PHYSICS

BOOKS - MTG PHYSICS (ENGLISH)

MOTION IN A STRAIGHT LINE

Introduction

1. A branch of physics dealing with motion without considering its causes is known as

A. statics

B. dynamics

C. kinematics

D. hydrodynamics

Answer: C

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Position Path Length And Displacement

1. Which of the following statements is incorrect? a) Path length is a scalar quantity whereas displacement is a vector quantity. b) The displacement depends

only on the end points whereas path length depends on the actual path followed. c) The path length is always positive whereas displacement can be positive, negative and zero. d) The path length is always positive whereas displacement can be positive, negative and zero.

A. Path length is a scalar quantity whereas displacement is a vector quantity.

B. The displacement depends only on the end points whereas path length depends on the actual path followed.

C. The path length is always positive whereas displacement can be positive, negative and zero.

D. The path length is always positive whereas displacement can be positive, negative and zero.

Answer: B

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2. The numerical ratio of displacement to the distance covered is always a) always equal to one b)

always less than one c) always greater than one d) equal to or more than one

A. always equal to one

B. always less than one

C. always greater than one

D. equal to or more than one

Answer: D

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3. Which of the following statements is incorrect? a) Displacement is independent of the choice of origin

of the axis. b) Displacement may or may not be equal to the distance travelled. c) When a particle returns to its starting point, its displacement is not zero. d) Displacement does not tell the nature of the actual motion of a particle between the points.

A. Displacement is independent of the choice of origin of the axis.

B. Displacement may or may not be equal to the distance travelled.

C. When a particle returns to its starting point, its displacement is not zero.

D. Displacement does not tell the nature of the actual motion of a particle between the points.

Answer: C

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4. A man goes 10 m towards North, then 20 m towards east then displacement is

A. 22.5 m

B. 25 m

C. 25.5 m

D. 30 m

Answer: A

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5. A drunkard is walking along a straight road. He takes five steps forward and three steps backward and so on. Each step is $1m$ long and takes $1s$. There is a pit on the road $11m$, away from the starting point. The drunkard will fall into the pit after.

A. 21 s

B. 29 s

C. 31 s

D. 37 s

Answer: B

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6. The three initial and final positions of a man on the x-axis are given as

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

(iii) (-7 m, 3 m)

A. (i)

B. (ii)

C. (iii)

D. i) and iii)

Answer: B

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Average Velocity And Average Speed

1. Which of the following statements is incorrect? (i) Average velocity is path length divided by time interval.

(ii) In general, speed is greater than the magnitude of the velocity.

(iii) A particle moving in a given direction with a non-zero velocity can have zero speed. (iv) The magnitude of average velocity is the average speed.

A. (ii) and (iii)

B. (ii) and (iv)

C. (i), (iii) and (iv)

D. All four

Answer: C

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

A. velocity

B. acceleration

C. work done

D. The averge velocity of the car in going for a particle in a given interval of time represents

Answer: D

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3. The area under velocity-time graph for a particle in a given interval of time represnets

A. velocity

B. acceleration

C. work done

D. Displacement does not tell the nature of the actual motion of a particle between the points.

Answer: D

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4. A cyclist moving a car circular track of raidus 40 cm completes half a revolution in 40 s. Its average velocity is

A. zero

B. $4\pi ms^{-1}$

C. $2cms^{-1}$

D. $8\pi ms^{-1}$

Answer: C

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5. The position of an object moving along x-axis is given by $x = a + bt^2$, where $a = 8.5m$ and b=2.5 ms^(-2) and (t) is measured in seconds. What is the velocity at t=1= $0s$ and t=2.0 s? What is the average velocity between $t = 2.0s$ and $t = 4.0s$? a) 5 m/s b) 10 m/s c) 15 m/s d) 20 m/s

A. $5ms^{-1}$

B. $10ms^{-1}$

C. $15ms^{-1}$

D. $20ms^{-1}$

Answer: C

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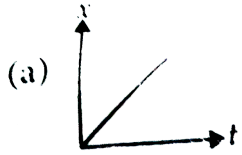
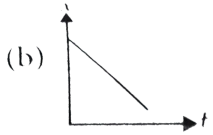
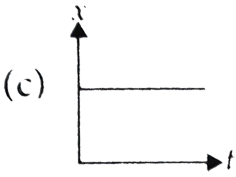
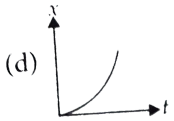
6. Which of the following graphs represents the position time-graph of a particle moving with negative velocity?

A. 

B. 

C. 

D. 

Answer: B

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7. A body moving along a straight line travels one third of the total distance with a speed of $3.0ms^{-1}$. The remaining distance is covered with a speed of $4.0ms^{-1}$ for half the time and $5.0ms^{-1}$ for the other half of the time. The average speed during the motion is

A. $4.0ms^{-1}$

B. $6.0ms^{-1}$

C. $3.8ms^{-1}$

D. $2.4ms^{-1}$

Answer: C

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

A. 0,0

B. $6kmh^{-1}, 0$

C. $0, 6km^{-1}$

D. $6kmh^{-1}, 6kmh^{-1}$

Answer: B

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Instantaneous Velocity And Speed

1. Speedometer of a car measures

A. average speed

B. average velocity

C. instantaneous speed

D. instantaneous velocity

Answer: C

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2. Speedometer measures the speed of the car in

A. ms^{-1}

B. kmh^{-1}

C. cms^{-1}

D. $km\ \min^{-1}$

Answer: B

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

A. Its speed is zero.

B. Its acceleration is zero.

C. Its acceleration is opposite to the velocity.

D. Its speed may be variable.

Answer: B

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4. The position of and object moving along x-axis is given by $x = a + bt^2$, where $a = 8.5m$ and b=2.5 ms^(-2) and (t) is measured in seconds. What is the velocity at $t = 0$s and $t = 2.0s$? What is the average velocity between $t = 2.0s$ and $t = 4.0s$?

A. $5ms^{-1}$

B. $10ms^{-1}$

C. $15ms^{-1}$

D. $20ms^{-1}$

Answer: B

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5. The motion of a particle is described by the equation $x = a + bt^2$ where $a = 15$ cm and $b = 3cm/s^2$. Its instantaneous velocity at time 3 sec will be

A. $33cms^{-1}$

B. $18cms^{-1}$

C. $16cms^{-1}$

D. $32cms^{-1}$

Answer: A

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6. The motion of a particle is described by x = $x_o\left(1-e^{-kt}\right)$„ t $\geq$, $x_o$gt0, k gt 0. With what velocity does the particle start?

A. x_o/k

B. x_ok

C. $\frac{k}{x_o}$

D. $2x_o k$

Answer: B

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7. The velocity of the particle at any time t is given by $vu = 2t(3-t)ms^{-1}$. At what time is its velocity maximum?

