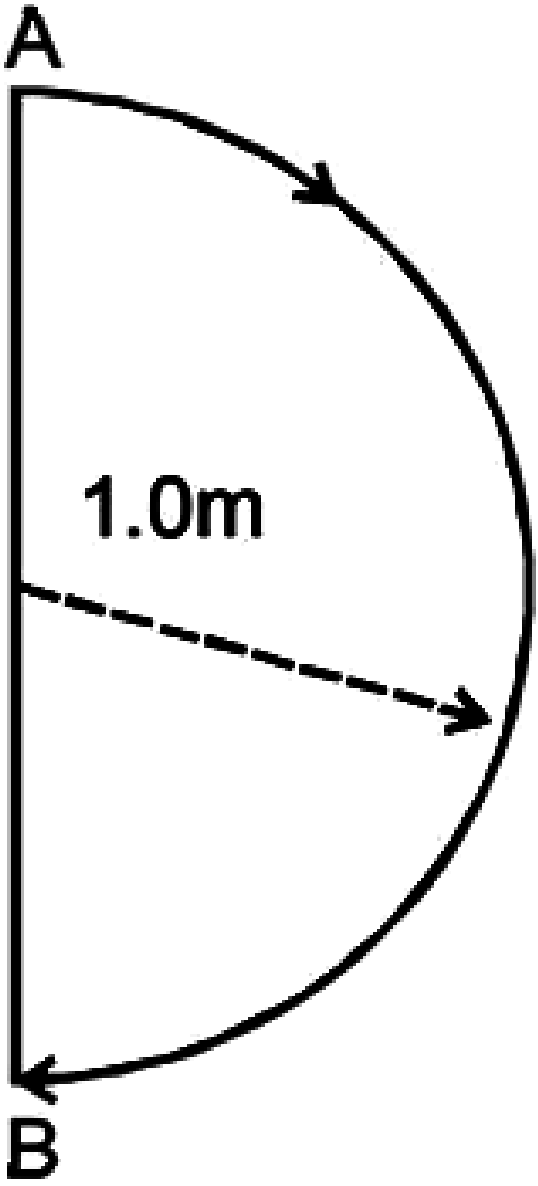
4. In $1.0s$, a particle goes from point A to point B , moving in a semicircle of radius $1.0m$ (see figure). The magnitude of the average

velocity



A. $3.14m/s$

B. $2.0m/s$

C. $1.0 m / s$

D. Zero

Answer: B

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5. The ratio of the numerical values of the average velocity and average speed of a body is always.

A. Unity

B. Unity or less

C. Unity or more

D. Less than unity

Answer: B

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6. 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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7. 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 $-v_0T < x < v_0T$

C. The acceleration is always a non-negative number

D. The motion has no turning points

Answer: B

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8. The displacement of a particle moving along x-axis is given by :

$x = a + bt + ct^2$

The acceleration of the particle is.

A. b

B. c

C. $b + c$

D. 2 c

Answer: D

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9. A particle moves along a straight line such that its displacement at any time t is given by $s = t^3 - 6t^2 + 3t + 4$ m. Find the velocity when the acceleration is zero.

A. $3ms^{-1}$

B. $-12ms^{-1}$

C. $42ms^{-1}$

D. $-9ms^{-1}$

Answer: D

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

A. $2\alpha v^3$

B. $2\beta v^3$

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

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

Answer: A

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11. A particle travels first half of the total distance with constant speed v_1 and second half with constant speed v_2. Find the average speed during the complete journey.

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

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

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

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

Answer: C

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12. A car completes its journey in a straight line in three equal parts with speeds v_1, v_2 and v_3 respectively. The average speed v is given by :

A. $\frac{v_1 + v_2 + v_3}{3}$

B. $3\sqrt{v_1 v_2 v_3}$

C. $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

D. $\frac{3}{v} = \frac{1}{v_1} + \frac{1}{v_2} + \frac{1}{v_3}$

Answer: D

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13. A man walks $8m$ towards east and $6m$ towards north. The magnitude of displacement is :

A. 14 m

B. 2 m

C. 10 m

D. $\left(8^2+6^2\right)m$

Answer: C

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14. The position vector of a particle is determined by the expression $\vec{r}=3t^2\hat{i}+4t^2\hat{j}+7\hat{k}$. The displacement travelled in first 10 seconds is :

A. 100 m

B. 150 m

C. 300 m

D. 500 m

Answer: D

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15. A frog walking in a narrow lane takes 5 leaps forward and 3 leaps backward, then again 5 leaps forward and 3 leaps backward, and so on. Each leap is $1m$ long and requires $1s$. Determine how long the frog takes to fall in a pit $13m$ away from the starting point.

A. 35 s

B. 36 s

C. 37 s

D. 38 s

Answer: C

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

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

A. $4.0m/s$

B. $5.0m/s$

C. $5.5m/s$

D. $4.8m/s$

Answer: A

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17. A car covers $\frac{1}{3}$ part of total distance with a speed of $20kmhr^{-1}$ and second $\frac{1}{3}$ part with a speed of $30kmhr^{-1}$ and the last $\frac{1}{3}$ part with a speed of $60kmhr^{-1}$. The average speed of the car is.

A. $55kmhr^{-1}$

B. $30kmhr^{-1}$

C. $45 km hr^{-1}$

D. $37.3 km hr^{-1}$

Answer: B

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18. Two particles are $100m$ apart and start approaching each other with constant velocities of $2m/s$ and $3m/s$. The particles will meet after.

A. 20 s

B. 50 s

C. 33.3 s

D. 15 s

Answer: A

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19. In the above question what are the distance travelled by each of them till they meet ?

A. 30 m and 70 m

B. 40 m and 60 m

C. 50 m by each

D. 45 m and 55 m

Answer: B

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20. Two cars starts out simultaneously from a point in the same direction, one of them going at a speed of $50kmhr^{-1}$ and the other at $40kmhr^{-1}$. In half an hour a third car starts out from the same point and overtakes the first car 1.5 hours after catching up with the second car. The speed of the third car is.

A. $55kmhr^{-1}$

B. $60kmhr^{-1}$

C. $72kmhr^{-1}$

D. $90kmhr^{-1}$

Answer: B

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21. A radius vector of point A relative to the origin varies with time t as $\vec{r} = at\hat{i} - bt^2\hat{j}$ where a and b are constant. The equation of point's trajectory is.

A. $y = -\frac{b}{a^2}x^2$

B. $y = \frac{b}{a^2}x^2$

C. $y = -\frac{2b}{a^2}x^2$

D. $y = \frac{2b}{a^2}x^2$

Answer: A

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22. An engineer works at a factory out os town. A car is sent for him from the factory every day and arrives at the railway station at the same time as the train. One day the engineer arrived at the station one our before his usual time and without waiting for the car, started walking towards factory. On his way he met the car and reached his factory 10 minutes before the usual time. For how much time (in minutes) did the engineer walk before the met the car ? (The car moves with the same speed everyday.)

A. 105 min

B. 55 min

C. 75 min

D. 45 min

Answer: B

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23. A man moves on his motorbike with $54km/h$ and then takes a U-turn and continues to move with same velocity The time of U-turn is $10s$. Find the magnitude of average acceleration during U-turn.

A. 0

B. $3ms^{-2}$

C. $1.5\sqrt{2}ms^{-2}$

D. none of these

Answer: B

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24. If $v = x^2 - 5x + 4$, find the acceleration of the particle when velocity of the particle is zero.

A. zero

B. 2

C. 3

D. none of these

Answer: A

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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. Zero

B. $\frac{1}{\sqrt{2}}m/s^2$ toward north-west

C. $\frac{1}{\sqrt{2}} m/s^2$ toward north-east

D. $\frac{1}{2} m/s^2$ toward north-west

Answer: B

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26. A particle is moving eastwards with a velocity of $5m/s$. In $10s$ the velocity changes to $5m/s$ northwards. The average acceleration in this time is

A. Zero

B. $\frac{1}{\sqrt{2}} m/s^2 N - W$

C. $\frac{1}{\sqrt{2}} m/s^2 N - E$

D. $\frac{1}{\sqrt{2}} m/s^2 S - W$

Answer: B

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27. A particle moves along x axis in such a way that its coordinate x varies with time t according to the equation $x = A_0 - A_1 t + A_2 t^2$. The initial velocity of the particle is.

A. A_0

B. A_1

C. A_2

D. $-A_1$

Answer: D

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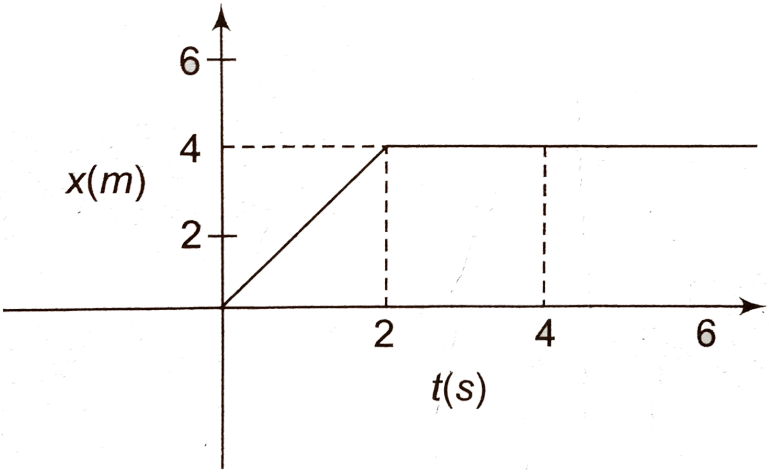
28. Mr. Verma drives his car at uniform speed from bottom of a mountain to the top in 30 minutes along a helical path as shown.

At the beginning the speedometer of his car shows $6225km$, while on reaching the top it reads $6285km$. (Take upward as positive y-axis and

positive x-axis towards right) The total distance covered is.



A. 30 km

B. 20 km

C. 60 km

D. cannot be determined

Answer: C

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29. In previous question, his displacement vector during the journey is :

A. $\left(-3\hat{i}+4\hat{j}\right)km$

B. 3 km

C. 5 km

D. none of these

Answer: A

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30. In $Q.28$, the average velocity during the journey is :

A. $\left(-6\hat{i}+9\hat{j}\right)km/h.$

B. $\left(-6\hat{i}+8\hat{j}\right)km/h$

C. $\left(-9\hat{i}+12\hat{j}\right)km/h$

D. None of these

Answer: B

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Motion With Constant Acceleration

1. If a body starts from rest, the time in which it covers a particular displacement with uniform acceleration is :

A. inversely alphaortional to the square root of the displacement

B. inversely alphaortional to the dispalcement

C. directly alphaortional to the displacement

D. directly alphaortional to the square root of the displacement

Answer: D

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2. Average velocity of a particle moving in a straight line, with constant acceleration a and initial velocity u in first t seconds is.

A. $u + \frac{1}{2}at$

B. $u + at$

C. $\frac{u + at}{2}$

D. $\frac{u}{2}$

Answer: A

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3. Speeds of two identical cars are u and 4u at at specific instant. The ratio of the respective distances in which the two cars are stopped from that instant is

A. $1:1$

B. $1:4$

C. $1:8$

D. $1:16$

Answer: D

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4. A car , moving with a speed of $50km/hr$, can be stopped by brakes after at least $6m$. If the same car is moving at a speed of $100km/hr$, the minimum stopping distance is

A. 6 m

B. 12 m

C. 18 m

D. 24 m

Answer: D

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5. An elevator is accelerating upwards with a constant acceleration a ms^{-2}. If a coin is dropped in it by a passenger, then.

A. the coin starts to fall downwards instantaneously as observed by the passenger.

B. the coin starts to fall downwards instantaneously as observed by a ground observer.

C. first, coin continues to move up with same acceleration of a ms^{-2} for some time and then starts falling with gravitational acceleration as observed by a ground observer.

D. None of these

Answer: A

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6. A particle starting from rest has a constant acceleration of $4m/s^2$ for 4 s. It then retards uniformly for next 8 s and comes to rest. Find during the motion of particle (a) average acceleration (b) average speed and (c) average velocity.

A. $4m/s^2$

B. zero

C. $8m/s^2$

D. $-4m/s^2$

Answer: B

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7. In previous problem, average speed during the motion of the particle is.

A. $8m/s$

B. zero

C. $4m/s$

D. $16m/s$

Answer: A

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8. In $Q.36$, average velocity during the motion of the particle is.

A. zero

B. $8m/s$

C. $2m/s$

D. $4m/s$

Answer: B

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9. When a body is acclerated : (i) its velocity always changes (ii) its speed always changes (iii) its direction always changes (iv) its speed may or may not change.

Which of the following is correct ?

A. (i) and (ii)

B. (i) and (iv)

C. (i) only

D. (ii) and (iii)

Answer: B

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10. Two cars start off to race with velocities $4m/s$ and $2m/s$ and travel in straight line with uniform accelerations $1m/s^2$ respectively. If they reach the final point at the same instant, then the length of the path is.

A. 30 m

B. 32 m

C. 20 m

D. 24 m

Answer: D

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11. A bus starts moving with acceleration $2ms^{-2}$. A cyclist $96m$ behind the bus starts simultaneously towards the bus at a constant speed of $20m/s$. After what time will he be able to overtake the bus ?

A. 4 s

B. 8 s

C. 12 s

D. 16 s

Answer: B

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12. In the previous problem, after some time the bus will be left behind. If the bus continues moving with the same acceleration, after what time from the beginning, the bus will overtake the cyclist ?

A. 10 s

B. 12 s

C. 14 s

D. 16 s

Answer: B

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

A. $48km/h$

B. $52km/h$

C. $54km/h$

D. $56km/h$

Answer: C

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14. 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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15. In the previous problem, the distance covered by the second body when they meet is :

A. 8 m

B. 16 m

C. 24 m

D. 32 m

Answer: D

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16. A police party is moving in a jeep at a constant speed v. They saw a thief at a distance x on a motorcycle which is at rest. The moment the police saw the thief, the thief started at constant acceleration a. Which of the following relations is true if the police is able to catch the thief?

A. $v^2 \leq \alpha x$

B. $v^2 \leq 2\alpha x$

C. $v^2 \geq 2\alpha x$

D. $v^2 \geq \alpha x$

Answer: C

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17. A moving car possesses average velocities of $5ms^{-1}, 10ms^{-1}$ and $15ms^{-1}$ in the first, second and third seconds

respectively. What is the total distance covered by the car in these three seconds ?

A. 15 m

B. 30 m

C. 55 m

D. None of these

Answer: B

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18. For a particle under going rectilinear motion with uniform acceleration, the magnitude of displacement is one third the distance covered in some time interval. The magnitude of final velocity is less than magnitude of initial velocity for this time interval. Then the ratio of initial speed velocity to the final speed for this time interval is :

A. $\sqrt{2}$

B. 2

C. $\sqrt{3}$

D. 3

Answer: A

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19. A body starts with some initial velocity along a straight line. After $3s$ it is found to be a distance of $15m$ from the starting point. At $4s$ it is at starting point. What is the initial velocity of the body ? (Assume constant acceleration).

A. $20ms^{-1}$

B. $10ms^{-1}$

C. $5ms^{-1}$

D. $15ms^{-1}$

Answer: A

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20. A car of mass m, travelling at speed v, stops in time t when maximum braking force is applied. Assuming the breaking force is same for both cases, what time would be required to stop a car of mass $2m$ travelling at speed v ?

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

B. t

C. $\sqrt{2}t$

D. $2t$

Answer: D

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21. A particle is moving in a straight line with initial velocity u and uniform acceleration f. If the sum of the distances travelled in t^{th} and $(t+1)^{th}$ seconds is $100cm$, then its velocity after t seconds, in cm/s, is.

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22. A body starting from rest moving with uniform acceleration has a displacement of $16m$ in first 4 seconds and $9m$ in first 3 seconds. The acceleration of the body is :

A. $1ms^{-2}$

B. $2ms^{-2}$

C. $3ms^{-2}$

D. $4ms^{-2}$

Answer: B

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23. A particle has an initial velocity of $5.5ms^{-1}$ due east and a constant acceleration of $1ms^{-2}$ due west. The distance covered by the particle in sixth second of its motion is.

A. 0

B. 0.25 m

C. 0.5 m

D. 0.75 m

Answer: B

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24. A body starts from rest and moves with constant acceleration. The ratio of distance covered by the body in nth second to that covered in n second is.

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

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

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

D. $\frac{2n-1}{2n^2}$

Answer: B

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25. A particle moves with uniform acceleration along a straight line AB. Its velocities at A and B are $2m/s$ and $14m/s$ respectively. M is the mid-point of AB. The particle takes t_1 seconds to go from A to M and t_2 seconds to go from M to B. Then $t_2 : t_1$ is.

A. $1:1$

B. $2:1$

C. $1:2$

D. $3:1$

Answer: C

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26. 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 5^{th} 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: A

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27. A student is standing at a distance of 50 metres from a bus. As soon as the bus begins its motion (starts moving away from student) with an acceleration of $1ms^{-2}$, the student starts running towards the bus with a uniform velocity u . Assuming the motion to be along a straight road. The minimum value of u, so that the student is able to catch the bus is :

A. $5ms^{-1}$

B. $8ms^{-1}$

C. $10m/s^{-1}$

D. $12m/s^{-1}$

Answer: C

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28. A particle is moving along a straight line with constant acceleration. At the end of tenth second its velocity becomes $20m/s$ and in tenth

second it travels a distance of $10m$. Then the acceleration of the particle will be.

A. $10m/s^2$

B. $20m/s^2$

C. $\frac{1}{5}m/s^2$

D. $3.8m/s^2$

Answer: B

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29. A bullet fired into a fixed target loses half of its velocity after penetrating 3cm. How much further it will penetrate before coming to rest assuming that it faces constant resistance to motion?

A. 1.5 cm

B. 1.0 cm

C. 3.0 cm

D. 2.0 cm

Answer: B

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

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

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

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

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

Answer: D

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Motion Under Gravity

1. A ball is thrown straight up in the air. For which situation are both the instantaneous velocity and the acceleration zero ?

A. one the way up

B. at the top of its flight path

C. halfway up and halfway down

D. none of the above

Answer: D

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2. A body is dropped from a certain height.

A. the time taken to travel first half of the height is greater than that for second half.

B. time time taken to travel first half of the height is less than that for second half

C. the time taken to travel first half of the height is equal to that for second half

D. any one of the above three situations may be correct depending upon the value of height.

Answer: A

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3. A ball is thrown vertically upwards under the influence of gravity. Suppose observer A films this motion and play the tape backwards (so the tape begins with the ball at its highest point and ends with it reaching the point from which it was released), and another observer B

observes the motion of the ball from a frame of reference moving at constant velocity which is equal to the initial velocity of the ball. The ball has a downward acceleration according to obsever.