A. 2 s

B. 3 s

C. 2/3 s

D. 3/2 s

Answer: D

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8. The motion of a body is given by the equation $d\nu/dt = 6 - 3\nu$ where ν is the speed in ms^{-1} and t is time in s. The body is at rest at t = 0. The speed varies with time as

A. $\nu = \left(1 - e^{-3t}\right)$

B. $\nu = 2\left(1 - e^{-3t}\right)$

C. $\nu = 1 + e^{-2t}$

D. $\nu = 2\left(1 + e^{-2t}\right)$

Answer: B

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

A. 54 m

B. 81 m

C. 24 m

D. 32 m

Answer: A

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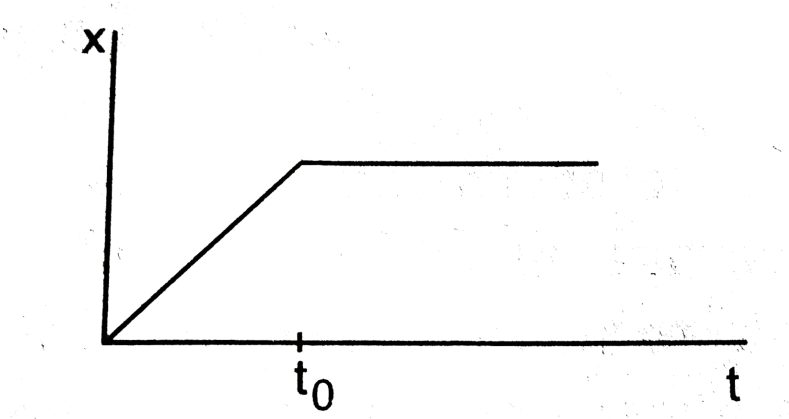
10. Figure shows the displacement-time graph of a particle moving on the X-axis



A. The particle is at rest.

B. The particle is continuously going along x-direction.

C. The velocity of the particle increases upto time t_o and then becomes constant.

D. The particle moves at a constant velocity up to a time t_o and then stops.

Answer: D

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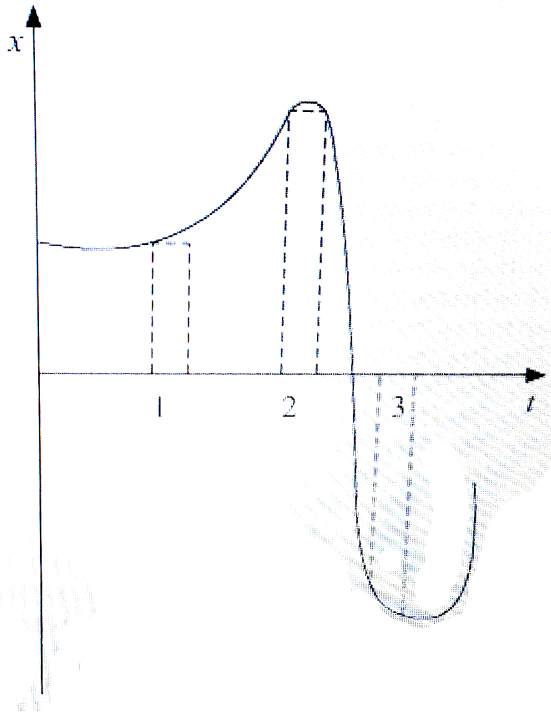
11. Figure 3.24 gives the $x - t$ plot of a particle in one-dimensional motion. Three different equal

intervals of time are shown. In which interval is the average speed greatest, and in which is it the least ? Give the sign of average velocity for each interval.



A. ν_1 gt ν_2

B. $\nu_2 > \nu_1$

C. $\nu_1 = \nu_2$

D. data is insufficient

Answer: A

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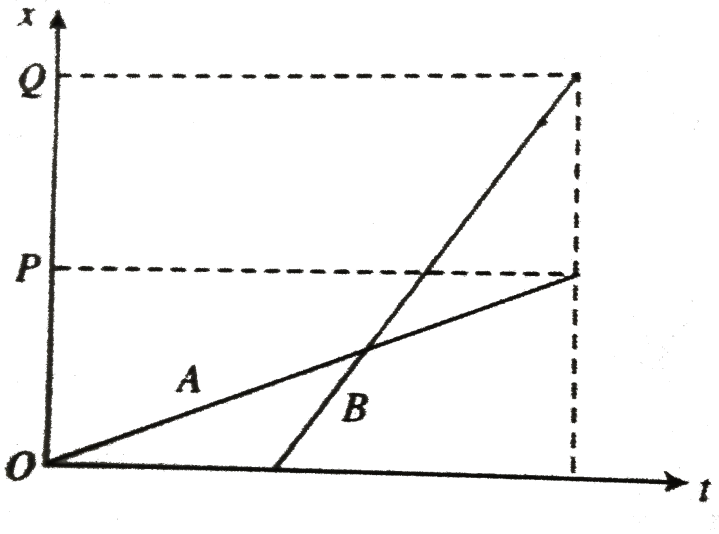
12. The position-time (x-t) graphs for two children A and B returning from their school O to their homes P and Q, respectively, are shown in . Choose the correct entries in the brackets



a.(A/B) lives closer to school than (B/A).

b. (A/B) starts from the school earlier than (B/A).

c. (A/B) walks faster than (B/A).

d. A and B reach home at the (same//differnt) time.

e. (A//B) overtakes on the road (once//twice).

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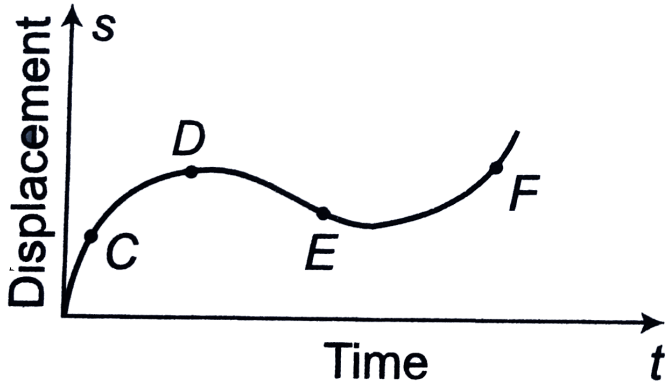
13. The displacement-time graph of moving particle is shown below



The instantaneous velocity of the particle in negative at the point

A. C

B. D

C. E

D. F

Answer: C

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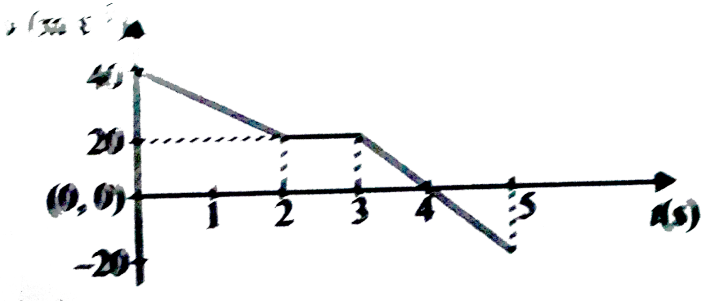
14. In the given v-t graph the distance travelled by the body in 5 seconds will be



A. 100 m

B. 80 m

C. 40 m

D. 20 m

Answer: A

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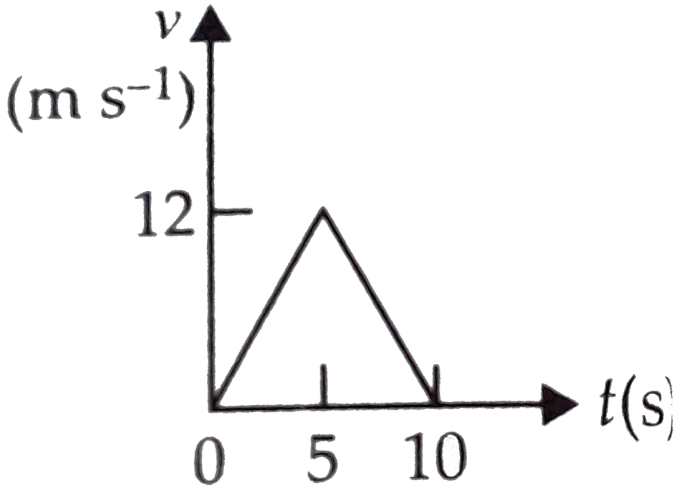
15. The speed-time graph of a particle moving along a fixed direction as shown in the figure. The distance

traversed by the particle between t = 0 s to t = 10 s is



A. 20 m

B. 40 m

C. 60 m

D. 80 m

Answer: C

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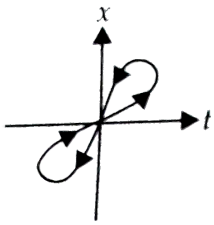
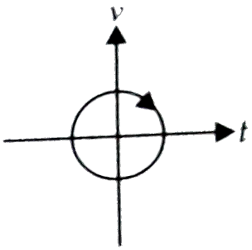
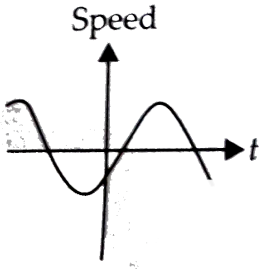
16. Which of the following graphs cannot possibly represent one dimensional motion of a particle?



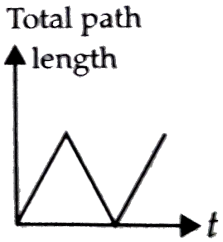
(i)



(ii)



(iii)



(iv)

A. (i) and (ii)

B. (ii) and (iii)

C. (i), (ii) and (iii)

D. All four

Answer: D

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Acceleration

1. The displacement of a body is proporticonal to the cube of time elapsed. What is the nature of the acceleration of the body ?

A. increasing with time

B. decreasing with time

C. constant but not zero

D. zero

Answer: A

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2. Match Column I with Column II.

Column I (Physical quantity)		Column II (Formula)	
(A)	Instantaneous velocity, $v =$	(p)	$\frac{\Delta x}{\Delta t}$
(B)	Average velocity, $\bar{v} =$	(q)	$\lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t}$
(C)	Instantaneous acceleration, $a =$	(r)	$\frac{\Delta v}{\Delta t}$
(D)	Average acceleration, $\bar{a} =$	(s)	$\lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t}$

A. A - p, B - q, C - r, D - s

B. A - r, B - s, C - p, D - q

C. A - s, B - p, C- q, D - r

D. A - q, B - r, C - s, D - p

Answer: C

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3. The slope of the tangent at a point on the curve of concentration of a reactant as a function of time gives the instantaneous rate of reaction.

A. acceleration

B. velocity

C. impusle

D. momentum

Answer: A

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4. The area under acceleration-time graph gives

A. intial velocity

B. final velocity

C. change in velocity

D. distance travelled

Answer: C

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5. Which of the following statements is not correct regarding the motion of a particle in a straight line?

A. x-t graph is a parabola, if motion is uniformly accelerated.

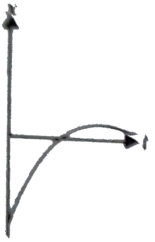
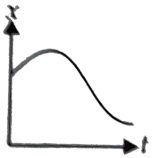
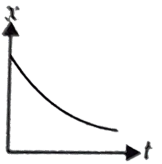
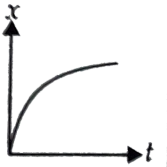
B. v-t is a straight line inclined to the time-axis, if motion is uniformly accelerated.

C. x-t graph is a straight line inclined to the time axis if motion is uniform and acceleration is zero.

D. v-t graph is a parabola if motion is uniform and acceleration is zero.

Answer: D

6. Match the Column I with Column II.

Column I (Graph)		Column II (Characteristic)	
(A)		(p)	Has $v > 0$ and $a < 0$ throughout.
(B)		(q)	Has $x > 0$ throughout and has a point with $v = 0$ and a point with $a = 0$.
(C)		(r)	Has a point with zero displacement for $t > 0$.
(D)		(s)	Has $v < 0$ and $a > 0$.

A. A - p, B - q, C - s, D - r

B. A - q, B - p, C - r, D - s

C. A - s, B - r, C - q, D - p

D. A - r, B - q, C - s, D - p

Answer: D

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7. A particle moving along a straight line has a velocity $v\ ms^{-1}$, when it cleared a distance of x m. These two are connected by the relation v = $\sqrt{49+x}$. When its velocity is $1ms^{-1}$, its acceleration is

A. $2ms^{-2}$

B. $7ms^{-2}$

C. $1ms^{-2}$

D. $0.5ms^{-2}$

Answer: D

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8. A particle moves rectilinearly. Its displacement x at time t is given by $x^2 = at^2 + b$ where a and b are constants. Its acceleration at time t is proportional to

A. $\frac{1}{x^3}$

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

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

D. $\frac{1}{x} - \frac{t^2}{x^3}$

Answer: A

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9. A car starts from rest, attain a velocity of $36kmh^{-1}$ with an acceleration of $0.2ms^{-2}$, travels 9 km with this uniform velocity and then comes to halt with a uniform deaceleration of 0.1 ms^{-2}. The total time of travel of the car is

A. 1050 s

B. 1000 s

C. 950 s

D. 900 s

Answer: A

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10. A point moves with a uniform acceleration and v_1, v_2, v_3 denote the average velociies in the three succellive intervals of time t_1 ,t_2 and t_3. Find the ratio of (v_1 - v_2) and (v_2 - v_3).

A. $t_1 - \frac{t_2}{t_2} - t_3$

B. $t_1 - \frac{t_3}{t_2} + t_3$

C. $t_1 + \frac{t_2}{t_2} - t_3$

D. $t_1 + \frac{t_2}{t_2} + t_3$

Answer: D

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11. A particle starts from point A moves along a straight line path with an acceleration given by a = p - qx where p, q are connected and x is distance from point A . The particle stops at point B. The maximum velocity of the particle is

A. $\frac{p}{q}$

B. $\frac{p}{\sqrt{q}}$

C. $\frac{q}{p}$

D. $\sqrt{\frac{q}{p}}$

Answer: B

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

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

B. $\nu(t) > 0$ for all $t > 0$

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

D. all of these

Answer: A

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13. Position-time graph for motion with zero acceleration is

A. 

B. 

C. 

D. 

Answer: C

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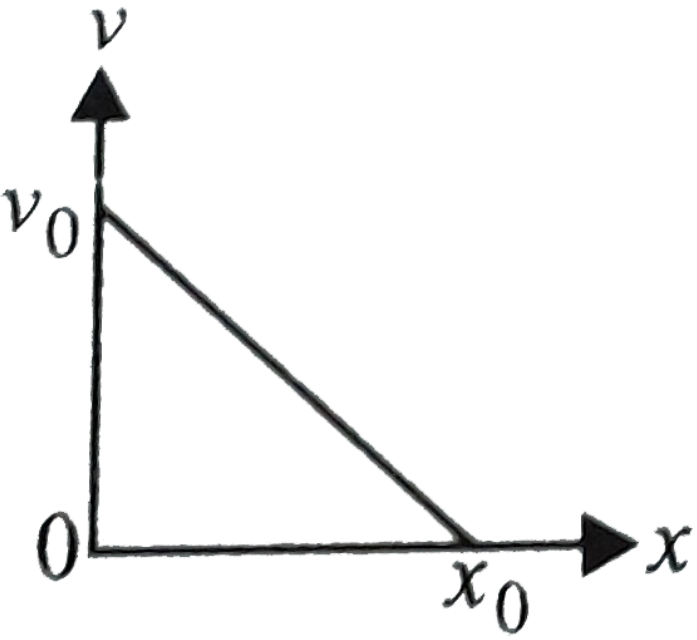
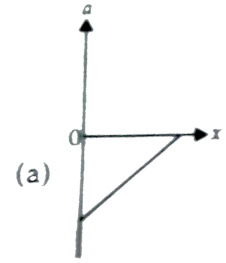
14. The velocity -displacement graph of a particle is as shown in the figure. Which of the following graphs correctly represents the variation of acceleration with

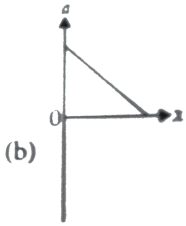
displacement?