A. A and B

B. only A

C. only B

D. neither

Answer: A

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4. Two balls A and B of same masses are thrown from the top of the building A. Thrown upward with velocity V and B, thrown downward with velocity V, then

A. Velocity of A is more than B at the ground

B. Velocity of B is more than A at the ground

C. Both A and B strike the ground with same velocity

D. None of these

Answer: C

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5. You drop a ball from a window located on an upper floor of a building. It strikes the ground with speed v. You now repeat the drop, but your friend down on the ground throws another ball upward at the same speed v, releasing her ball at the same moment that you drop yours from the window. At some location, the balls pass each other. This location is.

A. at the halfway point between window and ground,

B. above this point,

C. below this point

D. cannot be determined

Answer: B

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6. A pebble is released from rest at a certain height and falls freely, reaching an impact speed of $4m/s$ at the floor. Next, the pebble is thrown down with an initial speed of $3m/s$ from the same height. What is its speed at the floor ?

A. $4m/s$

B. $5m/s$

C. $6m/s$

D. $7m/s$

Answer: B

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7. A pebble is dropped from rest from the top of a till cliff and falls $4.9m$ after $1.0s$ has elapsed. How much farther does it drop in the next $2.0s$? $(\text{Take} g - 9.8m / s^2)$.

A. 9.8

B. 19.6 m

C. 39 m

D. 44 m

Answer: C

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8. A ball is released from the top of a tower of height h meters . It takes T seconds to reach the ground . What is the position of the ball at $\frac{T}{3}$ second

A. $h / 9$ metres from the ground

B. $7h/9$ metres from the ground

C. $8h/9$ metres from the ground

D. $17h/18$ metres from the ground

Answer: C

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9. A ball is upward with such a velocity v that it returns to the thrower after after $3s$. Take $g = 10ms^{-2}$. Find the value of v.

A. 15 m//s

B. 20 m//s

C. 10 m//s

D. 5 m//s

Answer: A

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10. A stone is thrown upwards with a velocity $50ms^{-1}$. Another stone is simultaneously thrown downwards from the same location with a velocity $50ms^{-1}$. When the first stone is at the highest point, the velocity of the second stone is $\left(\text{Take} g = 10^{-2}\right)$:

A. Zero

B. $50ms^{-1}$

C. $100ms^{-1}$

D. $150ms^{-1}$

Answer: C

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11. An object is dropped from a height h. Then the distance travelled in times t, $2t$, $3t$ are in the ratio.

A. $1:2:3$

B. $1:4:9$

C. $1:3:5$

D. $1:9:5$

Answer: B

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12. A body is thrown vertically upward with velocity u. The ratio of times at which it is at particular height h is $1:2$. What is the maximum height reached by the body above point of projection ?

A. $(9/4)h$

B. $(4/3)h$

C. $(9/8)h$

D. none of these

Answer: C

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13. A body is dropped from a height h. If t_1 and t_2 be the times in covering first half and the next distances respectively, then the relation between t_1 and t_2 is.

A. $t_1 = t_2$

B. $t_1 = 2t_2$

C. $t_1 = 3t_2$

D. $t_1 = \dfrac{t_2}{\left(\sqrt{2}-1\right)}$

Answer: D

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14. A body projected vertically upwards with a given velocity. The ratio of the times taken to cover the first one fourth and the last one fourth of the ascent to the highest point is.

A. $1:\left(2-\sqrt{3}\right)$

B. $2:\left(2-\sqrt{3}\right)$

C. $\left(2-\sqrt{3}\right):1$

D. $\left(2-\sqrt{3}\right):2$

Answer: C

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15. A man in a balloon rising vertically with an acceleration of $5ms^{-2}$ releases a ball 2 second after the balloon is let go from the ground. The greatest height above the ground reached by the ball in meter is : $\left(g=10ms^{-2}\right)$.

A. 20

B. 15

C. 30

D. 5

Answer: B

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16. A ball projected upwards from the foot of a tower. The ball crosses the top of the tower twice after an interval of $6s$ and the ball reaches the ground after $12s$. The height of the tower is $\left(g = 10m/s^2\right)$:

A. 120 m

B. 135 m

C. 175 m

D. 180 m

Answer: B

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17. From the top of the tower of height $400m$, a ball is dropped by a man, simultaneously from the base of the tower, another ball is thrown up with a velocity $50m/s$. At what distance will they meet from the base of the tower ?

A. 100 m

B. 320 m

C. 80 m

D. 240 m

Answer: C

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18. A stone falls freely from rest from aheight h and it travels a distance $9h/25$ in the last second. The value of h is

A. 100 m

B. 122.5 m

C. 145 m

D. 167.5 m

Answer: B

Watch Video Solution

19. A stone is thrown upwards from the top of a tower with some initial speed and it reaches the ground in 16 seconds. Now it is thrown with the same initial speed downward and it reaches the ground in $9\,\text{sec}$. In how much time will it reach the ground if the stone is allowed to fall freely under gravity from the same place ?

A. 25 s

B. 12.5 s

C. 7 s

D. 12 s

Answer: D

Watch Video Solution

20. A body is projected vertically upwards with some velocity u. It is at the same point at $t = 6s$ as was at $t = 4s$. Find the value of u.

A. $30m / s$

B. $40m / s$

C. $20m / s$

D. $50m / s$

Answer: D

Watch Video Solution

21. A balloon starts rising from ground with an acceleration of $1.25m/\sec^2$. A 8 seconds a stone is released from the balloon. The maximum height from the ground reached by stone will be.

A. 40 m

B. 50 m

C. 45 m

D. 55 m

Answer: C

Watch Video Solution

22. A ball is thrown vertically upwards from the ground. It crosses a point at the height of 25 m twice at an interval of 4 secs. The ball was thrown with the velocity of

A. $20m/\sec$

B. $25m/\sec$

C. $30m/\sec$

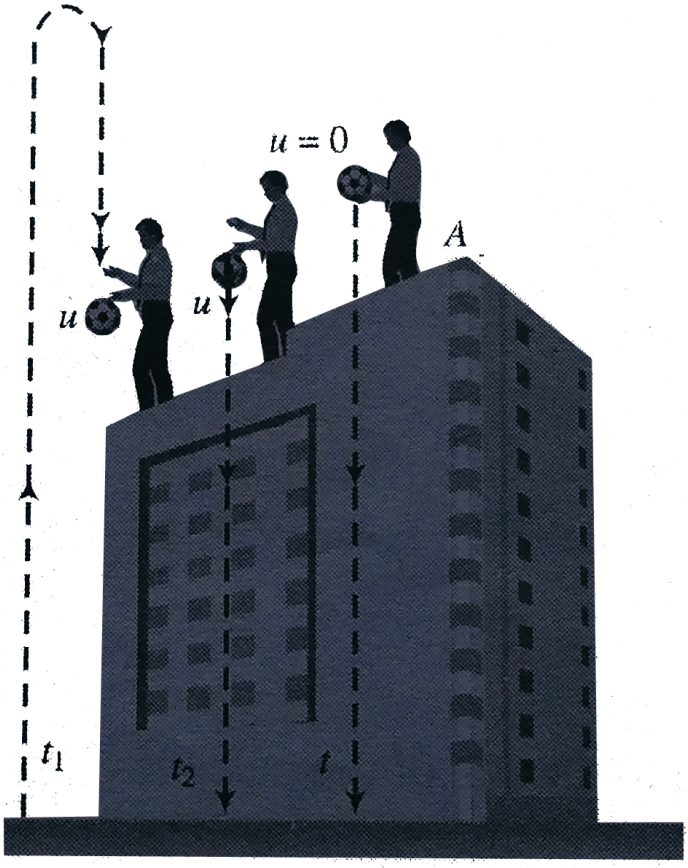
D. $35m/\sec$

Answer: C

Watch Video Solution

23. 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. $\sqrt{t_1/t_2}$

B. $\sqrt{t_2/t_1}$

C. $\sqrt{t_1 t_2}$

D. $t_1 t_2$

Answer: C

Watch Video Solution

24. From a tower of height H, a particle is thrown vertically upwards with a speed u . The time taken by the particle , to hit the ground , is n times that taken by it to reach the highest point of its path. The relative between H, u and n is :

A. $2gH = nu^2(n-2)$

B. $gH = (n-2)u^2$

C. $2gH = n^2u^2$

D. $gH = (n-2)2u^2$

Answer: A

Watch Video Solution

25. A particle is dropped from rest from a large height Assume g to be constant throughout the motion. The time taken by it to fall through

successive distance of $1m$ each will be :

A. all equal, being equal to $\sqrt{2/g}$ second

B. in the ratio of the square roots of the integers $1, 2, 3, ...$

C. in the ratio of the difference in the square roots of the integers,

i.e.,

$\sqrt{1}, (\sqrt{2}-\sqrt{1}), (\sqrt{3}-\sqrt{2}), (\sqrt{4}-\sqrt{3}), ...$

D. in the ratio of the reciprocals of the square roots of the integers,

i.e., $\frac{1}{\sqrt{1}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}, ...$

Answer: C

Watch Video Solution

26. A body falls freely from rest. It covers as much distance in the last second of its motion as covered in the first three seconds. The body has fallen for a time of :

A. 3 s

B. 5 s

C. 7 s

D. 9 s

Answer: B

Watch Video Solution

27. A body is dropped from a height of $40m$. After it crosses half distance, the acceleration due to gravity ceases to act. The body will hit ground with velocity $\left(\text{Take} g = 10m/s^2\right)$:

A. $20m/s$

B. $10m/s$

C. $2m/s$

D. $15m/s$

Answer: A

Watch Video Solution

28. A ball is thrown from the top of a tower in vertically upward direction. Velocity at a point h m below the point of projection is twice of the velocity at a point h m above the point of projection. Find the maximum height reached by the ball above the top of tower.

A. 2 h

B. 3 h

C. $(5/3)h$

D. $(4/3)h$

Answer: C

Watch Video Solution

29. A juggler keeps on moving four balls in the air throwing the balls after regular intervals. When one ball leaves his hand $\left(\text{speed} = 20ms^{-1}\right)$ the positions of other balls (height in m) $\left(\text{Take} g = 10ms^{-2}\right)$.

A. $10, 20, 10$

B. $15, 20, 15$

C. $5, 15, 20$

D. $5, 10, 20$

Answer: B

Watch Video Solution

30. A body is allowed to fall from a height of $100m$. If the time taken for the first $50m$ is t_1 and for the remaining $50m$ is t_2 then :

A. $t_1 = t_2$

B. $t_1 > t_2$

C. $t_1 < t_2$

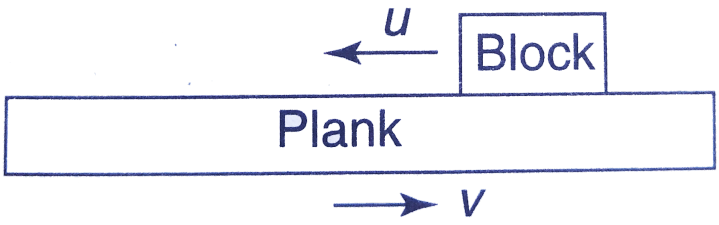
D. depends upon the mass.

Answer: B

Watch Video Solution

Relative Motion In One Dimension

1. A plank is moving on ground with a velocity v and a block is moving on the plank with respect to it with a velocity u as shown in figure. What is the velocity of block with respect to ground ?



A. $v - u$ towards right

B. $v - u$ towards left

C. u towards right

D. none of these

Answer: A

Watch Video Solution

2. An elevator, in which a man is standing, is moving upward with a constant acceleration of $2m/s^2$. At some instant when speed of elevator is $10m/s$, the man drops a coin from a height of $1.5m$. Find the time taken by the coin to reach the floor.

A. $\frac{1}{\sqrt{3}}\text{sec}$

B. $\frac{1}{2}\text{sec}$

C. $\frac{1}{\sqrt{2}}\text{sec}$

D. $1\,\text{sec}$

Answer: B

Watch Video Solution

3. Suppose you are riding a bike with a speed of $20m/s$ due east relative to a person A who is walking on the ground towards east. If your friend B walking on the ground due west measures your speed as $30m/s$, find the relative velocity between two reference frames A and B.

A. Velocity of A w.r.t B is $5m/s$ towards east

B. Velocity of A w.r.t B is $5m/s$ towards west

C. Velocity of A w.r.t B is $10m/s$ towards east

D. Velocity of A w.r.t B is $10m/s$ towards west

Answer: C

Watch Video Solution

4. A train is moving eastwards with a velocity of $10ms^{-1}$. On a parallel truck another train passes with a velocity of $15ms^{-1}$ eastwards, To the passengers in the second train, the first train will appear to be moving with a velocity.

A. $5ms^{-1}$ westwards

B. $5ms^{-1}$ eastwards

C. $20ms^{-1}$ westwards

D. $25ms^{-1}$ eastwards

Answer: A

Watch Video Solution

5. A man swims to and fro along the bank of a river with a velocity v relative to water. If the velocity of flow is u, the average speed of the man (for to and fro motion) is :

A. 0

B. $\sqrt{uv}$

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

D. $\frac{v^2-u^2}{v}$

Answer: D

Watch Video Solution

6. Refer $Q.95$. If the man takes t_1 and t_2 to move to and fro journey respectively, the time taken by him to go downstream (while the man does not swim) is :

A. $\frac{2t_1t_2}{t_1+t_2}$

B. $\sqrt{t_1^2+t_2^2}$

C. $\sqrt{t_1t_2}$

D. $\frac{2t_1t_2}{t_1-t_2}$

Answer: D

Watch Video Solution

7. Referring to $Q.95$, the time taken by the man in moving to and fro through equal distance when there is no flow of water is :

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

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

C. $\frac{4t_1 t_2}{t_1 + t_2}$

D. $\sqrt{t_1 t_2}$

Answer: C

Watch Video Solution

8. When we release a stone from a balloon which ascends with a velocity v and acceleration a, the velocity and acceleration of the stone just after

release are :

A. $v \uparrow , (g + a) \downarrow$

B. $v \uparrow , (g - a) \downarrow$

C. $v \uparrow , g \downarrow$

D. $v \uparrow , (a - g) \uparrow$

Answer: C

Watch Video Solution

9. Two trains, each $50m$ long, are travelling in opposite directions with velocities $10ms^{-1}$ and $15ms^{-1}$. The time of their crossing each other is.

A. 2 s

B. 4 s

C. $2\sqrt{3}$

D. $4\sqrt{3}$

Answer: B

Watch Video Solution

10. A person A is sitting in one train while another person B is in the second train. The trains are moving with velocities $60m/s$ and $40m/s$, respectively, in the same direction. Then the velocity of B relative to A will be

A. $100m/s$ in the direction of trains

B. $20m/s$ in the direction of trains

C. $100m/s$ in the direction opposite to that of trains

D. $20m/s$ in the direction opposite to that of the trains

Answer: D

Watch Video Solution

11. Imagine yourself standing in an elevator while is moving with an upward acceleration $a = 2m/s^2$. A coin is dropped from rest from the roof of the elevator, relative to you. The roof to floor height of the elevator is $1.5m$. $\left(\text{Take} g = 10m/s^2\right)$. Find the velocity of the coin relative to you when it strikes the base of the elevator.

A. $3m/s$

B. $6m/s$

C. $2m/s$

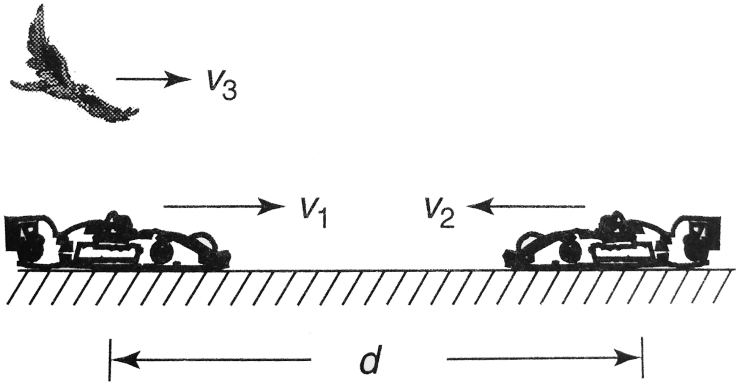
D. $1.5m/s$

Answer: B

Watch Video Solution

12. A bird flies to and fro between two cars which moves with velocities $v_1 = 20m/s$ and $v_2 = 30m/s$. If the speed of the bird is $v_3 = 10m/s$ and the initial distance of separation between them is $d = 2km$, find the

total distance covered by the bird till the cars meet.



A. 2000 m

B. 1000 m

C. 400 m

D. 200 m

Answer: C

Watch Video Solution

13. A man swimming downstream overcomes a float at a point M. After travelling distance D,he turned back and passed the float at a distance of

$D/2$ from the point M. Then the ratio of speed of swimmer with respect to still water to the speed of the river will be

A. 2

B. 3

C. 4

D. 2.5

Answer: B

Watch Video Solution

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

A. 30 sec

B. 45 sec

C. 40 sec

D. 35 sec

Answer: B

Watch Video Solution

15. A bus is moving with a velocity $10ms^{-1}$ on a straight road. A scooterist wishes to overtake the bus in $100s$. If the bus is at a distance of $1km$ from the scooterist, with what velocity should the scooterist chase the bus ?

A. $50ms^{-1}$

B. $40ms^{-1}$

C. $30ms^{-1}$

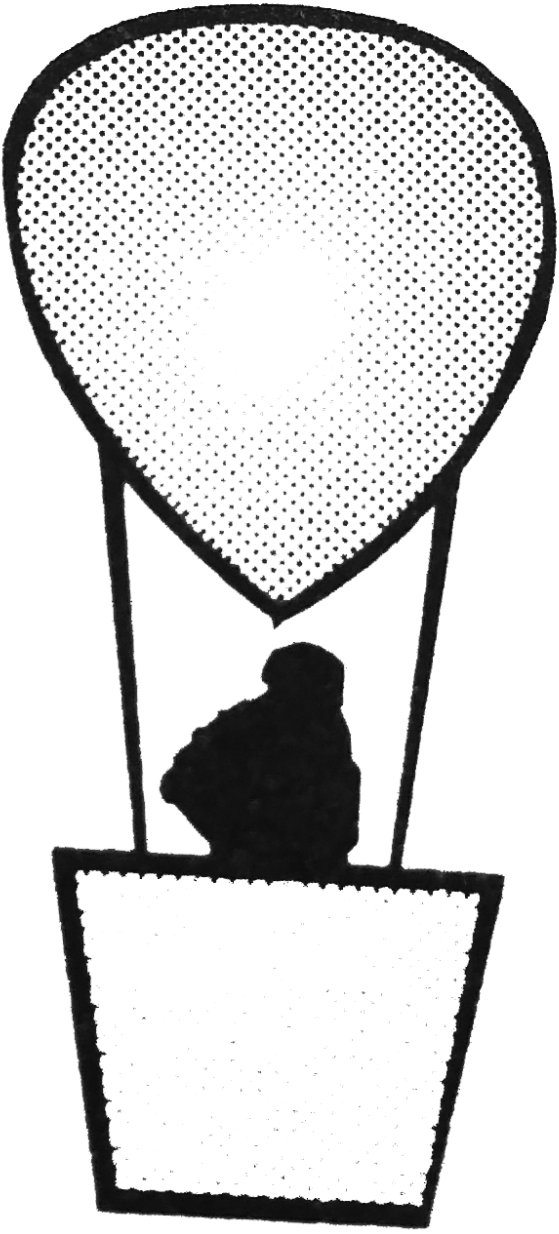
D. $20ms^{-1}$

Answer: D

Watch Video Solution

16. A man in a balloon throws a stone downwards with a speed of $5m/s$ with respect to balloon. The balloon is moving upwards with a constant acceleration of $5m/s^2$. Then velocity of the stone relative to the man

after 2 seconds is.