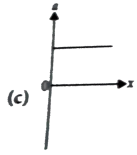


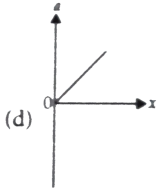
A.



B.



C. 

D. 

Answer: A

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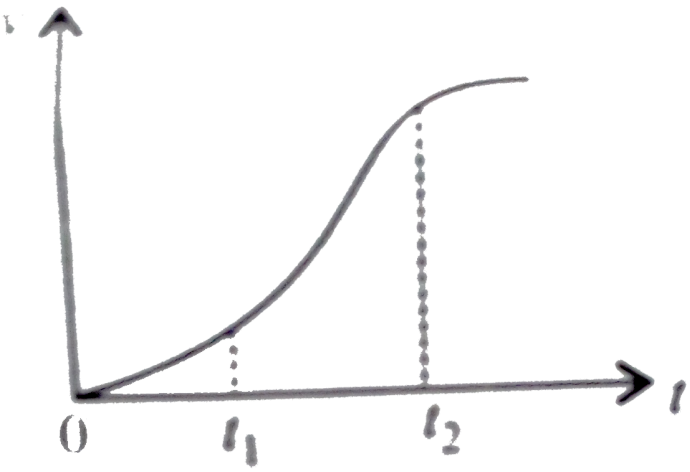
15. The velocity-time graph of a particle in one-dimensional motion is shown in the figure. Which of the following formulae is correct for describing the

motion of the particle over the time interval t_1 to t_2?



A.

$$x(t_2) = x(t_1) + v(t_1)(t_2 - t_1) + \left(\frac{1}{2}\right)a(t_2 - t_1)^2$$

B. $v(t_2) = v(t_1) + a(t_2 - t_1)$

C. $v_{\text{average}} = \dfrac{x(t_2) + x(t_1)}{t_2 - t_1}$

D. $a_{\text{average}} = \dfrac{v(t_2) - v(t_1)}{t_2 - t_1}$

Answer: D

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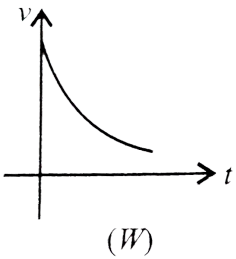
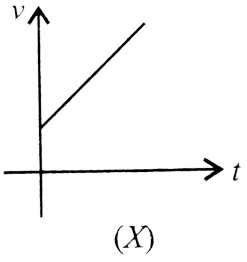
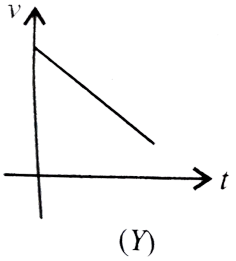
16. Given below are four curves describing variation of velocity with time of a particle. Which one of these describe the motion of a particle initially in positive direction with constant negative acceleration?



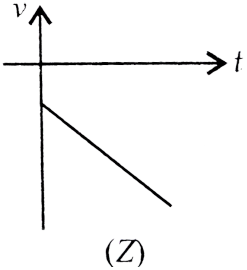
(W)



(X)



(Y)



(Z)

A. (W)

B. (X)

C. (Y)

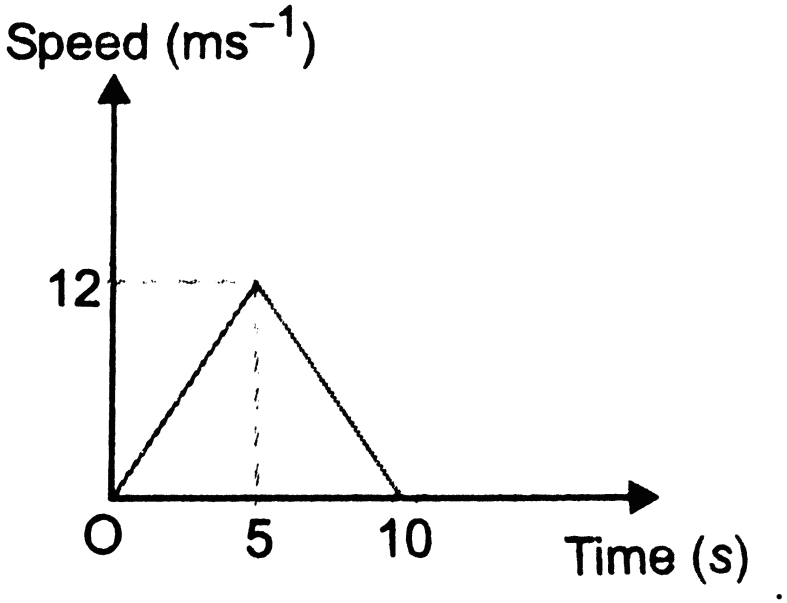
D. (Z)

Answer: C

Watch Video Solution

17. The speed-time graph of a particle moving along a fixed direction is shown in the Fig. 2 (CF) . 15. The distance traversed by the particle between $t = 2s$

and $6s$ is .



A. 1. 26 m

B. 2. 36 m

C. 3. 46 m

D. 4. 56 m

Answer: B

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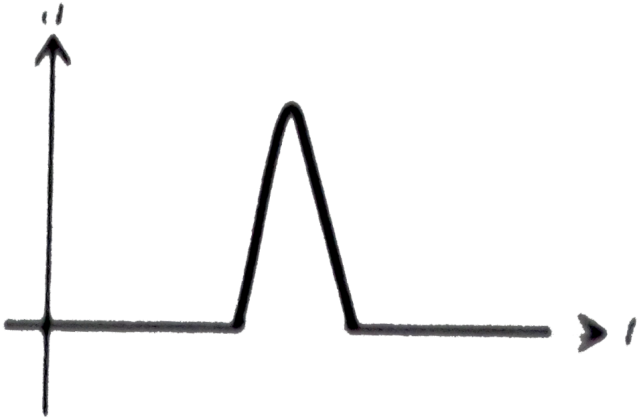
18. The given acceleration-time graph represents which of the following physical situation?



A. A cricket ball moving with a uniform speed is hit with a bat for a very short time interval.

B. A ball is falling freely from the top of a tower.

C. A car moving with constant velocity on a straight road.

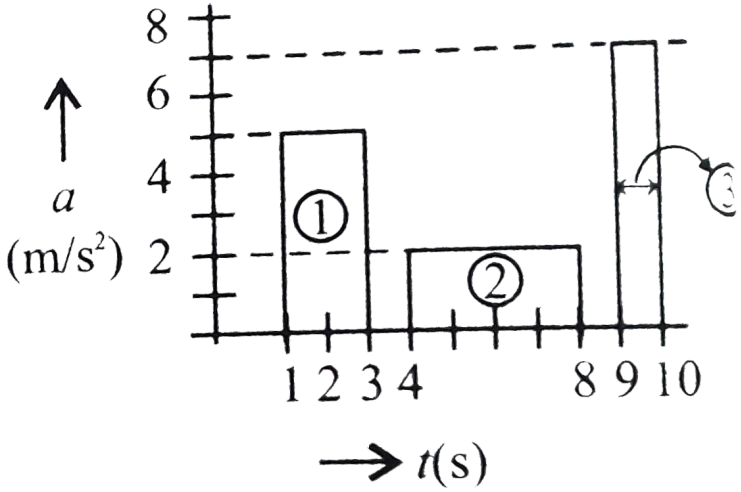
D. A football is kicked into the air vertically upwards.

Answer: A

 Watch Video Solution

19. The figure shows a particle moving along x - axis subjected to three particles of acceleration (a). Rank the periods according to the increase they produce in

the particle velocity, greatest first.