A. $10m/s$

B. $30m/s$

C. $15m/s$

D. $35m/s$

Answer: D

Watch Video Solution

17. A transparent lift A is going upwards with velocity $20ms^{-1}$ and retarding at the rate of $8ms^{-2}$. Second transparent lift B is located in front of it and is going down at $10ms^{-1}$ with retardation of $2ms^{-2}$. At the same instant a bolt from the ceiling of lift A drops inside lift A Height of car of lift A is $16m$. Find the time taken by boly to hit the floor of A.

A. 2 s

B. 3 s

C. 4 s

D. 6 s

Answer: C

Watch Video Solution

18. Refer $Q.107$. What is the velocity of bolt relative to lift B when it hits the floor of A ?

A. $18m/s$

B. $20m/s$

C. $22m/s$

D. none of these

Answer: A

Watch Video Solution

19. Refer $Q.107$. Find the displacement of bolt relative to B when it hits the flooe of A.

A. 20 m

B. 24 m

C. 32 m

D. 36 m

Answer: B

Watch Video Solution

20. 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. $(t_1 + t_2)/(2)$

B. $t_1 t_2/(t_2 - t_1)$

C. $t_1 t_2 / (t_2 + t_1)$

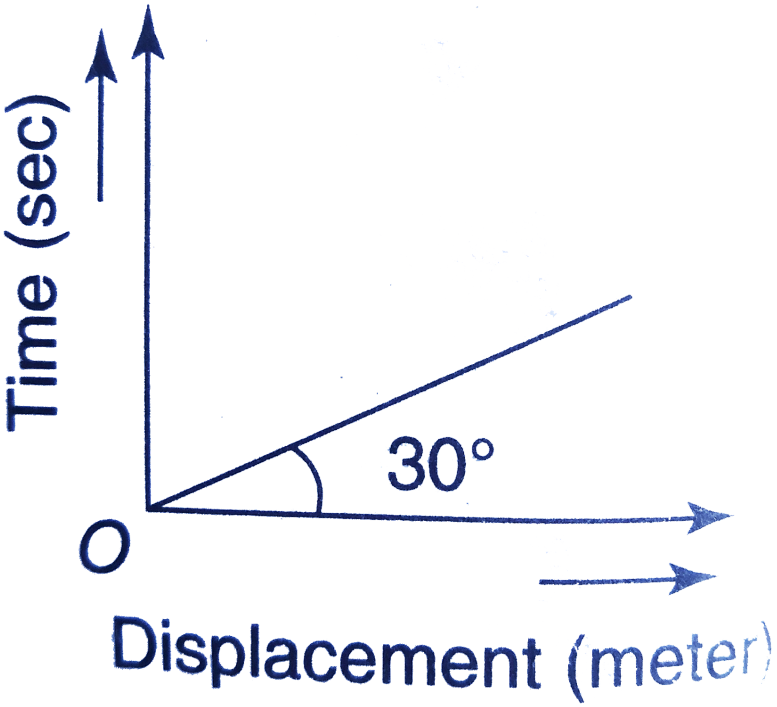
D. $t_1 - t_2$

Answer: C

Watch Video Solution

Understanding Motion Through Graphs

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



A. $\frac{1}{\sqrt{3}} m/s$

B. $3m/s$

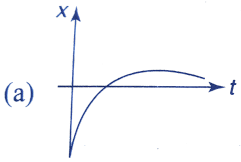
C. $\sqrt{3} m/s$

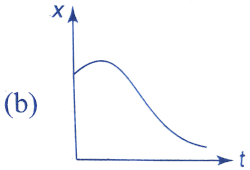
D. $\frac{1}{3} m/s$

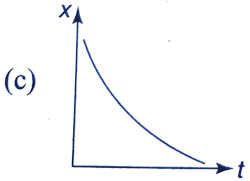
Answer: C

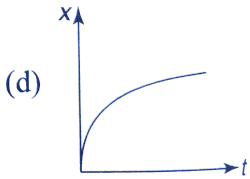
Watch Video Solution

2. 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. 

B. 

C. 

D. 

Answer: B

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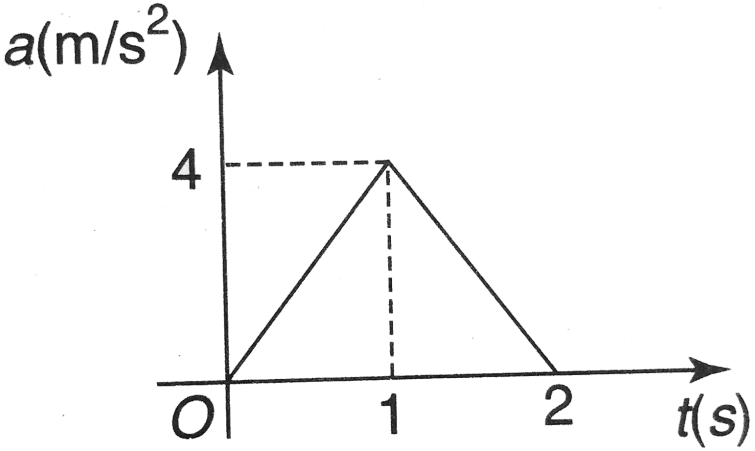
Watch Video Solution

3. The acceleration-time graph of a particle moving in a straight line is as shown in figure. The velocity of the particle at time $t = 0$ is $2m/s$. The velocity after 2 seconds will be



A. $6m/s$

B. $4m/s$

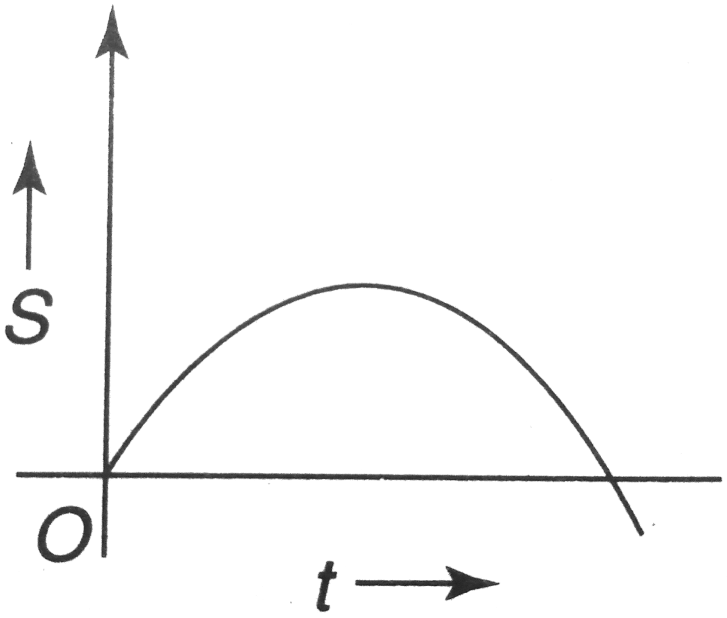
C. $2m/s$

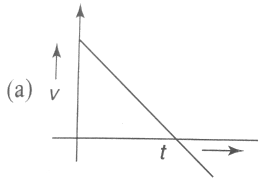
D. $8m/s$

Answer: A

Watch Video Solution

4. The graph of displacement versus time is shown. Its corresponding velocity-time graph will be.



A. 

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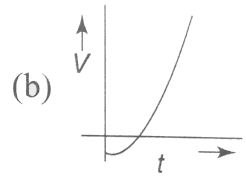
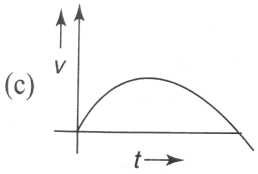
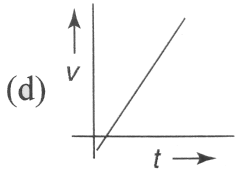
B. 

C. 

D. 

Answer: A

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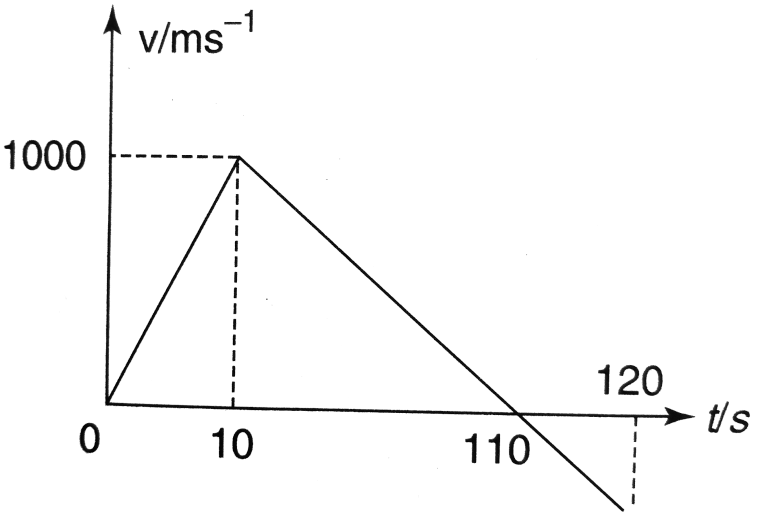
5. The graph shown the variation of velocity of a rocket with time. Then, the maximum height attained by the rocket is.



A. $1.1km$

B. $5km$

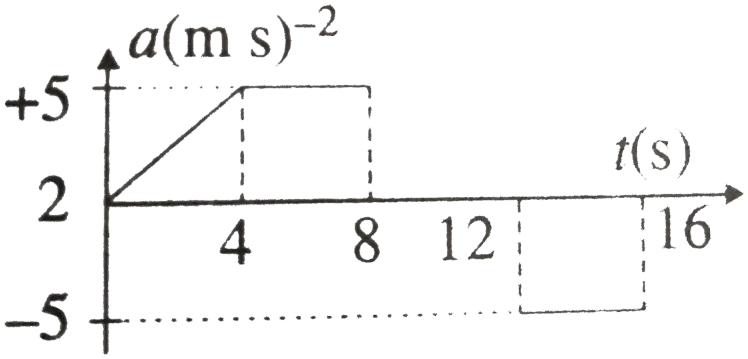
C. $55km$

D. none of these

Answer: C

Watch Video Solution

6. The acceleration of a particle starting from rest and travelling along a straight line is shown in figure. The maximum speed of the particle is



A. $20ms^{-1}$

B. $30ms^{-1}$

C. $40ms^{-1}$

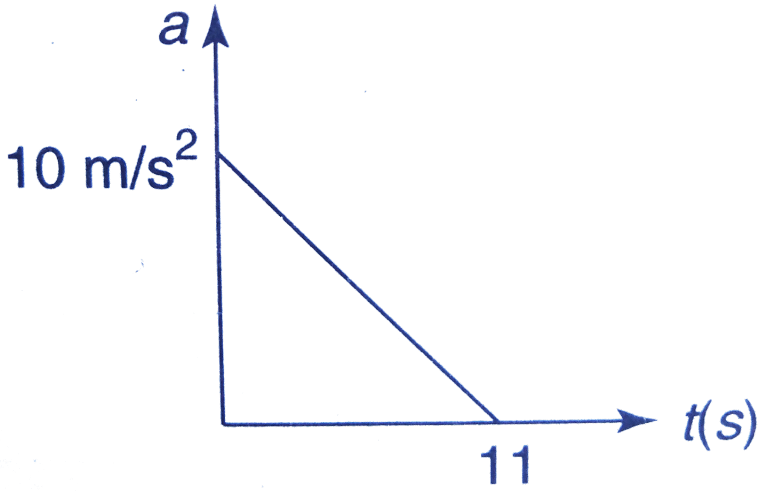
D. $60ms^{-1}$

Answer: B

Watch Video Solution

7. 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. $110m/s$

B. $55m/s$

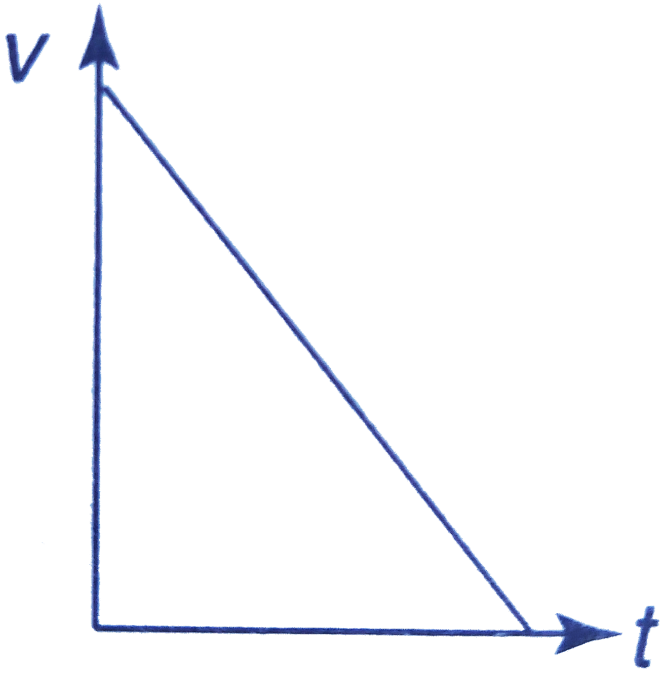
C. $550m/s$

D. $660m/s$

Answer: B

Watch Video Solution

8. Figure gives the velocity-time graph. This shows that the body is.



A. starting from rest and moving with uniform velocity

B. moving with uniform retardation

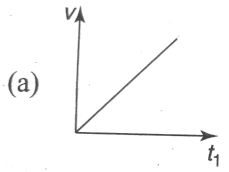
C. moving with uniform acceleration

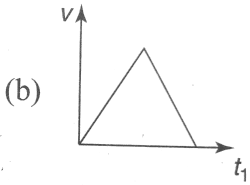
D. having same initial and final velocity.

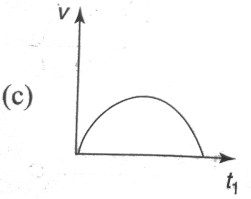
Answer: B

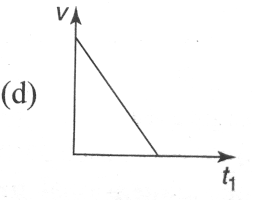
Watch Video Solution

9. A ball is thrown straight up with a velocity at $t = 0$ and returns to earth at $t = t_1$. Which graph shows the correct motion ?

A. 

B. 

C. 

D. 

Answer: C

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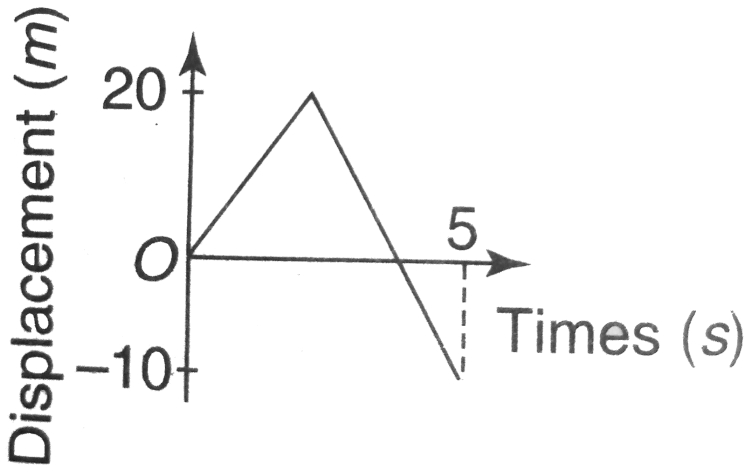
10. The diagram shows the displacement-time graph for a particle moving in a straight line. Find the average velocity for the interval from $t = 0$ to $t = 5s$.



A. $-2ms^{-1}$

B. $2ms^{-1}$

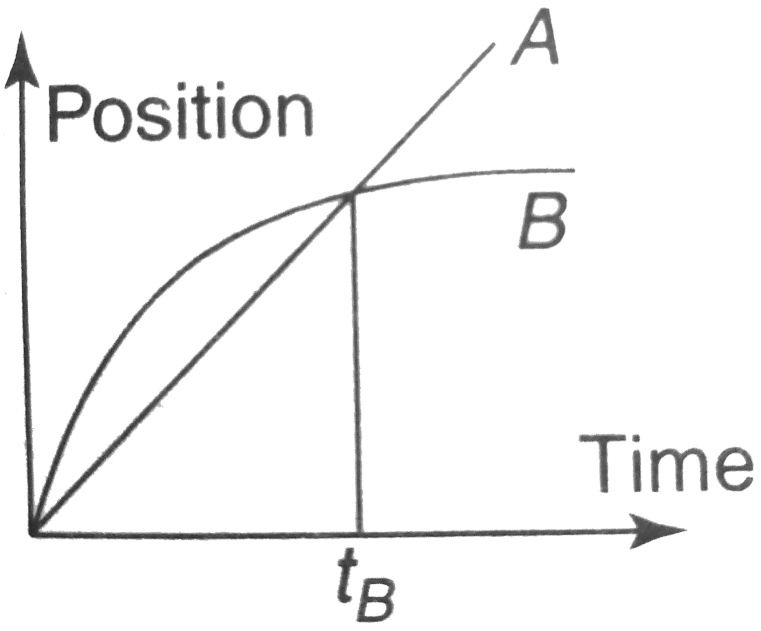
C. $-4ms^{-1}$

D. $4ms^{-1}$

Answer: A

Watch Video Solution

11. The graph shows position as a function of time for two trains running on parallel tracks. Which statement is true ?



A. At time t_B, both trains have the same velocity.

B. Both trains have the same velocity at some time after t_B

C. Both trains have the same velocity at some time before t_B.

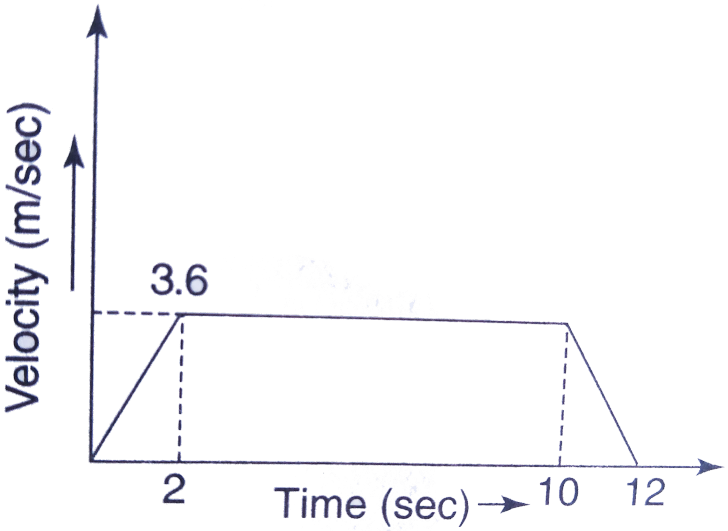
D. Somewhere on the graph, both trains have the same acceleration.

Answer: C

Watch Video Solution

12. 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. $28.8m$

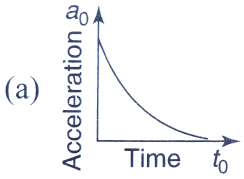
C. $36.0m$

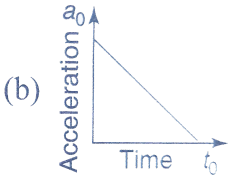
D. Cannot be calculate from the above graph.

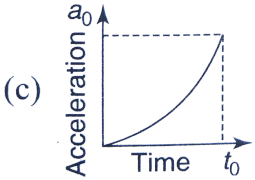
Answer: C

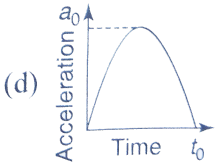
Watch Video Solution

13. Acceleration versus time graph for four objects are shown below. All axes have the same scale. Which object had the greatest change in velocity during the interval ?

A. 

B. 

C. 

D. 

Answer: D

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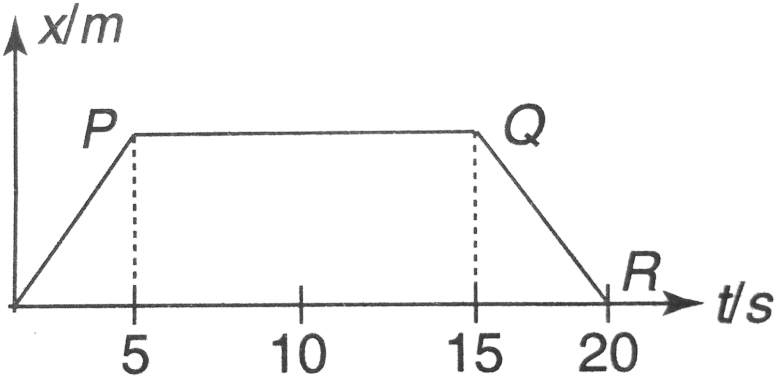
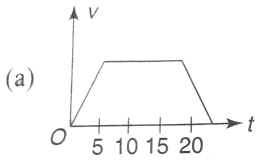
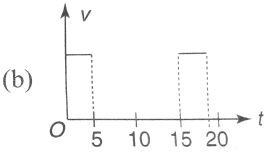
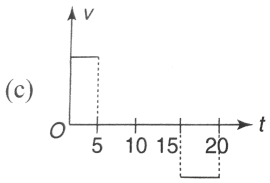
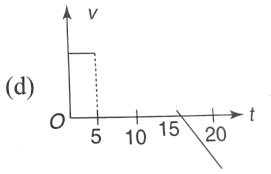
14. Figure shows the position the graph for a particle in one dimensional motion. Which of the graphs in fugure represent the variation in the velocity of the particle with time ?



A. 

B. 

C. 

D. 

Answer: C

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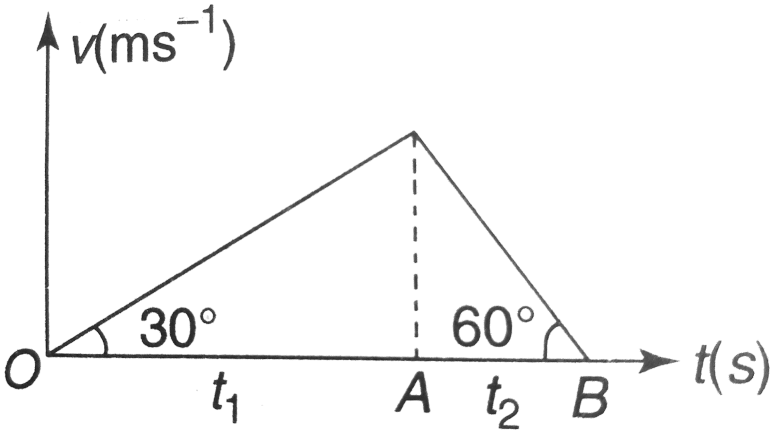
15. The velocity time graph of a body moving along a straight line is shown in figure. The ratio of the average velocities during the time t_1

and t_2 is.



A. $1:1$

B. $2:1$

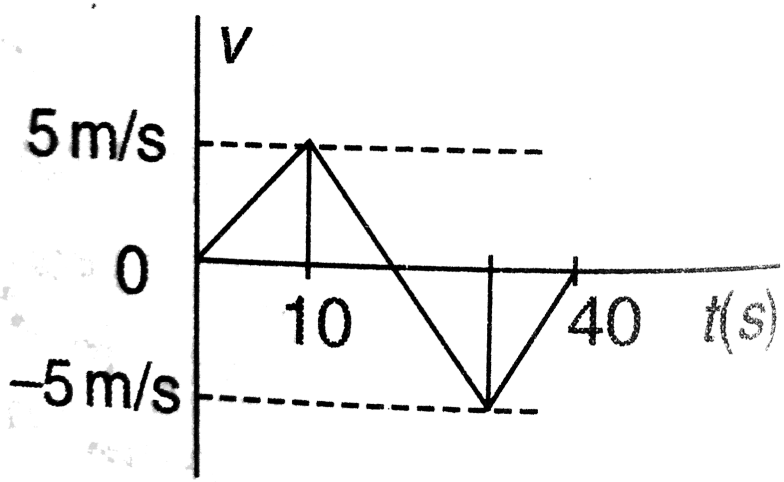
C. $3:1$

D. $1:3$

Answer: A

Watch Video Solution

16. The velocity-time plot is shown in figure. Find the average speed in time interval $t = 0$ to $t = 40s$ during the period.



A. zero

B. $2.5m/s$

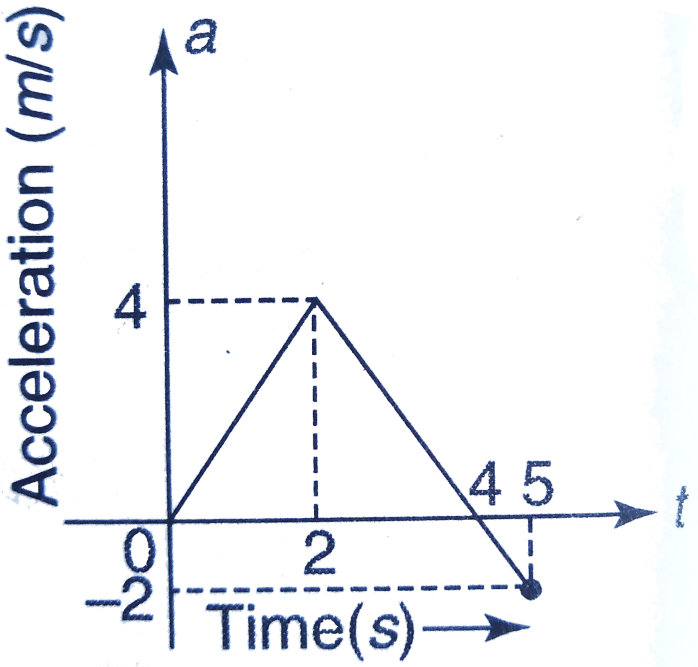
C. $5m/s$

D. none

Answer: B

Watch Video Solution

17. Figure shows the graph of acceleration of particle as a function of time. The maximum speed of the particle is (particle starts from rest).



A. $7m/s$

B. $8m/s$

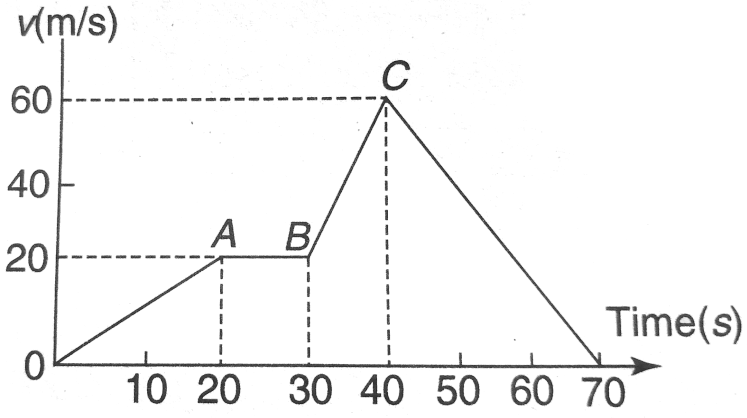
C. $4m/s$

D. $16m/s$

Answer: B

Watch Video Solution

18. The velocity-time graph of a body is given below. Find the average velocity from $t = 0$ to $t = 40s$.



A. $20m / s$

B. $40m / s$

C. $50m / s$

D. $60m / s$

Answer: A

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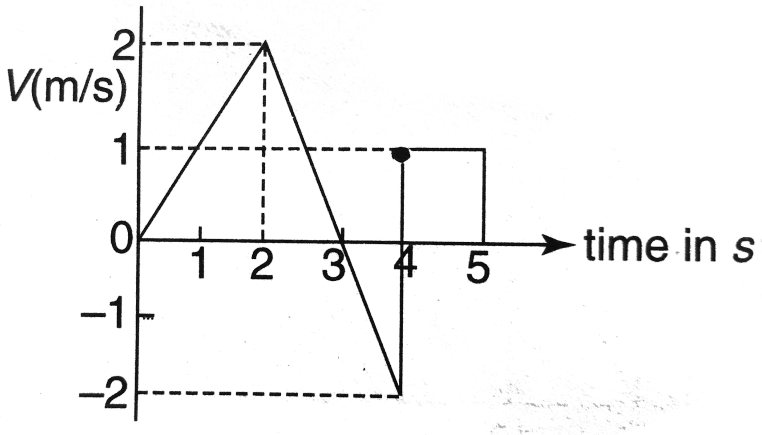
19. The velocity-time graph of a body moving along straight line is as follows :

The displacement of the body in 5 s is



A. 5 m

B. 2 m

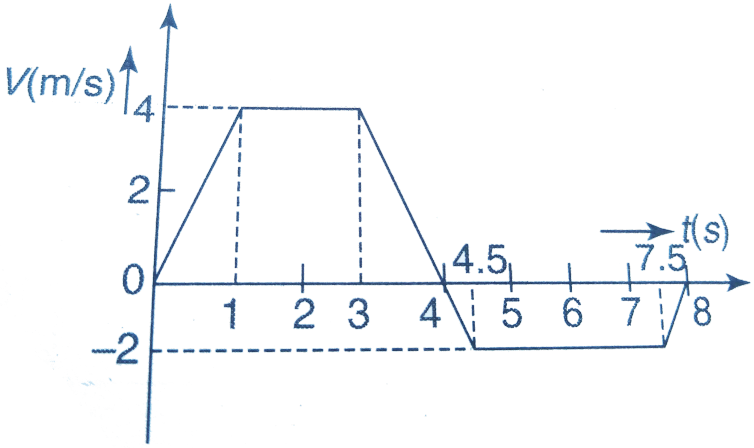
C. 4 m

D. 3 m

Answer: D

Watch Video Solution

20. The velocity-time graph of a linear motion os shown figure. The distance from the starting point after $8\,\text{sec}$ is.



A. 5 m

B. 16 m

C. 8 m

D. 19 m

Answer: A

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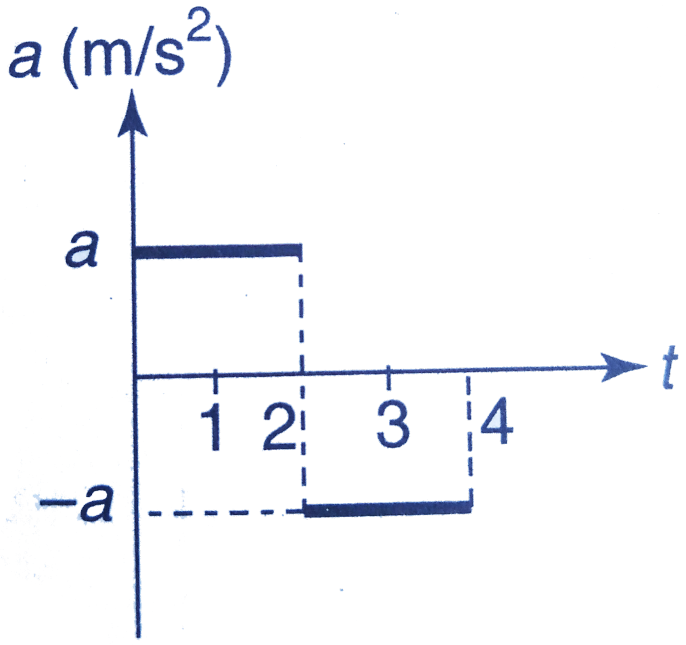
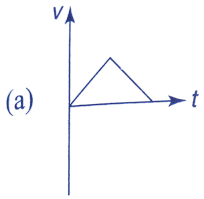
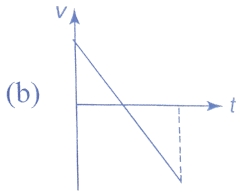
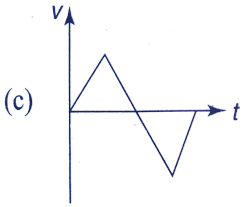
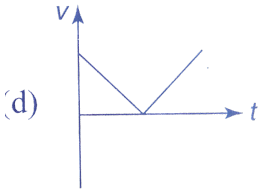
21. A particle starts from rest and undergoes an acceleration as shown in figure. The velocity-time graph from figure will have a shape.



A. 

B. 

C. 

D. 

Answer: A

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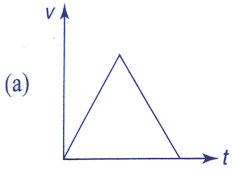
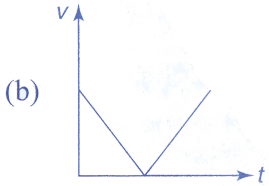
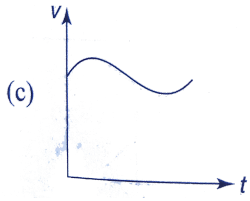
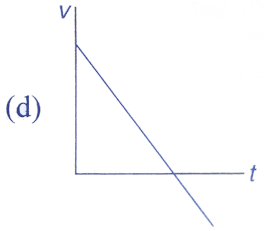
22. Which of the following graphs show the $v - t$ graph of a ball thrown upwards ?

A. 

B. 

C. 

D. 

Answer: D

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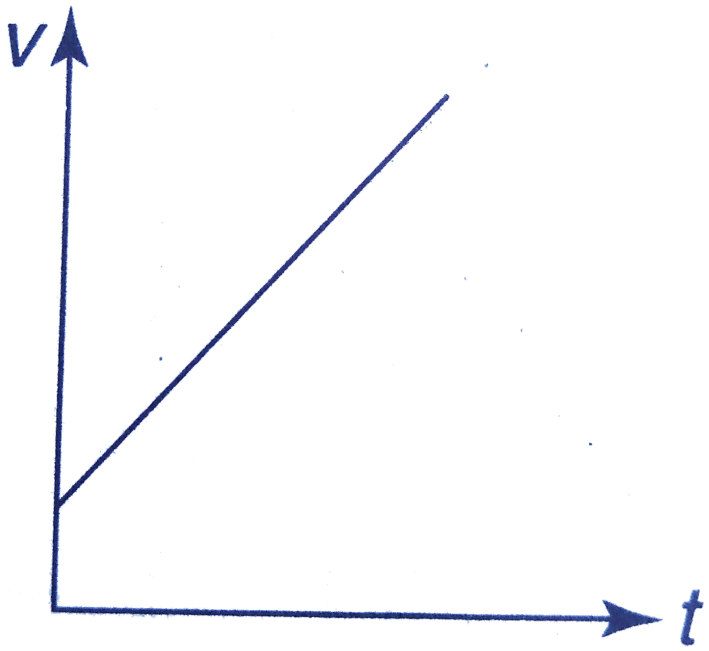
23. Figure shows a velocity-time graph. This shows that.



A. the body is at rest

B. the body starts from rest and moves with uniform velocity

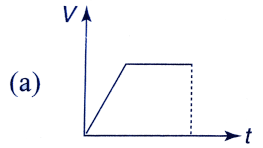
C. the body has some initial velocity and moves with uniform acceleration

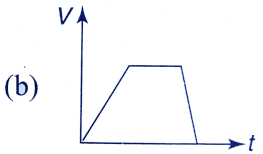
D. the motion is retarded

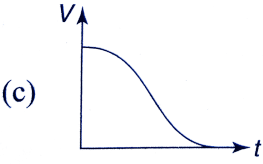
Answer: C

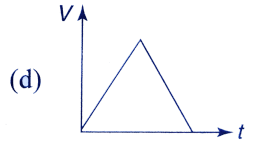
Watch Video Solution

24. A paratrooper id dropped from an airplane. After some time his parachute opens and he reaches the ground with almost zero speed. This speed of fall (v) versus time (t) grapg will look like :

A. 

B. 

C. 

D. 

Answer: D

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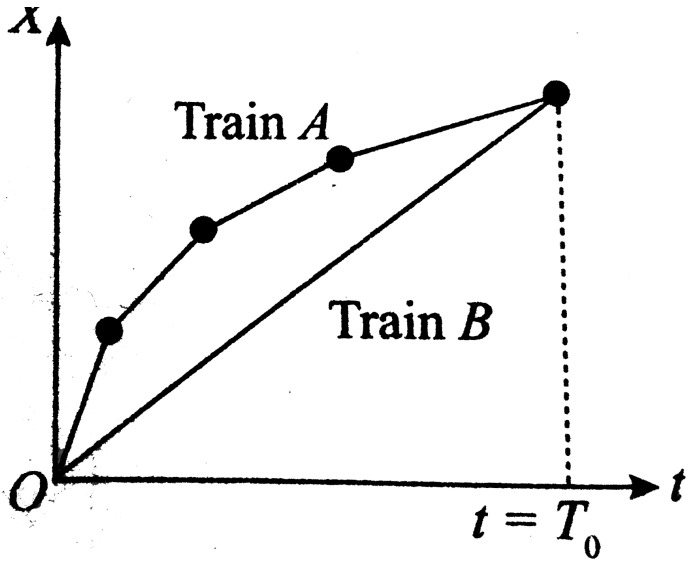
25. The plot shows the position (x) as a function of time (t) for two trains that run on a parallel track. Train A is next to train B at $t = 0$ and at $t = T_0$.