A. (a) ② > ① > ③

B. (b) ② > ③ > ①

C. (c) ① > ③ > ②

D. (d) ① > ② > ③

Answer: D

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Kinematic Equations For Uniformly Accelerated Motion

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

A. $x_2 = 3x_1$

B. $x_2 = x_1$

C. $x_2 = 4x_1$

D. $x_2 = 2x_1$

Answer: A

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

A. 1. uniform velocity

B. 2. uniform acceleration

C. 3. variable acceleration

D. 4. uniform speed

Answer: B

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3. Which of the following equations does not represent the kinematic equations of motion?

A. v = u + at

B. S = ut + at^2

C. S = vt + $\frac{1}{2}at^2$

D. $v^2 - u^2$ = 2aS

Answer: C

Watch Video Solution

4. Which of the following statements is not correct?

A. 1. The zero velocity of a body at any instant does not necessarily impy zero acceleration at that instant.

B. 2. The kinematic equation of motions are true only for motion in which the magnitude and the direction of acceleration are constants during the couse of motion.

C. 3. The sign of acceleration tells us whether the particle's speed is increasing or decreasing.

D. 4. all of these

Answer: C

Watch Video Solution

5. The distances covered by a freely falling body in its first, second, third, ..., b^{th} seconds of its motion a)forms an arithmetic progression b) forms a geometric progression c) do not form any well defined series d) form a series corresponding to the difference of square root of the successive natural numbers.

A. forms an arithematic progression

B. forms a geometric progression

C. do not form any well defined series

D. form a series corresponding to the difference of square root of the successive natural numbers.

Answer: A

6. A body covers 20 m, 22 m, 24 m, in 8^{th}, 9^{th} and 10^{th} seconds respectively. The body starts

A. 1. from rest and moves with uniform velocity.

B. 2. from rest and moves with uniform acceleration.

C. 3. with an initial velocity and moves with uniform acceleration.

D. 4. with an initial velocity and moves with uniform velocity.

Answer: C

Watch Video Solution

7. A player throws a ball vertically upwards with velocity u. At highest point,

A. 1. both the velocity and acceleration of the ball are zero.

B. 2. the velocity of the ball is u but its acceleration

C. 3. the velocity of the ball is zero but its acceleration is g.

D. 4. the velocity of the ball is u but its acceleration is g.

Answer: C

Watch Video Solution

8. A car moving along a straight road with speed of $144 km h^{-1}$ is brought to a stop within a distance of 200 m. How long does it take for the car to stop ?

A. 5 s

B. 10 s

C. 15 s

D. 20 s

Answer: B

Watch Video Solution

9. An auto travelling along a straight road increases its speed from $30.0ms^{-1}$ to $50.0ms^{-1}$ in a distance of 180 m. If the acceleration is constant, how much time elapse while the auto moves this distance?

A. 6.0 s

B. 4.5 s

C. 3.6 s

D. 7.0 s

Answer: B

 Watch Video Solution

10. A body falling freely under gravity passes two points 30 m apart in 1 s. From what point above the upper point it began to fall? (Take g = $9.8ms^{-2}$).

A. a. 32.1 m

B. b. 16.0 m

C. c. 8.6 m

D. d. 4.0 m

Answer: A

Watch Video Solution

11. A player throws a ball upwards with an initial speed of $30ms^{-1}$. How long does the ball take to return to the player's hands? (Take g = 10 ms^{-2})

A. a. 3 s

B. b. 6 s

C. c. 9 s

D. d. 12 s

Answer: B

Watch Video Solution

12. A girl standing on a stationary lift (open from above) throws a ball upwards with initial speed $50ms^{-1}$. The time taken by the ball to return to her hands is (Take g = $10ms^{-2}$)

A. a. 5 s

B. b. 10 s

C. c. 15 s

D. d. 20 s

Answer: B

Watch Video Solution

13. In the question number 62, if the lift starts moving up with a uniform speed of $5ms^{-1}$ and the girl again throws the ball up with the same speed, how much does the ball take to return to her hands?

A. a. 5 s

B. b. 10 s

C. c. 15 s

D. d. 20 s

Answer: B

View Text Solution

14. It is a common observation that rain clouds can be at about 1 km altitude above the ground. If a rain drop falls from such a height freely under gravity, then what will be its speed in km h^{-1}?

(Take g = $10ms^{-2}$)

A. a. 510

B. b. 610

C. c. 710

D. d. 910

Answer: A

Watch Video Solution

15. A man is standing on top of a building 100 m high. He throws two balls vertically, one at t = 0 and other after a time interval (less than 2s). The later ball is thrown at a velocity of half the first. The vertical gap between first and second ball is 15 m at t = 2. The gap is found to remain constant. The velocities with which the balls were thrown are (Take g = $10ms^{-1}$)

A. $20ms^{-1}, 10ms^{-1}$

B. $10ms^{-1}, 5ms^{-1}$

C. $16ms^{-1}, 8ms^{-1}$

D. $30ms^{-1}, 15ms^{-1}$

Answer: A

Watch Video Solution

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

A. 1 s

B. 4 s

C. 2 s

D. 16 s

Answer: C

Watch Video Solution

17. A ball is thrown vertically upwards with a velcotiy of $20ms^{-1}$ from the top of a multi-storey building. The height of the point fromwher the ball is thrown if 25m from the ground. (a) How high the ball will rise ? And (b) how long will it be before the ball hits the ground ? Take. $g = 10ms^{-2}$.

A. 10 m

B. 15 m

C. 45 m

D. 25 m

Answer: C

Watch Video Solution

18. In the question number 67, the time taken by the ball to reach the ground is

A. 2 s

B. 3 s

C. 5 s

D. 7 s

Answer: C

View Text Solution

19. Two trains A and B of length $400m$ each are moving on two parallel tracks with a uniform speed of $72kmh^{-1}$

in the same direction with A ahead of B .The driver of B decides to overtake A

and accelerates by 1m/s^2.if after 50s ,the guard of B just passes the driver of A , what was the original distance between them ?

A. 750 m

B. 1000 m

C. 1250 m

D. 2250 m

Answer: C

Watch Video Solution

20. The velocity of a particle at an instant is $10ms^{-1}$. After 3 s its velocity will becomes $16ms^{-1}$. The velocity at 2 s, before the given instant will be

A. $6ms^{-1}$

B. $4ms^{-1}$

C. $2ms^{-1}$

D. $1ms^{-1}$

Answer: A

Watch Video Solution

21. A body covers a distance of 4 m in 3^{rd} second and 12m in 5^{th} second. If the motion is uniformly accelerated. How far will it travel in the next 3 seconds?

A. 10 m

B. 30 m

C. 40 m

D. 60 m

Answer: D

Watch Video Solution

22. Stopping distance of a moving vehicle is directly proportional to

A. square of the initial velocity

B. square of the initial acceleration

C. the initial velocity

D. the initial acceleration

Answer: A

 Watch Video Solution

23. 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

 Watch Video Solution

24. An object falling through a fluid is observed to have acceleration given by $a = g - bv$ where ` g= gravitational acceleration and (b) is constant. After a long time of rlease. It is observed to fall with constant speed. What must be the value of constant speed ?