A. At T_0 both trains have the same velocity

B. Both trains speed up all the times

C. Both trains have the same velocity at some time before T_0

D. At T_0 the trains have covered different distances.

Answer: C

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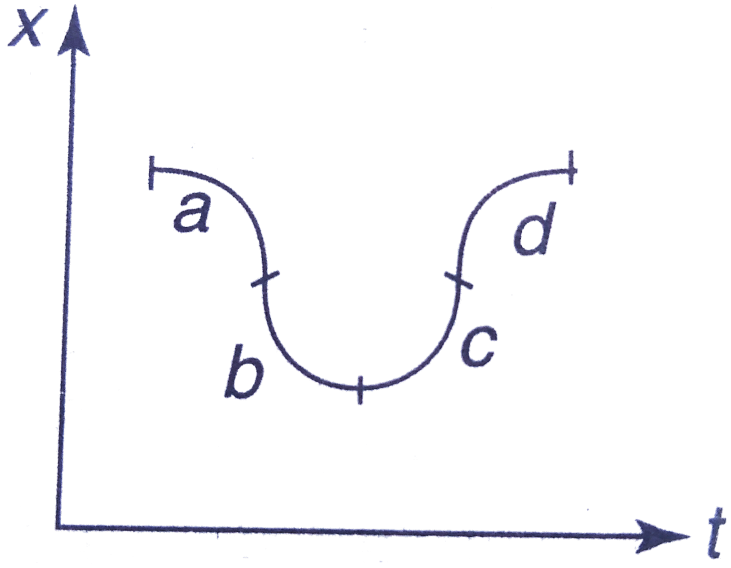
26. The graph to the right is a plot of position versus time. For which lebeled region is the velocity positive and the acceleration negative ?



A. a

B. b

C. c

D. d

Answer: D

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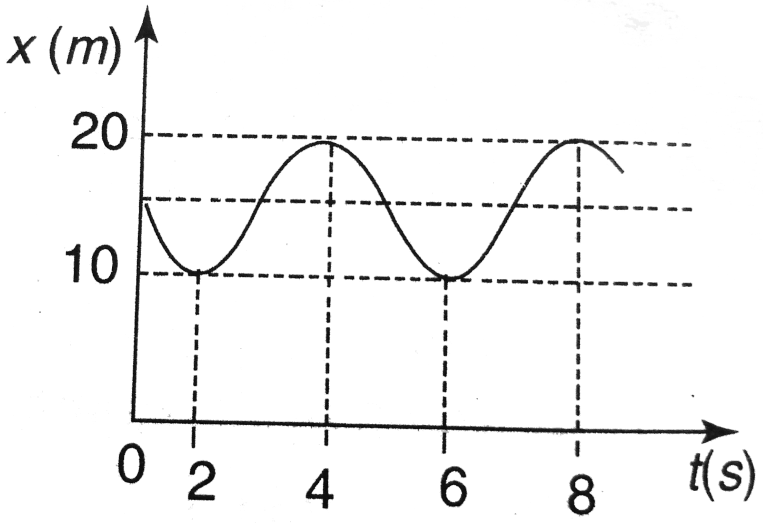
27. Figure shows the position of a particle moving on the x-axis as a function of time, Choose the WRONG statement.



A. The particle has come to rest 4 times.

B. The maximum speed is at $t = 4s$

C. The average velocity is zero for $t = 2s$ to $t = 6s$

D. Motion of particle is non-uniformly accelerated.

Answer: B

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28. A particle moves rectilinearly with a constant acceleration $1m/s^2$. Its speed after 10 seconds is $5m/s$. The distance covered by the particle in this duration is.

A. 20 m

B. 25 m

C. 30 m

D. 50 m

Answer: B

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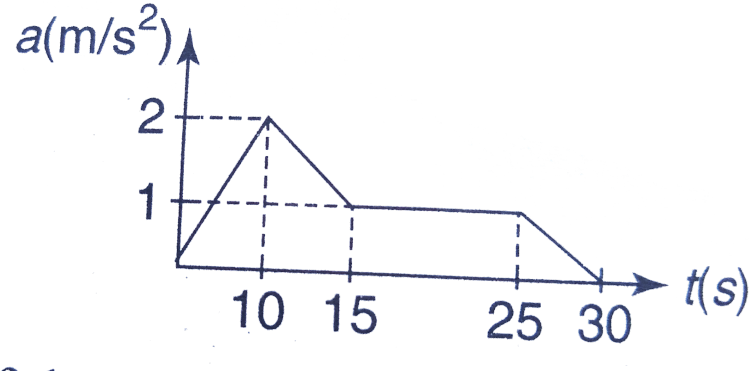
29. In figure shown, the graph shows the variation of acceleration of body with time t. The velcocity of the body at $t = 0$ is zero. The velocity of the body at $t = 30s$ is.



A. $30m / s$

B. $20m / s$

C. $40m / s$

D. none

Answer: A

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30. Refer $Q.139$. The average acceleration of the body from $t = 0$ to $t = 15s$ is.

A. $1.25m/s^2$

B. $4/7m/s^2$

C. $5/6m/s^2$

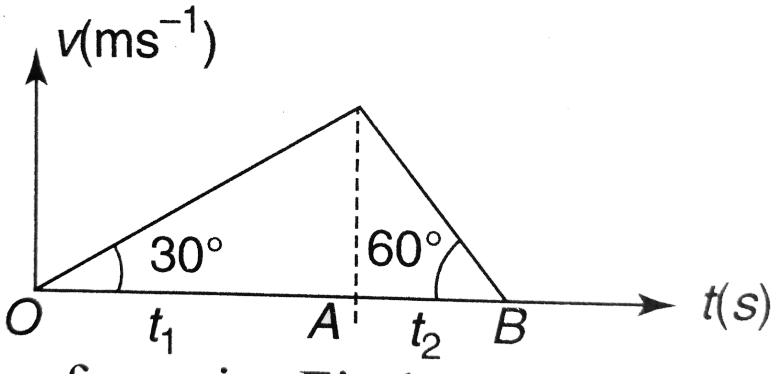
D. $7/6m/s^2$

Answer: D

Watch Video Solution

31. Velocity v of a particle moving along x axis as a function of time is given by $v = 2tm/s$. Initially the particle is to the right of the origin and $2m$ away from it. Find the position (distance from origin) of the particle

after first $3s$.



A. 5 m

B. 7 m

C. 11 m

D. 9 m

Answer: C

Watch Video Solution

32. Refer $Q.141$ find the displacement of the particle after $3s$.

A. 5 m

B. 7 m

C. 11 m

D. 9 m

Answer: D

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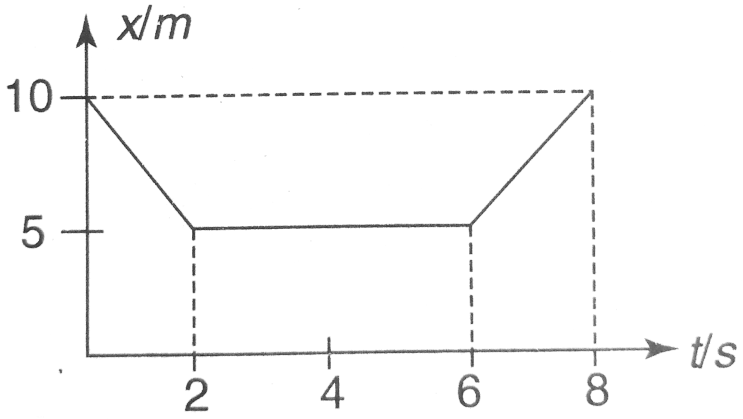
33. Figure shows the position time graph for a particle in one dimensional motion. What is the displacement of the particle in first 4 seconds ?



A. 5 m

B. $-5m$

C. zero

D. 15 m

Answer: B

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34. Refer $Q.\ 143$, What is the average velocity of the particle from $4s$ to $8s$?

A. $1.25m/s$

B. $2.5m/s$

C. $5m/s$

D. $1m/s$

Answer: A

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35. Refer $Q.143$. Starting from $t = 0$, what is the displacement of the particle at the end of $8s$?

A. $7.5m$

B. 10 m

C. 5 m

D. zero

Answer: D

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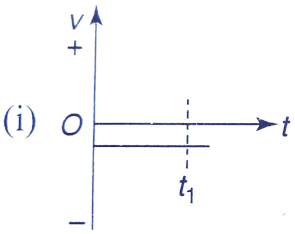
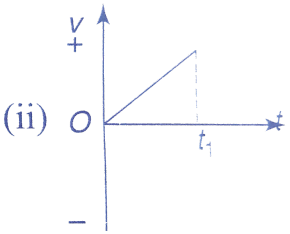
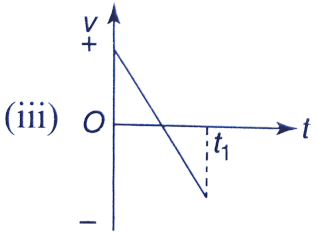
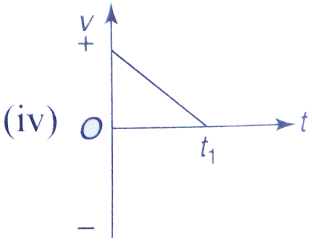
36. In which of the graphs both net displacement and velocity are negative ?









A. Graph (iii) and (iv)

B. Graph (i) and (ii)

C. Graph (i) only

D. Graph (iv) only

Answer: C

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37. Refer $Q.146$. In which of the graphs the particle may return to its initial position again ?

A. Graph (i)

B. Graph (ii)

C. Graph (iii)

D. Graph (iv)

Answer: C

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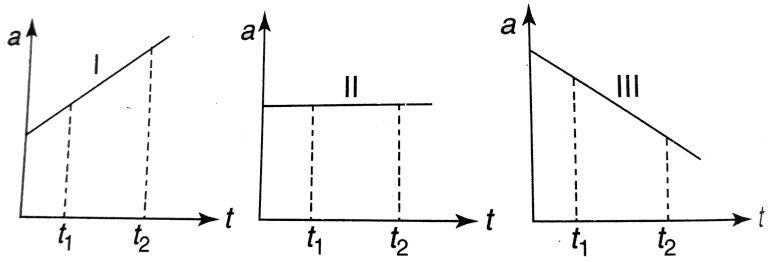
38. Each of the three graphs represents acceleration versus time for an object that already has a positive velocity at time t_1. Which graphs show an object whose speed is increasing for the entire time interval between

t_1 and t_2 ?



A. graph I, only

B. graphs I and II, only

C. graphs I and III, only

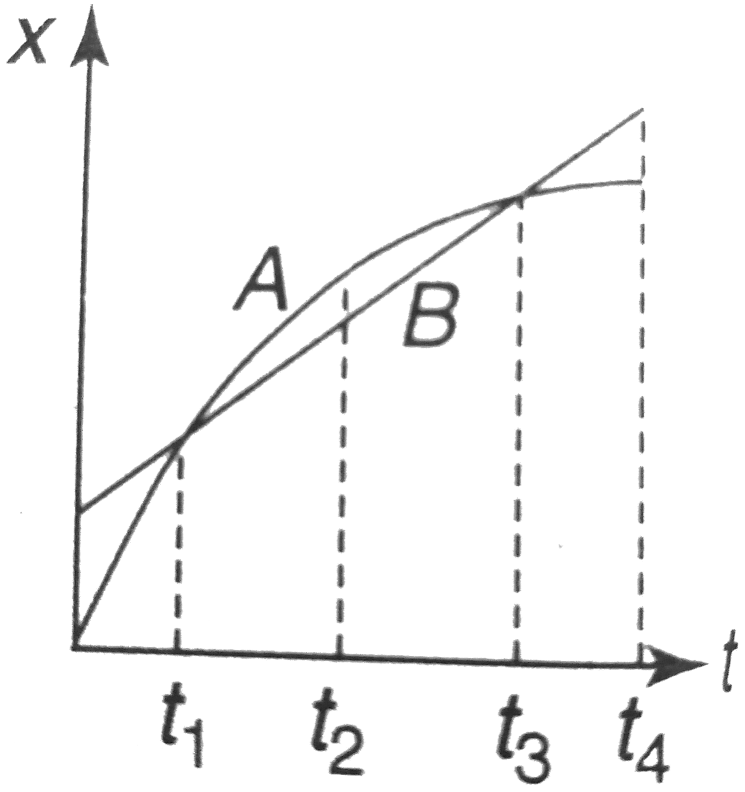
D. graphs I, II and III.

Answer: D

Watch Video Solution

39. The graph given shows the positions of two cars, A and B, as a function of time. The cars move along the x-axis on parallel but separate tracks, so that they can pass each other's position without colliding. At

which instant in time is car-A overtaking the car-B ?



A. t_1

B. t_2

C. t_3

D. t_4

Answer: A

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40. Refer $Q.149$. At time t_3. Which car is moving faster ?

A. car A

B. car B

C. same speed

D. None of these

Answer: B

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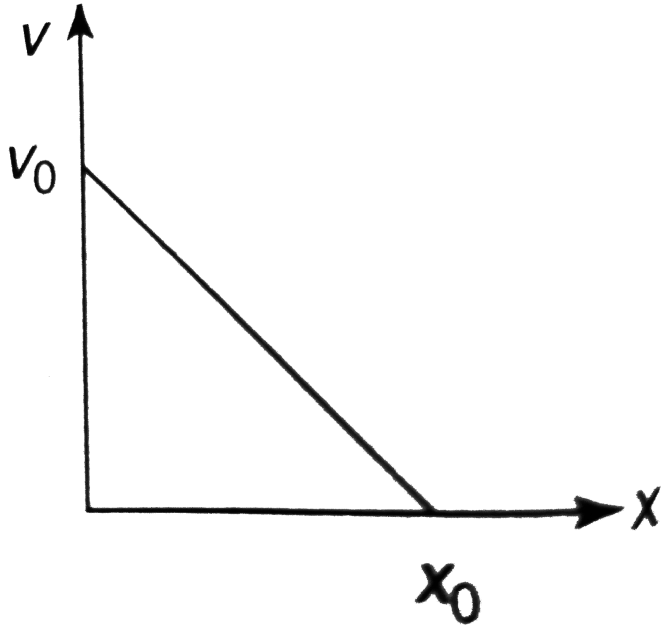
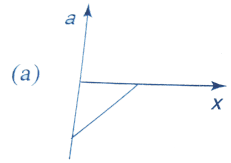
Problem Based On Mixed Concepts

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

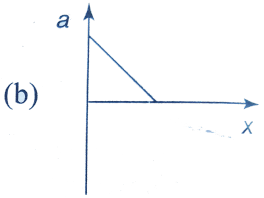
of acceleration with displacement ?

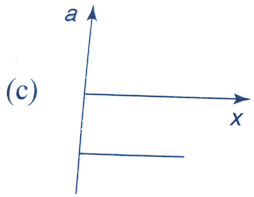


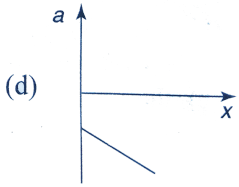
A.



B.



C. 

D. 

Answer: A

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2. 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

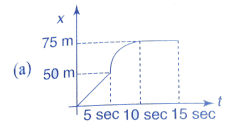
C. 12 m

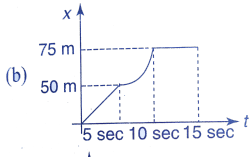
D. 16 m

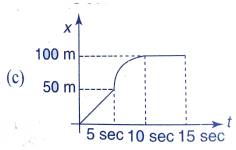
Answer: B

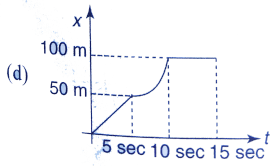
Watch Video Solution

3. A car is moving with uniform velocity $10m/s$. After $t = 5\,\text{sec}$, brakes are applied to produce constant retardation and car comes to rest at $t = 10\,\text{sec}$. The position time graph from $t = 0$ to $15s$ is.

A. 

B. 

C. 

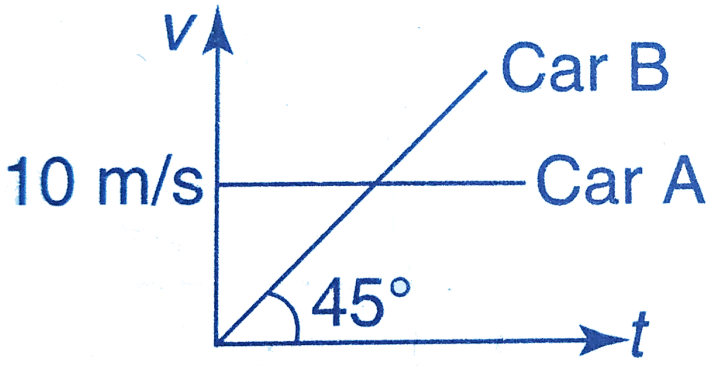


D.

Answer: A

Watch Video Solution

4. Initially car A is $10.5m$ ahead of car B. Both start moving at time $t = 0$ in the same direction along a straight line. The velocity-time graph of two cars is shown in figure. The time when the car B will catch the car A, will be.



A. $t = 21\,\text{sec}$

B. $t = 2\sqrt{5}\,\text{sec}$

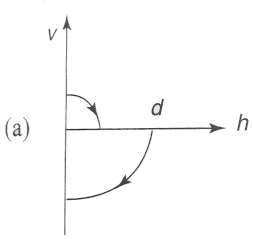
C. 20 sec

D. none

Answer: A

Watch Video Solution

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

A. 

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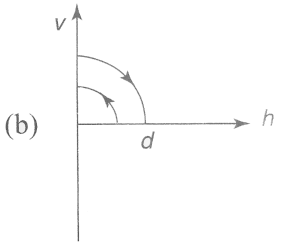
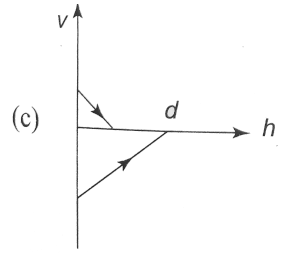
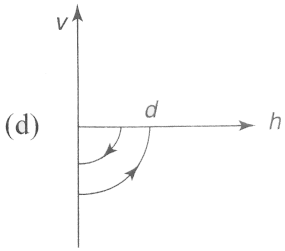
B.