A. g/b

B. b/g

C. bg

D. b

Answer: A

Watch Video Solution

25. A particle is released from rest from a tower of height 3h. The ratio of time intervals for fall of equal height h i.e. $t_1 : t_2 : t_3$ is :

A. $t_1 : t_2 : t_3 = 3 : 2 : 1$

B. $t_1 : t_2 : t_3 = 1 : (\sqrt{2} - 1) : (\sqrt{3} - 2)$

C. $t_1 : t_2 : t_3 = \sqrt{3} : \sqrt{2} : 1$

D. $t_1 : t_2 : t_3 = 1 : (\sqrt{2} - 1) : (\sqrt{3} - \sqrt{2})$

Answer: D

Watch Video Solution

26. A stone is dropped from the top of a tower and one second later, a second stone is thrown vertically downward with a velocity $20ms^{-1}$. The second stone will overtake the first after travelling a distance of $(g = 10ms^{-2})$

A. $\frac{g}{2}\left[\frac{n\left(u-\frac{gn}{2}\right)}{(u-gn)}\right]^2$

B. $\frac{g}{2}\left[\frac{n\left(\frac{u}{2}-gn\right)}{u-gn}\right]^2$

C. $\frac{g}{2}\left[\frac{n\left(\frac{u}{2}-gn\right)}{\frac{u}{2}-gn}\right]^2$

D. $\frac{g}{5}\left[\frac{u-gn}{\frac{u}{2}-gn}\right]^2$

Answer: A

Watch Video Solution

27. A motorcycle and a car start from rest from the same place at the same and travel in the same

direction. The motorcycle acceleration at $1.0ms^{-1}$ up to a speed of $36kmh^{-1}$ and the car at $0.5ms^{-1}$ up to a speed of $54kmh^{-1}$. The time at which the car would overtake the motorcycle is

A. 20 s

B. 25 s

C. 30 s

D. 35 s

Answer: D

View Text Solution

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

A. 2v(n - 1)/n

B. v(n - 1)/n

C. v(n + 1)/n

D. 2v(n + 1)/n

Answer: A

 Watch Video Solution

29. 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. 0.21458333333333

B. 0.213194444444444

C. 0.37847222222222

D. 0.37986111111111

Answer: A

Watch Video Solution

30. A bullet fired into a wooden block loses half of its velocity after penetrating 40 cm. It comes to rest after penetrating a further distance of

A. 22/3 cm

B. 40/3 cm

C. 20/3 cm

D. 22/5 cm

Answer: B

Watch Video Solution

31. A body moving with some initial velocity and having uniform acceleration attains a final velocity v m/s after travelling x m. If its final velocity is v = $\sqrt{180-7x}$, find the acceleration of the body.

A. $-3.5m/s^2$

B. $-7m/s^2$

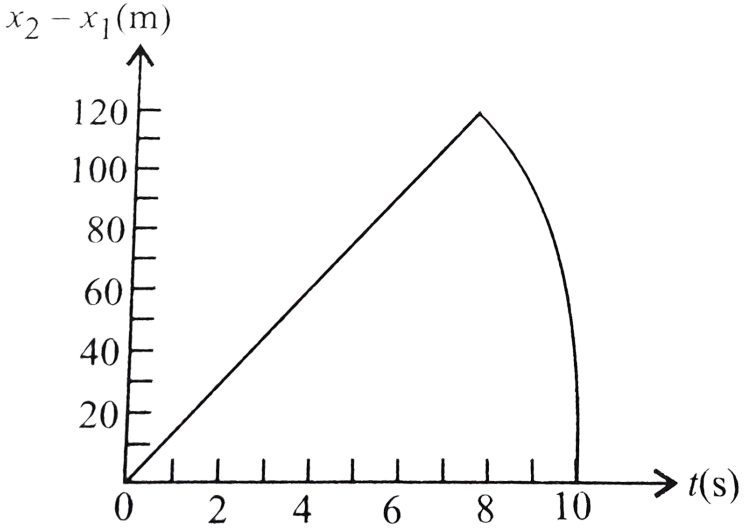
C. $-15m/s^2$

D. $-30m/s^2$

Answer: A

Watch Video Solution

32. Two stones are thrown up simultaneously from the edge of a cliff 200 m high with initial speeds of $15ms^{-1}$ and $30ms^{-1}$ respectively. The time variation of the relative position of the second stone with respect to the first is shown in the figure. The equation of the linear part is



A. $x_2 - x_1$ = 50t

B. $x_2 - x_1$ = 10t

C. $x_2 - x_1$ = 15t

D. $x_2 - x_1$ = 20t

Answer: C

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Relative Velocity

1. A ball A is dropped from a building of height $45m$. Simultaneously another ball B is thrown up with a

speed $40m/s$. Calculate the relative speed of the balls as a function of time.

A. 0

B. $10ms^{-1}$

C. $25ms^{-1}$

D. $50ms^{-1}$

Answer: D

Watch Video Solution

2. A ball A is thrown up vertically with a speed u and at the same instant another ball B is released from a

height h. At time t, the speed A relative to B is

A. u

B. u - 2gt

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

D. u - gt

Answer: A

Watch Video Solution

3. two car A and B are moving with velocities of $60kmh^{-1}$ and $45kmh^{-1}$ respectively. Calculate the relative velocity of A w.r.t B if (i) both cars are

travelling eastwards and (ii)car A is travelling eastwards and car B is travelling westwards.

A. $15kmh^{-1}$

B. $45kmh^{-1}$

C. $60kmh^{-1}$

D. $105kmh^{-1}$

Answer: A

Watch Video Solution

4. In question number 85, what is the relative velocity of a car A with respect to car B, if car is moving

eastward and car B is moving toward westward?

A. $15kmh^{-1}$

B. $45kmh^{-1}$

C. $60kmh^{-1}$

D. $105kmh^{-1}$

Answer: D

Watch Video Solution

5. On a two lane road , car (A) is travelling with a speed of $36kmh^{-1}$. Tho car B and C approach car (A) in opposite directions with a speed of $54kmh^{-1}$

each . At a certain instant , when the distance (AB) is equal to (AC), both being $1km, (B)decides \rightarrow overtake$ A before C does , What minimum accelration of car (B) is required to avoid and accident.

A. $1ms^{-2}$

B. $1.5ms^{-2}$

C. $2ms^{-2}$

D. $3ms^{-2}$

Answer: A

Watch Video Solution

6. A bird is tossing (flying to and fro) between two cars moving towards each other on a straight road. One car has a speed of $18km/h$ while the other has the speed of $27km/h$. The bird starts moving from first car towards the other and is moving with the speed of $36km/h$ and when the two cars were separated by $36km$. What is the total distance covered by the bird ? What is the total displacement of the bird ?

A. 28.8 km

B. 38.8 km

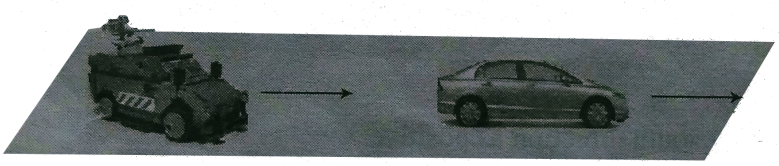
C. 48.8 km

D. 58.8 km

Answer: A

Watch Video Solution

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



A. $95ms^{-1}$

B. $105ms^{-1}$

C. $115ms^{-1}$

D. $125ms^{-1}$

Answer: B

Watch Video Solution

8. A bus is moving with a speed of $10ms^{-1}$ on a straight road. A scooterist wishes to overtake the bus in 100 s. If the bus is at a distance of 1 km from the

scooteritst with what speed should the scooterist chase the bus?

A. $40ms^{-1}$

B. $25ms^{-1}$

C. $10ms^{-1}$

D. $20ms^{-1}$

Answer: D

Watch Video Solution

9. Two town A and B are connected by a regular bus service with a bus leaving in either direction every T

minutes. A man leaving in either direction every in the direction A to B notices that a bus goes past him every 18 min in the direction of his motion, and every 6 min in the opposite direction. The period T of the bus service is

A. 4.5 min

B. 9 min

C. 1.2 min

D. 24 min

Answer: B

Watch Video Solution

10. A 175 m long train is travelling along a straight track what a velocity $72kmh^{-1}$. A bird is flying parallel to the train in the opposite direction with a velocity $18kmh^{-1}$. The time taken by the bird to cross the train is

A. 35 s

B. 27 s

C. 11.6 s

D. 7 s

Answer: D

Watch Video Solution

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

A. $10ms^{-1}$

B. $15ms^{-1}$

C. $25ms^{-1}$

D. $40ms^{-1}$

Answer: D

Watch Video Solution

12. In the question number of 93, what is the velocity of a monkey running on the roof of the train A against its motion with a velocity of $18kmh^{-1}$ with repect to the train A as observed by a man standing on the ground?