C.



D.

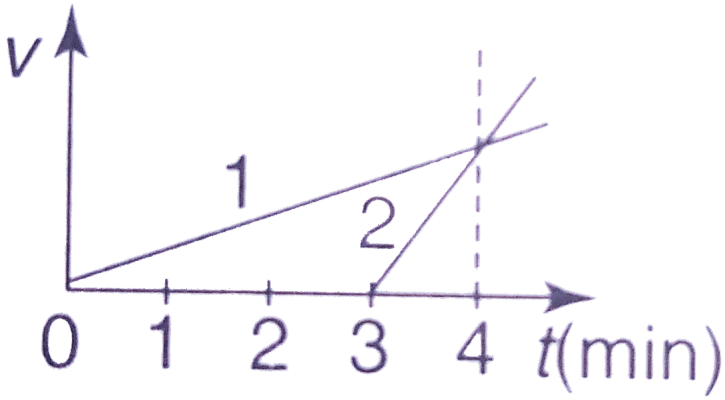


Answer: A

Watch Video Solution

6. The drawing shows velocity (v) versus time (t) graphs for two cyclists moving along the same straight segment of a highway from the same point. The second cyclist starts moving at $t = 3\ \text{min}$. At what time do

the two cysclist meet ?



A. 4 min

B. 6 min

C. 8 min

D. 12 min

Answer: B

Watch Video Solution

7. A train normally travels at a uniform speed of $72km/h$ on a long stretch of straight level track. On a particular day, the train was forced to make a 2.0 minute stop at a station along this track. If the train decelerates at a uniform rate of $1.0m/s^2$ and accelerates at a rate of $0.50m/s^2$, how much time is lost in stopping at the station ?

A. 2 min

B. 2 min 30 s

C. 30 s

D. 2 min 20 s

Answer: B

Watch Video Solution

8. Two objects moving along the same straight line are leaving point A with an acceleration a, $2a$ and velocity $2u$, u respectively at time $t = 0$.

The distance moved by the object with respect to point A when one object overtakes the other is :

A. $\frac{3u^2}{a}$

B. $\frac{2u^2}{a}$

C. $\frac{4u^2}{a}$

D. $\frac{6u^2}{a}$

Answer: D

Watch Video Solution

9. The speed v of a car moving on a straight road changes according to equation, $v^2 = 1 + bx$, where a and b are positive constants. Then the magnitude of acceleration in the course of such motion : (x is the distance travelled).

A. increases

B. decreases

C. stay constant

D. first decreases and then increases

Answer: C

Watch Video Solution

10. When two bodies move uniformly towards each other, the distance between them diminishes by $16m$ every $10s$. If bodies move with velocities of the same magnitude and in the same direction as before the distance between then will decrease $3m$ every $5s$. The velocity of each body is.

A. $1.5m/s, 0.8m/s$

B. $1.1m/s, 0.5m/s$

C. $2.4m/s, 1.5m/s$

D. $3.0m/s, 1.5m/s$

Answer: B

Watch Video Solution

11. A particle is thrown upwards from ground. It experiences a constant resistance force which can produce a retardation of $2ms^{-2}$. The ratio of time of ascent to time of descent 13 ($g = 10ms^{-2}$)

A. $1:1$

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

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

D. $\sqrt{\frac{3}{2}}$

Answer: B

Watch Video Solution

12. A particle moving along a straight line with a constant acceleration of $-4m/s^2$ passes through a point A on the line with a velocity of $+8m/s$ at some moment. Find the distance travelled by the particle in 5 seconds after that moment.

A. 26 m

B. 18 m

C. 9 m

D. 32 m

Answer: A

Watch Video Solution

13. A particle starts from rest with uniform acceleration and it's velocity after n seconds is v. The displacement of the body in last two seconds is.

A. $\frac{v(n+1)}{n}$

B. $\frac{2v(n+1)}{n}$

C. $\frac{2v(n-1)}{n}$

D. $\frac{v(n-1)}{n}$

Answer: C

Watch Video Solution

14. Two bikes A and B start from a point. A moves with uniform speed $40m/s$ and B starts from rest with uniform acceleration $2m/s^2$. If B starts at $t = 10$ and A starts from the same point at $t = 10s$, then the time during the journey in which A was ahead of B is :

A. 20 s

B. 8 s

C. 10 s

D. A is never ahead of B.

Answer: D

Watch Video Solution

15. A parachutist after bailing out falls 50m without friction. When parachute opens, it decelerates at $2m/s^2$. He reaches the ground with a speed of $3m/s$. At what height, did the bail out?

A. 293 m

B. 111 m

C. 91 m

D. 182 m

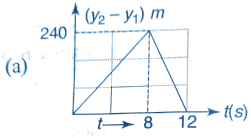
Answer: A

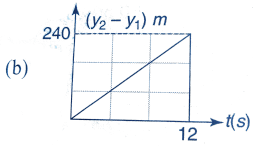
Watch Video Solution

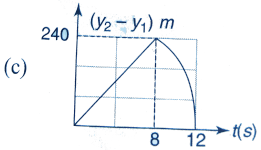
16. Two stones are thrown up simultaneously from the edge of a cliff $240m$ high with initial speed of $10m/s$ and $40m/s$ respectively . Which of the following graph best represents the time variation of relative position of the speed stone with respect to the first ?

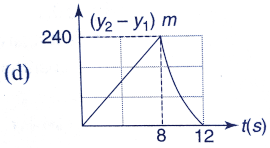
(Assume stones do not rebound after hitting the groumd and neglect air resistance , take $g = 10m/s^2$)

(The figure are schematic and not drawn to scale)

A. 

B. 

C. 

D. 

Answer: C

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

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

B. $v_0 + g + f$

C. $v_0 + g/2 + f$

D. $v_0 + 2g + 3f$

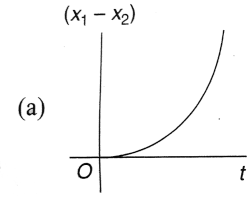
Answer: A

Watch Video Solution

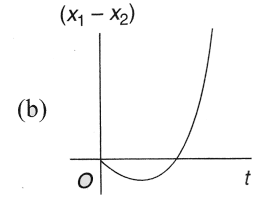
18. A body is at rest at $x = 0$. At $t = 0$, it starts moving in the positive $x - direction$ with a constant acceleration . At the same instant another

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

A.



B.



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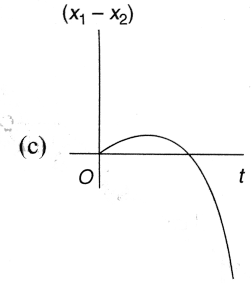
C.



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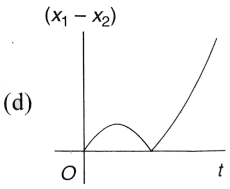

D.

Answer: B

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19. An object moving with a speed of $6.25 m / s$, is deceleration at a rate given by :

$$\frac{dv}{dt} = -25\sqrt{v},$$

where v is instantaneous speed. The time taken by the obeject, to come to rest, would be :

A. 1 s

B. 2 s

C. 4 s

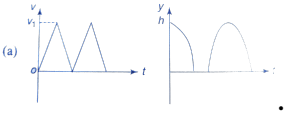
D. 8 s

Answer: B

Watch Video Solution

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

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

A. 

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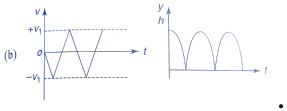
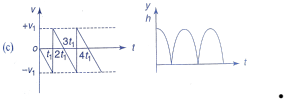
B. 

.

C. 

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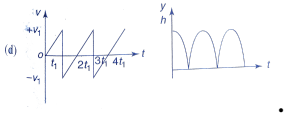
D. 

.

Answer: C

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21. Two particles start moving from the same point along the same straight line. The first moves with constant velocity v and the second with constant acceleration a. During the time that elapses before the sound catches the first, the greatest distance between the particle is.

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

B. $\frac{v^2}{2a}$

C. $\frac{2v^2}{a}$

D. $\frac{v^2}{4a}$

Answer: B

Watch Video Solution

22. Ball A is dropped from the top of a building. At the same instant ball B is thrown vertically upwards from the ground. When the balls collide,

they are moving in opposite direction and the speed of A is twice the speed of B. At what fraction of the height of the building did the collision occurs ?

A. $1/3$

B. $2/3$

C. $1/4$

D. $2/5$

Answer: B

Watch Video Solution

23. In a car race, car A takes t_0 time less to finish than car B and passes the finishing point with a velocity v_0 more than car B. The cars start from rest and travel with constant accelerations a_1 and a_2. Then the ratio $\frac{v_0}{t_0}$ is equal to.

A. $\frac{a_1^2}{a_2}$

B. $\frac{a_1 + a_2}{2}$

C. $\sqrt{a_1 a_2}$

D. $\frac{a_2^2}{a_1}$

Answer: C

Watch Video Solution

24. A juggler maintains four balls in motion, making each to them to rise a height of $20m$ from his hand. What time interval should he maintain, for the alphaer distance between them.

A. 3 s

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

C. 1 s

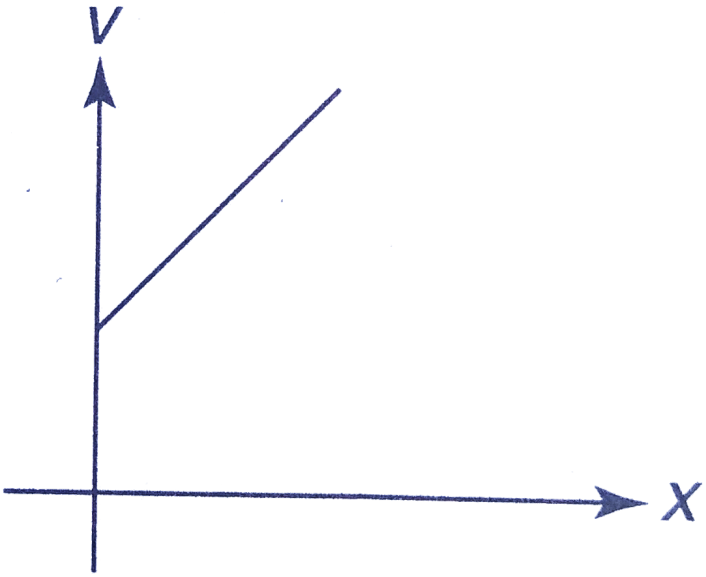
D. 2 s

Answer: C

Watch Video Solution

25. Graph of velocity versus displacement of a particle moving in a straight line is as shown in figure.

The acceleration of the particle is.



A. constant

B. increases linearly with x

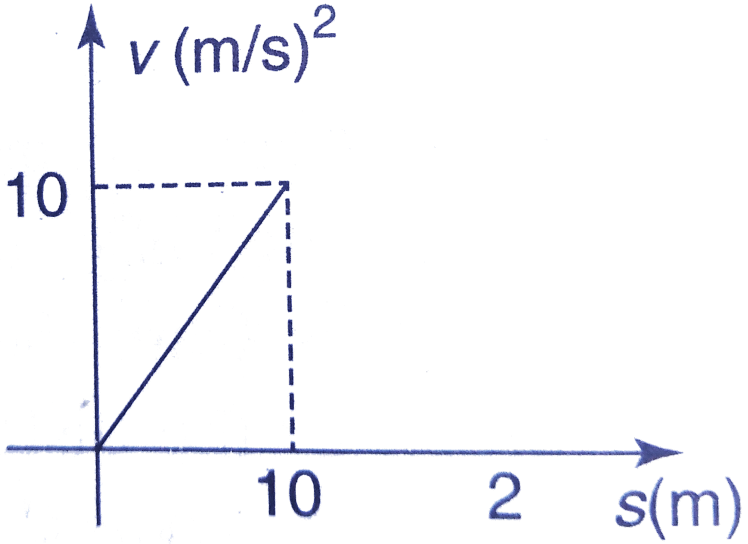
C. increases parabolically with x

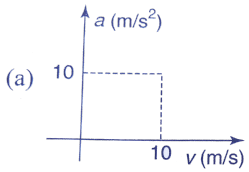
D. none of these

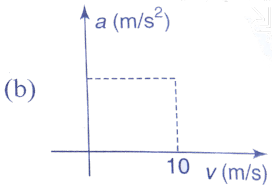
Answer: B

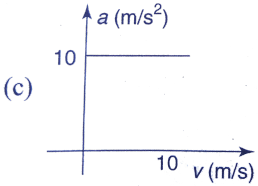
Watch Video Solution

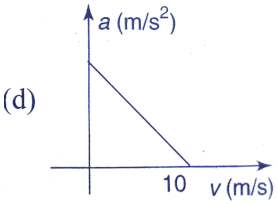
26. Velocity versus displacement graph of a particle moving in a straight line is shown in figure. Corresponding acceleration versus velocity graph will be.



A. 

B. 

C. 

D. 

Answer: A

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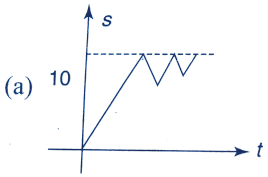
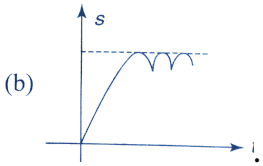
27. A ball is dropped from a certain height on a horizontal floor. The coefficient of restitution between the ball and the floor is $\frac{1}{2}$. The displacement time graph of the ball will be.

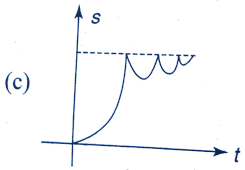
A.



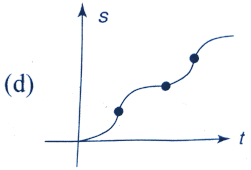
B.



C.



D.



Answer: C

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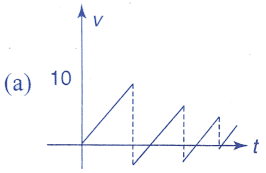
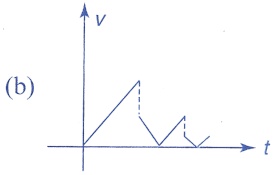
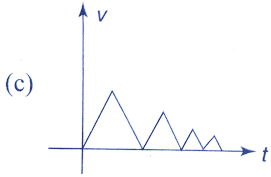
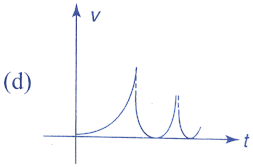
Watch Video Solution

28. The speed -time graph of the ball in the above situation is.

A. 

B. 

C. 

D. 

Answer: B

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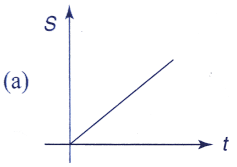
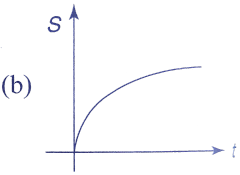
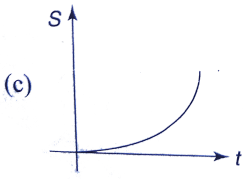
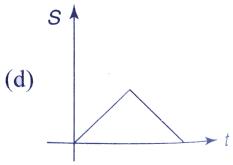
29. One stone is dropped from a tower from rest and simultaneously another stone is projected vertically upwards from the tower with some initial velocity. The graph of distance (s) between the two stones varies with time (t) as (before either stone hits the ground).

A. 

B. 

C. 

D. 

Answer: A

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30. Two stones are thrown up simultaneously from the edge of a cliff with initial speed v and $2v$. The relative position of the second stone with respect to first varies with time till both the stones strike the ground as.

A. linearly

B. first linearly then parabolically

C. parabolically

D. first parabolically then linearly

(assume that the first stone comes to rest after striking the ground).

Answer: B

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Assertion Reasoning

1. Assertion: The instantaneous velocity does not depend on instantaneous position vector.

Reason: The instantaneous velocity and average velocity of a particle are always same.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: C

Watch Video Solution

2. Assertion: A balloon ascends from the surface of earth with constant speed. When it was at a height $50m$ above the ground, a packet is dropped from it. To an observer on the balloon, the displacement of the packet, from the moment it is dropped to the moment it reaches the surface of earth, is $50m$

Reason: Displacement (vector) depends upon the reference frame used to measure it.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: D

Watch Video Solution

3. Assertion: If two particles, moving with constant velocities are to meet, the relative velocity must be along the line joining the two particles.

Reason: Relative velocity means motion of one particle as viewed from the other.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

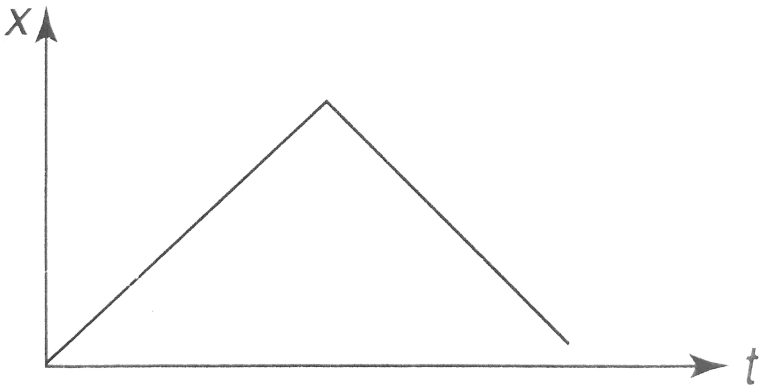
D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

4. Assertion: $x - t$ graph, for a particle undergoing rectilinear motion, can be as shown in the figure.

Reason: Infinitesimal changes in velocity are physically possible only in infinitesimal time.



A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: D

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5. Assertion: Area under velocity-time graph give displacement.

Reason: Area under acceleration-time graph give velocity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: C

Watch Video Solution

6. Assertion: In a uniformly accelerated motion, acceleration the graph is straight line with positive slope.

Reason: Acceleration is rate of change of velocity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: D

Watch Video Solution

7. Assertion: A particle is moving on a horizontal surface its path will be straight line if initial velocity and acceleration are along same horizontal surface.

Reason: An between $\vec{u}$ and $\vec{a}$ determine particle therefore. It may be accelerated or retarded curvilinear.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: D

Watch Video Solution

8. Assertion: if air resistance is considerd then time to ascent and time of desent will be different.

Reason: Magnitudes of acceleration will be different in upwards and downward motion.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

9. Assertion: A body,whatever its motion, is always at rest in a frame of reference which is fixed to the body itself.

Reason: The relative velocity of a body with respect to itself is zero.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

10. Assertion: A body having non zero acceleration can have a constant velocity.

Reason: Acceleration is the rate of change of velocity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: D

Watch Video Solution

11. Statement I: A body can have acceleration even if its velocity is zero at a given instant .

Statement II: A body is momentarily at rest when it reverses its direction of velocity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

12. Assertion: The average velocity of the object over an interval of time is either smaller then or equal to the average speed of the object over the same interval.