A. $5ms^{-1}$

B. $10ms^{-1}$

C. $15ms^{-1}$

D. $20ms^{-1}$

Answer: B

View Text Solution

13. A train A which is 120 m long is running with velocity 20 m/s while train B which is 130 m long is running in opposite direction with velocity 30 m/s. What is the time taken by train B to cross the train A?

A. 5 s

B. 25 s

C. 10 s

D. 100 s

Answer: A

Watch Video Solution

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

A. $500 kmh^{-1}$

B. $1000 kmh^{-1}$

C. $1500 kmh^{-1}$

D. $2000 kmh^{-1}$

Answer: B

Watch Video Solution

15. On a long horizontally moving belt, a child runs to an fro with a speed $9kmh^{-1}$ (with respect to the belt) between his father and mother located 50m a part on the moving belt. The belt moves with a speed of 4 kmh^{-1}. For an observer on a stationery platform outside, what is the

(i) speed of the child running in the direction of motion of the belt,

(ii) speed of the child running opposited to the direction of motion of the belt , and (iii) time taken by child in (i) and (ii) ?

which of the answers alter if motion is viewed by one of the parents?

A. $4kmh^{-1}, 5kmh^{-1}$

B. $5kmh^{-1}, 9kmh^{-1}$

C. $9kmh^{-1}, 4kmh^{-1}$

D. $13kmh^{-1}, 5kmh^{-1}$

Answer: D

Watch Video Solution

16. In the question number 97, the speed of the child running opposite to the direction of motion of the

belt is

A. $4kmh^{-1}$

B. $5kmh^{-1}$

C. $9kmh^{-1}$

D. $13kmh^{-1}$

Answer: B

View Text Solution

17. In the question number 97, time taken by the child to go from father to mother and back to father is

A. 10 s

B. 20 s

C. 30 s

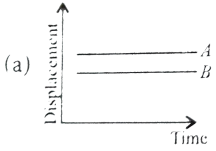
D. 40 s

Answer: D

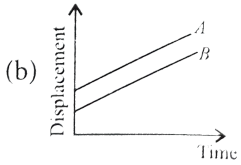
View Text Solution

18. Which one of the following represents displacement-time graph of two objects A and B moving with zero relative velocity?

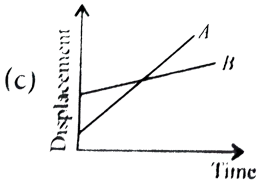
A.



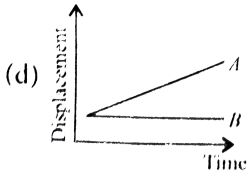
B.



C.



D.



Answer: B

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Hots

1. A particle of mass m is initially situated at point P inside a hemispherical surface of radius r as shown in the figure. A horizontal acceleration of magnitude a_o is suddenly produced acceleration on the particle in the horizontal direction. If gravitational acceleration is neglected, then time taken by the particle to touch the sphere again is

A. $\sqrt{4r\frac{\sin\alpha}{a_o}}$

B. $\sqrt{4r\frac{\tan\alpha}{a_o}}$

C. $\sqrt{4r\frac{\cos\alpha}{a_o}}$

D. None of these

Answer: (c)

Watch Video Solution

2. An aeroplane is flying from city A to city B along path 1. The path 1 is a circular arc whose centre coincides with the centreof the earth. Another aeroplane is flying along path 2 from A to B. The path 2 is circular arc whose centre is at C. O is the centre of the earth. Then,

A. The distance travelled by 1^{st} aeroplane is greater than that of 2^{nd}aeroplane.

B. The distance travelled by 1^{st} aeroplane is less than that of 2^{nd} aeroplane.

C. The displacement of both aeroplane is different.

D. None of these

Answer: (b)

 Watch Video Solution

3. A particle is moving on a circular path of radius R with constant speed v. During motion of the particle

form point A to point B

A. Average speed is v/2

B. The magnitude of average velocity is v/π

C. The magnitude of average acceleration is $\frac{2v^2}{\pi R}$

D. Average velocity is zero.

Answer: (c)

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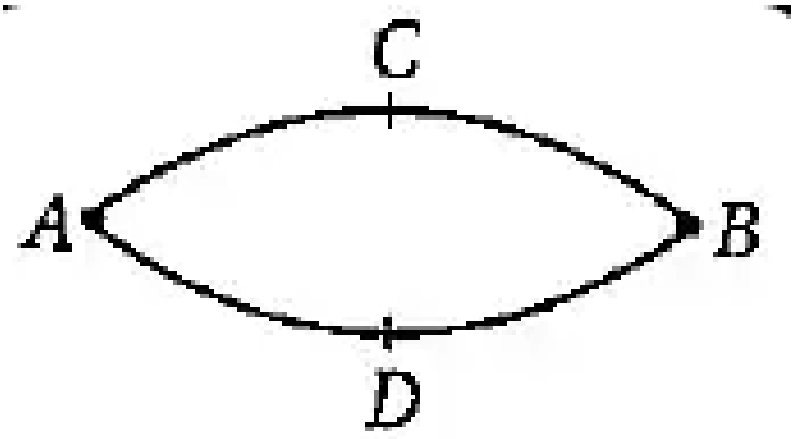
4. A length of path ACB is 1500 m and the length of the path ADB is 2100 m. Two particles start from

point A simultaneously around the track ACBDA. One of them travels the track in clockwise sense and other in anti-clockwise sense and other in anti-clockwise with their respective constant speeds. After 12 s from the start, the first time they meet at the point B. After minimum time (in s) in which they meet first at point B, again will they meet at the point B is time $t_{\min} = (12)^x s$.The value of x is



A. 2

B. 3

C. 4

D. 5

Answer: (a)

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5. 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 relation between H, u and n is:

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

B. 2 gH = n^2u^2

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

D. 2 gH = $\nu^2(n-2)$

Answer: (d)

Watch Video Solution

6. Points P, Q and R are in vertical line such that $PQ = QR$. A ball at (P) is allowed to fall freely. What is the ratio of the times of descent through PQ and QR ?

A. 0.042361111111111

B. $1 : \sqrt{2}$

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

D. $1 : (\sqrt{2} + 1)$

Answer: (c)

Watch Video Solution

7. A police party is chasing a dacoit in a jeep which is moving at a constant speed v. The dacoit is on a motor cycle. When he is at a distance x from the jeep, he accelerates from rest at a constant rate α. Which

of the following relations is true, if the police is able to catch the dacoit ?

A. $v^2 < ax$

B. $v^2 < 2ax$

C. $v^2 \geq 2ax$

D. $v^2 = ax$

Answer: (c)

Watch Video Solution

8. A juggler keeps n balls going with one hand, so that at any instant, (n - 1) balls are in air and one ball

in the hand. If each ball rises to a height of x metres, the time for each ball to stay in his hand is

A. $\frac{1}{n} - 1\left(\frac{\sqrt{2x}}{g}\right)$

B. $\frac{2}{n} - 1\left(\frac{\sqrt{2x}}{g}\right)$

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

D. $\frac{1}{n}\left(\frac{\sqrt{2x}}{g}\right)$

Answer: (b)

Watch Video Solution

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

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

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

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

D. 4. $\frac{g}{4n^2}$

Answer: (a)

Watch Video Solution

10. Two trains 121 m and 99 m in length are running in opposite directions with velocities $40kmh^{-1}$ and $32kmh^{-1}$. In what time they will completely cross each other?

A. a. 9 s

B. b. 11 s

C. c. 13 s

D. d. 15 s

Answer: (b)

Watch Video Solution

Ncert Exemplar Problems

1. 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)

Watch Video Solution

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2. 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. $x > 0, v > 0, a > 0$

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Watch Video Solution

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

A. 1. The displacement in time T must always take on-negative values.

B. 2. The displacement x in time T satifies - $v_o T$< x < v_oT.

C. 3. The acceleration is always a non-negative number.

D. 4. The motion has no turning points.

Answer: (b)

Watch Video Solution

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

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

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

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

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

Answer: (c)

Watch Video Solution

5. 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. a. 4 m

B. b. 8 m

C. c. 12 m

D. d. 16 m

Answer: (b)

Watch Video Solution

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

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

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

D. $t_1 - t_2$

Answer: (c)

Watch Video Solution

Assertion And Reason

1. Assertion : In one dimensional motion of an object, path length comes out to be equal to displacement.

Reason : Direction of object is changed two times.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (c)

Watch Video Solution

2. Assertion : The magnitude of the displacement for a course of motion may be zero.

Reason : The path length for the corresponding course of motion is zero.

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

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

C. C. If assertion is true but reason is false.

D. D. If both assertion and reason is false

Answer: (c)

Watch Video Solution

3. Assertion : The speedometer of an automobile measure the average speed of the automobile.

Reason : Average velocity is equal to total displacement per total time taken.

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

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

C. C. If assertion is true but reason is false.

D. D. If assertion is false and reason is true

Answer: (b)

Watch Video Solution

4. Assertion : The average speed of an object is greater than or equal to the magnitude of the average velocity over a given time interval.

Reason : The two are equal only if the path length is equal to the magnitude of displacement.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (a)

Watch Video Solution

5. Assertion : The position-time graph of a body moving uniformly is a straight line parallel to position-axis.

Reason : The slope of position-time graph in a uniform motion gives the velocity of an object.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (d)

6. Assertion : The average and instantaneous velocities have same value in a uniform motion.

Reason : In uniform motion, the velocity of an object increases uniformly

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

B. Both assertion and reason are true but reason is not the correct explanations of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason is false

Answer: (c)

Watch Video Solution

7. Stopping distance of a moving vehicle is directly proportional to

A. Square of initial velocity

B. Square of initial acceleration

C. The initial velocity

D. The initial acceleration

Answer: (a)

Watch Video Solution

8. Assertion : For a particle, acceleration-time graph gives the velocity.

Reason : Rate of change of velocity is acceleration.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (b)

Watch Video Solution

9. Asserion : The acceleration of an object at a particular time is the slope of the velocity-time graph at that instant of time.

Reason : For uniform motion acceleration is zero.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (b)

10. Assertion : Acceleration and velocity cannot change values abruptly at an instant.

Reason : Their changes can either be continuous or discontinuous.

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

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

assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (c)

11. Assertion : A particle may be momentarily at rest and yet have non-zero acceleration.

Reason : The zero velocity of a particle at any instant does not necessarily imply zero acceleration at that instant.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (a)

Watch Video Solution

12. Assertion : The accelerated motion of an object may be due to change in magnitude of velocity or direction of velocity or both.

Reason : Acceleration can be produed only by change in the magnitude of the velocity.

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

B. Both assertion and reason are true but reason is not the correct explanations of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason is false

Answer: (c)

Watch Video Solution

13. Assertion : An object may fall with a constant velocity.

Reason : This happens when acceleration of the object is equal to acceleration due to gravity.

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

B. Both assertion and reason are true but reason is not the correct explanations of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason is false

Answer: (c)

Watch Video Solution

14. Assertion : Kinematic equations are exact and are always correct.

Reason : The definitions of instantaneous velocity and acceleration are true only for motion in which the magnitude and direction of acceleration are constant during the course of motion.

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

B. Both assertion and reason are true but reason is not the correct explanations of assertion.

C. Assertion is true but reason is false.

D. Both assertion and reason is false

Answer: (d)

Watch Video Solution

15. Statement-1 : The relative velocity between any two bodies moving in opposite direction is equal to

sum of the velocities of two bodies. Statement-2 : Sometimes relative velocity between two bodies is equal to difference in velocities of the two.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason is false

Answer: (b)

Watch Video Solution

Higher Order Thinking Skills

1. A particle of mass m is initially situated at point P inside a hemispherical surface of radius r as shown in the figure. A horizontal acceleration of magnitude a_o is suddenly produced acceleration on the particle in the horizontal direction. If gravitational acceleration is neglected, then time taken by the particle to touch the sphere again is

A. $\sqrt{4r\frac{\sin\alpha}{a_o}}$

B. $\sqrt{4r\frac{\tan\alpha}{a_o}}$

C. $\sqrt{4r\frac{\cos\alpha}{a_o}}$

D. None of these

Answer: (c)

Watch Video Solution

2. An aeroplane is flying from city A to city B along path 1. The path 1 is a circular arc whose centre coincides with the centreof the earth. Another aeroplane is flying along path 2 from A to B. The path 2 is circular arc whose centre is at C. O is the centre

of the earth. Then,

A. The distance travelled by 1^{st} aeroplane is greater than that of 2^{nd} aeroplane.

B. The distance travelled by 1^{st} aeroplane is less than that of 2^{nd} aeroplane.

C. The displacement of both aeroplane is different.

D. None of these

Answer: (b)

Watch Video Solution

3. A particle is moving on a circular path of radius R with constant speed v. During motion of the particle form point A to point B

A. Average speed is v/2

B. The magnitude of average velocity is v/π

C. The magnitude of average acceleration is $\frac{2v^2}{\pi R}$

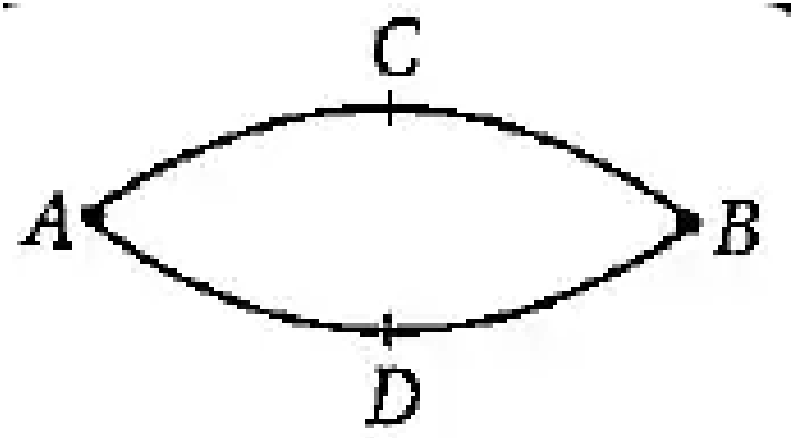
D. Average velocity is zero.

Answer: (c)

Watch Video Solution

4. A length of path ACB is 1500 m and the length of the path ADB is 2100 m. Two particles start from point A simultaneously around the track ACBDA. One of them travels the track in clockwise sense and other in anti-clockwise sense and other in anti-clockwise with their respective constant speeds. After 12 s from the start, the first time they meet at the point B. After minimum time (in s) in which they meet first at point B, again will they meet at the point B is time

$t_{\min} = (12)^x s$.The value of x is



A. 2

B. 3

C. 4

D. 5

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Watch Video Solution

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Watch Video Solution

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

D. $t_1 - t_2$

Answer: (c)

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