Reason: Velocity is a vector quantity and speed s a scalar quantity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

13. Assertion: A negative acceleration of a body can be associated with a 'speeding up' of the body.

Reason: Increase in speed of a moving body is independent of its direction of motion.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: B

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14. Assertion: The average speed of a body over a given interval of time is equal to the average velocity of the body in the same interval of time if a body moves in a straight line in one direction.

Reason: Because in this case distance travelled by a body is equal to the displacement of the body.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

15. Assertion: The slope of displacement-time graph of a body moving with high velocity is steeper than the slope of displacement-time graph of a body with low velocity.

Reason: Slope of displacement-time graph = Velocity of the body.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

16. Assertion: Displacement of a body may be zero when distance travelled by it is not zero.

Reason: The displacement is the longest distance between initial and final position.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: C

Watch Video Solution

17. Assertion: The displacement of a body is vector sum of the area under velocity-time graph.

Reason: Displacement is a vector quantity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

Watch Video Solution

18. Assertion: For a particle moving in a straight line velocity (v in m//s) of the particle in terms of time (t in sec) is given by $v = t^2 - 6t + 8$.

Then the speed of the particle is minimum at $t = 2\,\text{sec}$

Reason: For a particle moving in a straight line velocity v at any time t may be minimum or may be maximum when $\frac{dv}{dt} = 0$.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: B

Watch Video Solution

19. Assertion: In rectilinear motion when velocity is positive distance travelled increases and when velocity is negative distance travelled

decreases.

Reason: Distance is length of the path covered by a particle.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: D

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20. Assertion: Three projectiles are moving in different paths in the air. Vertical component of relative velocity between any of the pair does not change with time as long as they are in air. Neglect the effect of air friction.

Reason: Relative acceleration between any of the pair of projectile is zero.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assersion is false but reason is true.

Answer: A

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NEET Questions

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 a moving trains

D. Train running on a straight track

Answer: D

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2. 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 sec

B. 68 sec

C. 80 sec

D. 92 sec

Answer: C

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3. The displacement of a particle moving in a straight line, is given by $s = 2t^2 + 2t + 4$ where s is in metres and t in seconds. The acceleration of the particle is.

A. $2m/s^2$

B. $4m/s^2$

C. $6m/s^2$

D. $8m/s^2$

Answer: B

Watch Video Solution

4. From the top of a tower, a particle is thrown vertically downwards with a velocity of $10m/s$. The ratio of the distances, covered by it in the $3rd$ and $2nd$ seconds of the motion is $\left(\text{Take} g = 10m/s^2\right)$.

A. $5:7$

B. $7:5$

C. $3:6$

D. $6:3$

Answer: B

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5. A man drops a ball downside from the roof of a tower of height 400 metres. At the same time another ball is thrown upside with a velocity $50\text{meter}/\sec$ from the surface of the tower, then they will meet at which height from the surface of the tower.

A. 100 metres

B. 320 metres

C. 80 metres

D. 240 meters

Answer: C

Watch Video Solution

6. 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. $1:4$

Answer: A

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7. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man jumps to a height of $2m$

on the surface of A. What is the height of jump by the same person on the planet B ?

A. 18 m

B. 6 m

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

D. $\frac{2}{9}m$

Answer: A

Watch Video Solution

8. The displacement of a particle is given by $y = a + bt + ct^2 - dt^4$. The initial velocity and acceleration are respectively.

A. $b, \ -4d$

B. $-b, 2c$

C. $b, 2c$

D. $2c, \ -4d$

Answer: C

Watch Video Solution

9. 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. $150m/s$

B. $27m/s$

C. $450m/s$

D. $250m/s$

Answer: A

Watch Video Solution

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

A. $1:4:9$

B. $1:2:4$

C. $1:3:5$

D. $1:2:3$

Answer: C

Watch Video Solution

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

C. $a/\sqrt{v-v_1}$

D. $a/(v+v_1)$

Answer: B

Watch Video Solution

12. 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 α =β

D. go on increasing with time.

Answer: D

Watch Video Solution

13. A ball is throw vertically upward. It has a speed of $10m/s$ when it has reached one half of its maximum height. How high does the ball rise ? (Taking $g = 10m/s^2$).

A. 15 m

B. 10 m

C. 20 m

D. 5 m

Answer: B

Watch Video Solution

14. 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. 24 m

B. 40 m

C. 56 m

D. 16 m

Answer: C

Watch Video Solution

15. Two bodies A (of mass $1kg$) and B (of mass $3kg$) are dropped from heights of $16m$ and $25m$. Respectively. The ratio of the time taken to reach the ground is :

A. $5/4$

B. $12/5$

C. $5/12$

D. $4/5$

Answer: D

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

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

B. $\sqrt{v_uv_d}$

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

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

Answer: A

Watch Video Solution

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

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

A. $f_0 T$

B. $\frac{1}{2} f_0 T^2$

C. $f_0 T^2$

D. $\frac{1}{2} f_0 T$

Answer: D

Watch Video Solution

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

A. 6 m

B. 4 m

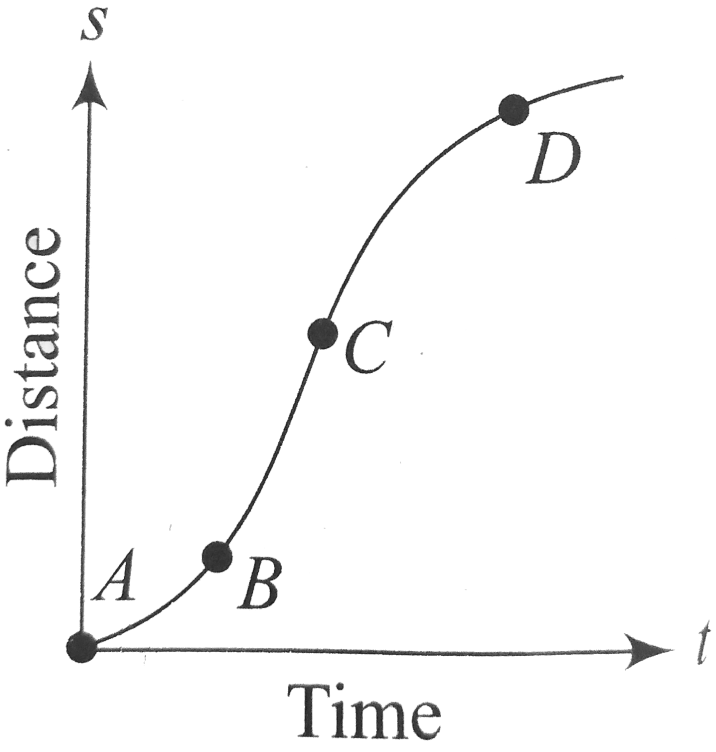
C. $\frac{10}{3} m$

D. $\frac{19}{3}m$

Answer: C

Watch Video Solution

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



A. B

B. C

C. D

D. A

Answer: B

Watch Video Solution

20. A particle moves in a straight line with a constant acceleration. It changes its velocity from $10ms^{-1}$ to $20ms^{-1}$ while passing through a distance $135m$ in t seconds. The value of t is.

A. 10

B. 1.8

C. 12

D. 9

Answer: D

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21. A bus is moving with a speed of $10ms^{-1}$ on a straight road. A scooterist wishes to overtake the bus in $10s$. If the bus is at a distance of $1km$ from the scooterist with what speed should the scooterist chase the bus ?

A. $20ms^{-1}$

B. $40ms^{-1}$

C. $25ms^{-1}$

D. $10ms^{-1}$

Answer: A

Watch Video Solution

22. A particle starts its motion from rest under the action of a constant force. If the distance covered in first $10s$ is s_1 and the covered in the first $20s$ is s_2, then.

A. $s_2 = 2s_1$

B. $s_2 = 3s_1$

C. $s_2 = 4s_1$

D. $s_2 = s_1$

Answer: C

Watch Video Solution

23. A ball is dropped from a high rise platform $t = 0$ starting from rest. After $6s$ another ball is thrown downwards from the same platform with a speed v. The two balls meet at $t = 18s$. What is the value of v ?

A. $74ms^{-2}$

B. $55ms^{-1}$

C. $40ms^{-1}$

D. $60ms^{-1}$

Answer: A

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24. A particle has initial velocity $\left(3\hat{i}+4\hat{j}\right)$ and has acceleration $\left(0.1\hat{i}+0.3\hat{j}\right)$. Its speed after $10s$ is.

A. 7 unit

B. $7\sqrt{2}$ unit

C. 8.5 unit

D. 10 unit

Answer: B

Watch Video Solution

25. 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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26. A boy standing at the top of a tower of $20m$. Height drops a stone. Assuming $g = 10ms^{-2}$ towards north. The average acceleration of the body is.

A. $20m/s$

B. $40m/s$

C. $5m/s$

D. $10m/s$

Answer: A

Watch Video Solution

27. 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. $7m/s^2$

B. $\sqrt{7}m/s^2$

C. $5m/s^2$

D. $1m/s^2$

Answer: C

Watch Video Solution

28. A particle covers half of its total distance with speed v_1 and the rest half distance with speed v_2. Its average speed during the complete journey is.

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

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

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

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

Answer: B

Watch Video Solution

29. 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. $12ms^{-2}$

B. $24ms^{-2}$

C. zero

D. $6ms^{-2}$

Answer: A

Watch Video Solution

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

A. $h_1 = 2h_2 = 3h_3$

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

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

D. $h_1 = h_2 = h_3$

Answer: B

Watch Video Solution

31. The displacement 'x' (in meter) of a particle of mass 'm' (in kg) moving in one dimension under the action of a force is released to time 't' (in sec) by $t = \sqrt{x} + 3$. The displacement of the particle when its velocity is zero will be.

A. 2 m

B. 4 m

C. zero

D. 6 m

Answer: C

Watch Video Solution

32. 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. $-2n\beta^2 x^{-2n+1}$

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

Answer: B

Watch Video Solution

33. A particle moves so that its position vector is given by $\overrightarrow{r} = \cos\omega t\hat{x} + \sin\omega t\hat{y}$, where ω is a constant which of the following is true ?

A. Velocity is perpendicular to $\vec{r}$ and acceleration is directed away from the origin.

B. Velocity and acceleration both are perpendicular to $\vec{r}$.

C. Velocity and acceleration both are parallel to $\vec{r}$.

D. Velocity is perpendicular to $\vec{r}$ and acceleration is directed towards the origin.

Answer: D

Watch Video Solution

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

B. $3A + 7B$

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

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

Answer: C

Watch Video Solution

35. Two cars P and Q start from a point at the same time in a straight line and their position are represented by $x_p(t)=at+bt^2$ and $x_Q(t)=ft-t^2$. At what time do the cars have the same velocity ?

A. $\frac{a+f}{a(1+b)}$

B. $\frac{f-a}{2(1+b)}$

C. $\frac{a-f}{1+b}$

D. $\frac{a+f}{2(b-1)}$

Answer: B

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36. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if the remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be :

A. $\frac{t_1 t_2}{t_2 - t_1}$

B. $\frac{t_1 t_2}{t_2 + t_1}$

C. $t_1 - t_2$

D. $\frac{t_1 + t_2}{2}$

Answer: B

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37. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\vec{E}$. Due to the force $q\vec{E}$, its velocity increases from 0 to $6m/s$ in one second duration.

At that instant the direction of field is reversed.

The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively.

A. $1.5m/s, 3m/s$

B. $2m/s, 4m/s$

C. $1m/s, 3.5m/s$

D. $1m/s, 3m/s$

Answer: D

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AIIMS Questions

1. 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: A

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2. The velocity of a bullet is reduced from $200m/s$ to $100m/s$ while travelling through a wooden block of thickness $10cm$. The retardation, assuming it to be uniform, will be.

A. $10 \times 10^4 m/s^2$

B. $12 \times 10^4 m/s^2$

C. $12.5 \times 10^4 m/s^2$

D. $15 \times 10^4 m/s^2$

Answer: D

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3. A particle starts from rest, accelerates at $2\frac{m}{s^2}$ for 10 s and then goes for constant speed for 30 s and then decelerates at $4\frac{m}{s^2}$ 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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4. Three different objects of masses m_1, m_2 and m_2 are allowed to fall from rest and from the same point O along three different frictionless paths. The speeds of three objects on reaching the ground will be:

A. $m_1 : m_2 : m_3$

B. $m_1 : 2m_2 : 3_{m_3}$

C. $1 : 1 : 1$

D. $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

Answer: C

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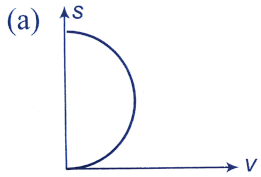
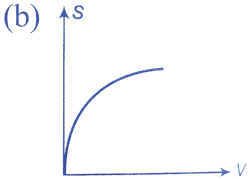
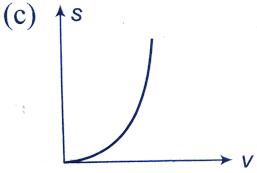
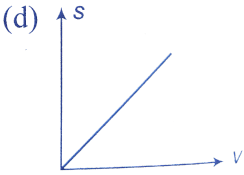
5. An object is moving with a uniform acceleration which is parallel to its instantaneous direction of motion. The dispalcement (s)-velocity (v) graph of this object is.

A. 

B. 

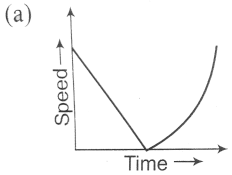
C. 

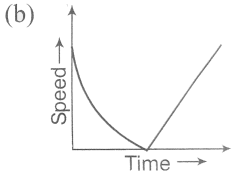
D. 

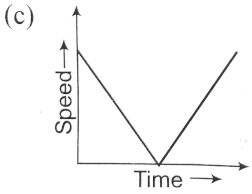
Answer: C

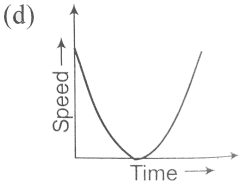
Watch Video Solution

6. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its height if the air resistance is not ingnored ?

A. 

B. 

C. 

D. 

Answer: C

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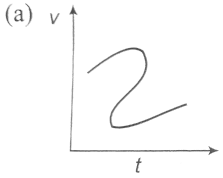
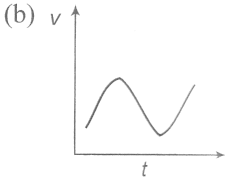
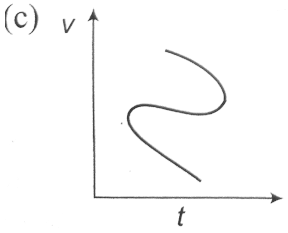
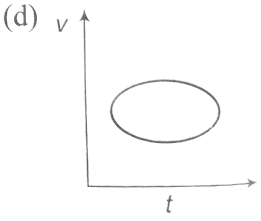
7. Which of the following velocity-time graphs shows a realistic situation for a body in motion ?

A. 

B. 

C. 

D. 

Answer: B

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8. 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. $\sqrt{3V_o}$

B. $3V_o$

C. $9V_o$

D. $3/2V_o$

Answer: A

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9. Two spheres of same size, one of mass $2kg$ and another of mass $4kg$, are dropped simultaneously from the top of Qutub Minar

$(height = 72m)$. When they are $1m$ above the ground, the two spheres have the same.

A. momentum

B. kinetic energy

C. potential energy

D. acceleration

Answer: D

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10. Two cars are moving in the same direction with the same speed $30km/hr$. They are separated by a distance of $5km$, the speed of a car moving in the opposite direction of it meets these two cars at an interval of 4 minutes, will be.

A. $40km/hr$

B. $45km/hr$

C. $10km/hr$

D. $15km/hr$

Answer: B

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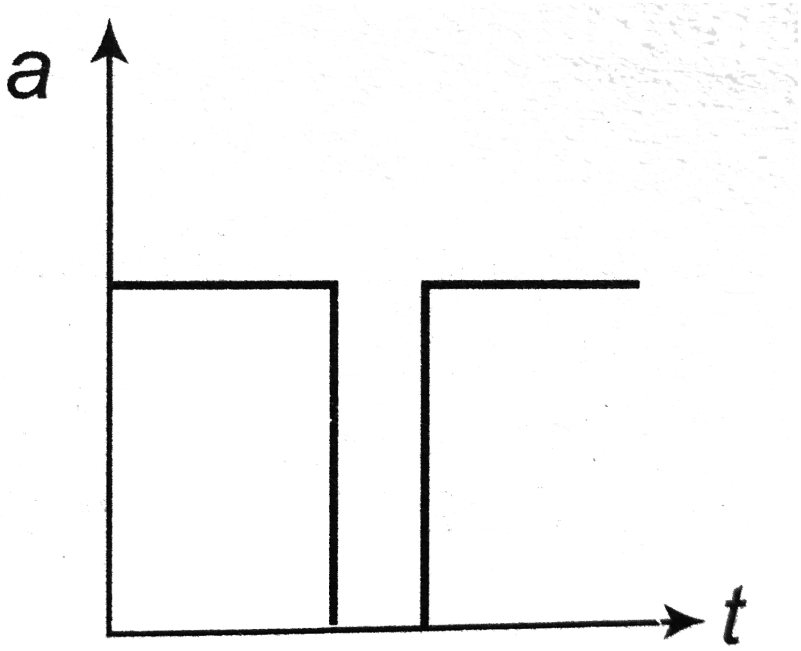
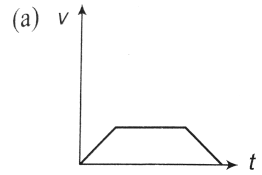
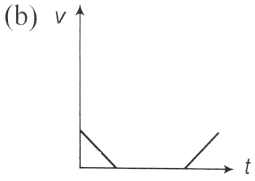
11. Acceleration-time graph of a body is shown. The corresponding velocity-time graph of the same body is.



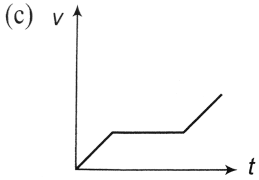
A.



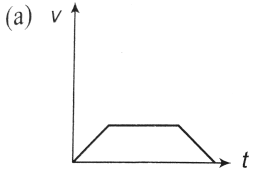
B.



C.



D.



Answer: C

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12. A particle starts from rest with uniform acceleration and is velocity after n seconds v. The displacement of the body in last two seconds is.

A. $\frac{2v(n+1)}{n}$

B. $\frac{v(n+1)}{n}$

C. $\frac{v(n-1)}{n}$

D. $\frac{2v(n-1)}{n}$

Answer: D

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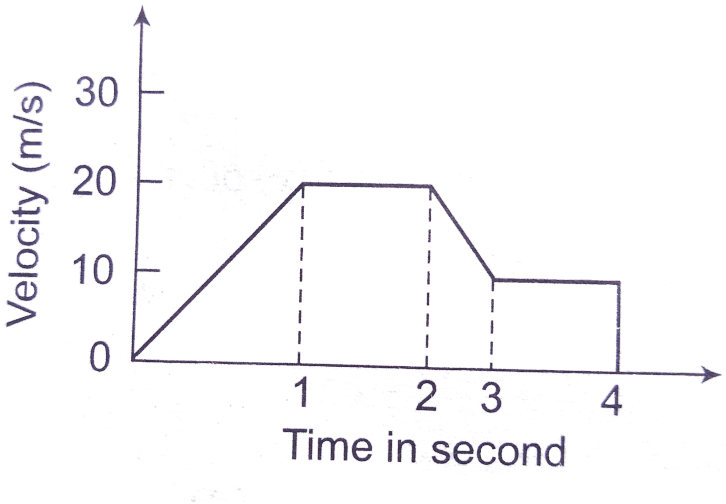
13. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled

by the particle in four seconds is.



A. 60 m

B. 55 m

C. 25 m

D. 30 m

Answer: B

Watch Video Solution

14. A body is projected vertically up with a velocity v and after some time it returns to the point from which it was projected. The average velocity and average speed of the body for the total time of flight are

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

B. 0 and $\frac{v}{2}$

C. 0 and 0

D. $\frac{\vec{v}}{2}$ and 0.

Answer: B

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15. Assertion: Retardation is directly opposite to the velocity.

Reason: Retardation is equal to the time rate of decrease of speed.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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16. Assertion: A body having non zero acceleration can have a constant velocity.

Reason: Acceleration is the rate of change of velocity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

Watch Video Solution

17. Assertion: Two balls of different masses are thrown vertically upward with same speed. They will pass through their point of projection in the downward direction with the same speed.

Reason: The maximum height and downward velocity attained at the point of projection are independent of the mass of the ball.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

18. Assertion: An object can have constant speed but variable velocity.

Reason: Speed is a scalar but velocity is a vector quantity.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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19. Assertion: The slope of displacement-time graph of a body moving with high velocity is steeper than the slope of displacement-time graph of a body with low velocity.

Reason: Slope of displacement-time graph = Velocity of the body.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

20. Assertion: Two bodies of masses M and $m(M > m)$ are allowed to fall from the same height if the air resistance for each be the same then both the bodies will reach the earth simultaneously.

Reason: For same air resistance, acceleration of both the bodies will be same.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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Chapter Test

1. A particle moves in a straight line, its position (in m) as function of time is given by $x = \left(at^2 + b\right)$.

What is average velocity in time interval $t = 3\,\text{sec}$ to $t = 5\,\text{sec}$? (Where a and b are constant and $a = 1m/s^2, b = 1m$.)

A. $8m/s$

B. $5m/s$

C. $10m/s$

D. $12m/s$

Answer: A

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2. The position vector of a particle is given as $\vec{r} = \left(t^2 - 4t + 6\right)\hat{i} + \left(t^2\right)\hat{j}$. The time after which the velocity vector and acceleration vector becomes perpendicular to each other is equal to

A. 2 sec

B. 1 sec

C. 1.5 sec

D. 5 sec

Answer: B

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3. A body is thrown vertically upwards. If air resistance is to be taken into account, then the time during which the body rises is.

A. Equal to the time of fall

B. Less than the time of fall

C. Greater than the time of fall

D. Twice the time of fall

Answer: B

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4. The position of a particle moving rectilinearly is given by $x = t^3 - 3t^2 - 10$. Find the distance travelled by the particle in the first 4 seconds starting from $t = 0$.

A. 24 unit

B. 36 unit

C. 15 unit

D. 50 unit

Answer: A

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5. A body is moving from rest under constant acceleration and let S_1 be the displacement in the first $(p-1)$ sec and S_2 be the displacement in the first p sec. The displacement in $\left(p^2 - p + 1\right)$ sec. will be

A. $S_1 + S_2$

B. $S_1 S_2$

C. $S_1 - S_2$

D. S_1 / S_2

Answer: A

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6. A particle moves in a straight line with an acceleration ams^{-2} at time 't' seconds where $a = -\frac{1}{t^2}$ When $t = 1$ the particle has a velocity of $3ms^{-1}$. Find the velocity of the particle at $t = 4s$.

A. $5.25m/s$

B. $1.25m/s$

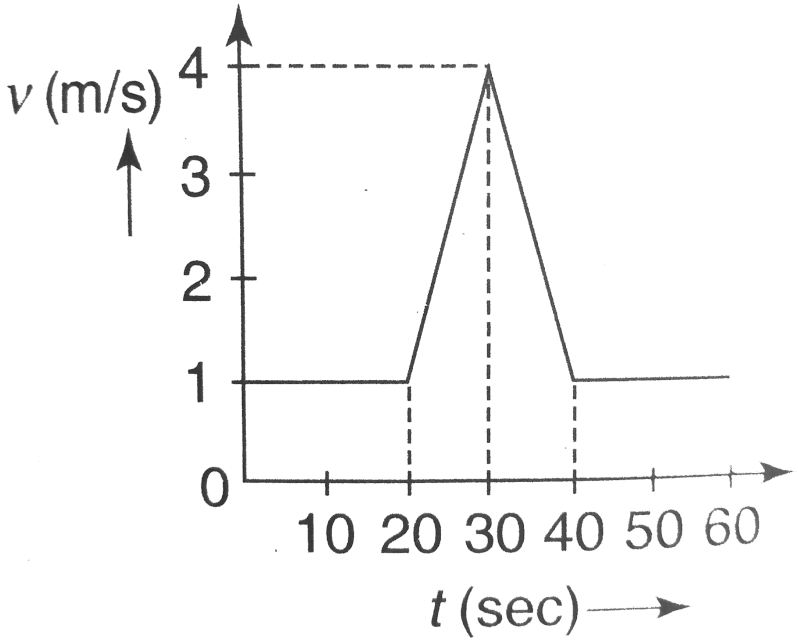
C. $2.25m/s$

D. $8.25m/s$

Answer: C

Watch Video Solution

7. Velocity-time graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is non-zero acceleration and retardation is.



A. 60 m

B. 50 m

C. 30 m

D. 40 m

Answer: B

Watch Video Solution

8. Two particles at a distance $5m$ apart, are thrown towards each other on an inclined smooth plane with equal speed 'v'. Inclined plane is inclined at an angle of 30° with the horizontal. It is known that both particle move along the same straight line. The particle colllide at the point from where the lower is thrown. Find the value of $[\text{take } \ g = 10m/s^2]$.

A. $1m/s$

B. $1.5m/s$

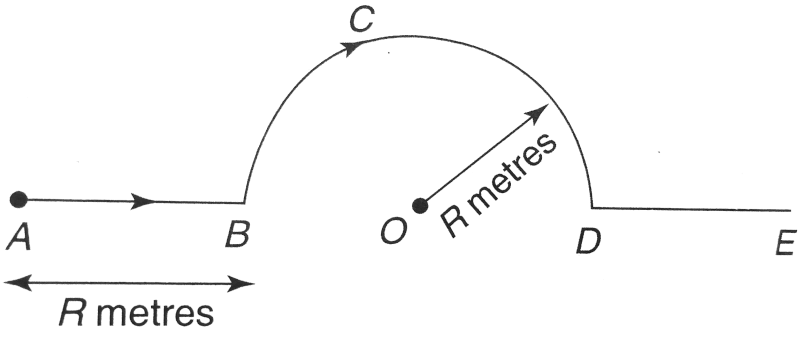
C. $2m/s$

D. $2.5m/s$

Answer: D

Watch Video Solution

9. A particle at $t = 0$ second is at point A and moves along the shown path (ABCDF) with uniform speed $v = \left(1 + \frac{\pi}{3}\right) m/s$. Both the straight segments AB and DE are along the diameter BD of semicircle BCD radius $R = 1$ meter. Find the instant of time at which the instantaneous velocity of the particle is along the direction of average velocity from $t = 0$ second to that instant.



A. 2 sec

B. 4 sec

C. 1 sec

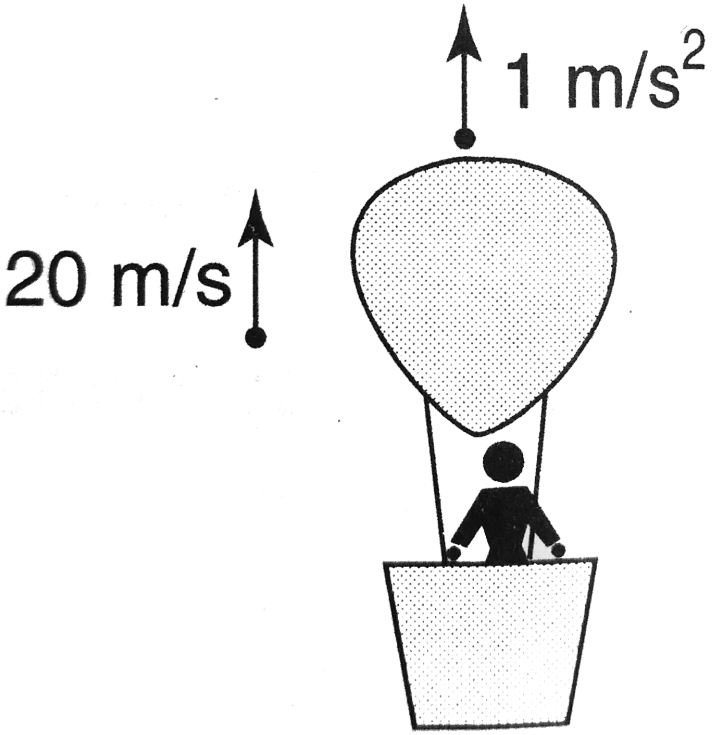
D. 1.5 sec

Answer: C

Watch Video Solution

10. A balloon is moving along with constant upward acceleration of $1m/s^2$. A stone is thrown from the balloon downwards with speed $10m/s$ with respect to the balloon. At the time of projectile balloon is at height $120m$ from the ground and is moving with speed $20m/s$. Find

the time required to fall on the ground by the stone after the projection.



A. 6 sec

B. 4 sec

C. 3 sec

D. 4.5 sec

Answer: A

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11. A train stopping at two stations $2km$ apart on a straight line takes 4 minutes for the journey. Assuming that its motion its uniformly accelerated and then unoformly retarded. If $\frac{1}{x}+\frac{1}{y}=n$, where 'x' and 'y' are the magnitudesof the acceleration and retardation respectively. find the value of n.

A. 2

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

C. 4

D. $\frac{1}{4}$

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B

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13. A parachutist drops first freely from a plane for $10s$ and then his parachute opens out. Now he descends with a net retardation of $2.5ms^{-2}$ If he bail out of the plane at a height of $2495m$ and $g = 10ms^{-2}$, his velocity on reaching the ground will be`.

A. $8m/s$

B. $5m/s$

C. $6m/s$

D. $2.5m/s$

Answer: B

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14. Three particles starts from origin at the same time with a velocity $2ms^{-1}$ along positive x-axis, the second with a velocity $6ms^{-1}$ along negative y-axis, Find the velocity of the third particle along $x = y$ line so that the three particles may always lie in a straight line.

A. $-3\sqrt{3}$

B. $3\sqrt{2}$

C. $-3\sqrt{2}$

D. $2\sqrt{2}$

Answer: B

Watch Video Solution

15. A lift performs the first part of ascent with uniform acceleration a and the remainder with uniform retardation $2a$. The lift starts from rest and finally comes to rest. If t is the time of ascent. Find the height ascended by lift.

A. $\frac{at^2}{4}$

B. $\frac{at^2}{3}$

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

D. $\frac{at^2}{8}$

Answer: B

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16. A particle is projected upwards from the top of a tower. Treat point of projection as origin and upwards as positive. Consider three point on its path such that at (s represents displacement from origin and v represents velocity).

(i) $s > 0, v > 0$

(ii) $s > 0, v < 0$

(iii) $x < 0, v < 0$

Which of the following correctly indicates the distance travelled by particle since its projection to respective points in apalphariate order ?

A. (i) gt (ii) gt (iii)

B. (i) = (ii) lt (iii)

C. (i) lt (ii) lt (iii)

D. ordering depends on exact location of points.

Answer: C

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

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

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

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

Answer: C

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18. A railway track runs parallel to a road until a turn brings the road to railway crossing. A cyclist rides along the road every day at a constant speed $20km/hr$. He normally meets a train that travels in same

direction at the crossing. One day he was late by 25 minutes and met the train $10km$ before the railway crossing. Find the speed of the train.

A. $9km/hr$

B. $90km/hr$

C. $120km/hr$

D. $40km/hr$

Answer: C

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19. Two particles P and Q start from rest and move for equal time on a straight line. Particle P has an acceleration of Xm/s^2 for the first half of the total time and $2Xm/s^2$ for the second half. The particle Q has an acceleration of $2Xm/s^2$ for the first half of the total time and Xm/s^2 for the second half. Which particle has covered longer distance ?

A. both have covered the same distance

B. P has covered the larger distance

C. Q has covered the larger distance

D. none of these

Answer: C

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20. An insect moving along a straight line, travels in every second distance equal to the magnitude of time elapsed. Assuming acceeleration to be constant, and the insect starts at $t = 0$. Find the magnitude of initial velocity of insect.

A. $\frac{3}{2}$ unit

B. $\frac{5}{4}$ unit

C. 2 unit

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

Answer: D

Watch Video Solution

21. A car starts from rest and moves with uniform acceleration a on a straight road from time $t = 0$ to $t = T$. After that, a constant deceleration brings it to rest. In this process the average speed of the car is

A. $\frac{aT}{4}$

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

C. $\frac{aT}{2}$

D. aT

Answer: C

Watch Video Solution

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

A. $v_0 t + \frac{1}{3} bt^2$

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

C. $v_0 t + \frac{1}{6} bt^2$

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

Answer: C

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23. A stone is dropped from the top of a tower. When it crosses a point 5 m below the top, another stone is let fall from a point 25 m below the top. Both stones reach the bottom of the tower simultaneously. Find the height of the tower. Take $g = 10 m / s^2$.

A. 45 m

B. 50 m

C. 60 m

D. 65 m

Answer: A

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24. A car , starting from rest, accelerates at the rate f through a distance S then continues at constant speed for time t and then decelerates at the rate $\frac{f}{2}$ to come to rest . If the total distance traversed is $15S$, then

A. $S = \frac{1}{2}ft^2$

B. $S = \frac{1}{4}ft^2$

C. $S = \frac{1}{72}ft^2$

D. $S = \frac{1}{6}ft^2$

Answer: C

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25. Particle beginning from rest, travels a distance S with uniform acceleration and immediately after travels a distane of $3S$ with uniform velocity followed by a distance $5S$ with uniform deceleration, and comes to rest. Then the ratio of average speed to the maximum speed of the particle is.

A. $1/5$

B. $2/5$

C. $\frac{3}{5}$

D. $\frac{4}{5}$

Answer: C

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26. A car moving at $160km/h$ when passes the mark-A, driver applies brake and reduces its speed uniformly to $40km/h$ at mark-C. The mark are spaced at equal distances along the road as shown below.

At which part of the track the car has instantaneous speed of $100km/h$? Neglect the size of the car.

A. A mark-B

B. Between mark-A and mark-B

C. between mark-B and mark-C

D. insufficient information to decide.

Answer: C

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27. 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. $24ms^{-1}$

B. $25ms^{-1}$

C. $25.5ms^{-1}$

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

Answer: C

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28. A particle moving with uniform acceleration along x-axis has speed vm/s at a position x metre given $v = \sqrt{180 - 16x}$ $\left(0 < x < \frac{180}{16}\right)$

The acceleration of the particle in m/s^2 is.

A. -16

B. -8

C. 8

D. 16

Answer: B

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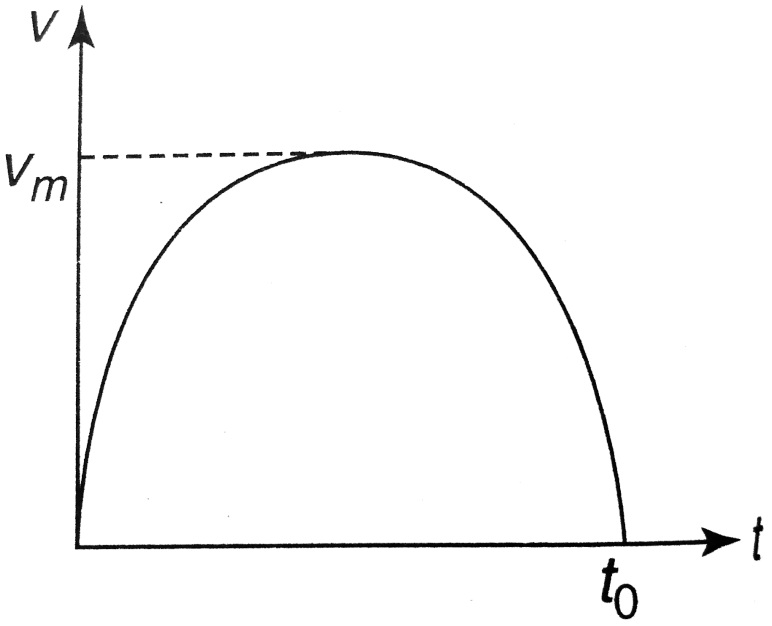
29. The velocity of a particle moving in a straight line varies with time in such a manner that v versus t graph is represented by one-half of an ellipse. The maximum velocity is v_m and the total time of motion is t_0

(i) average velocity of the particle is $\frac{\pi}{4}v_m$

(ii) such motion cannot be realized in practical terms.



A. only (i) is correct

B. only (ii) is correct

C. both (ii) and (ii) are correct

D. both (i) and (ii) are wrong

Answer: C

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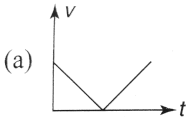
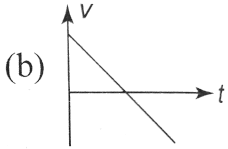
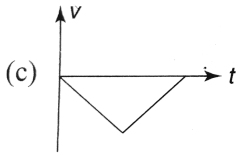
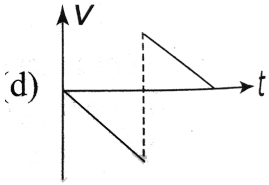
30. A ball is dropped from some height. After rebound from the floor it ascends to the same height. Draw the velocity-time graph for the given motion.

A. 

B. 

C. 

D. 

Answer: D

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