PHYSICS

BOOKS - DC PANDEY PHYSICS (HINGLISH)

MOTION

Solved Example

1. A particle moves in a plane such that its coordinates changes with time as $x = at$ and $y = bt$, where a and b are constants. Find the position vector of the particle and its direction at any time t.

A. $(a)\hat{i} + (bt)\hat{j}$

B. $(at)\hat{i} + (b)\hat{j}$

C. $(at)\hat{i} + (bt)\hat{j}$

D. $(a)\hat{i} + (b)\hat{j}$

Answer: C

Watch Video Solution

2. An object moves from position (3,4) to (6,5) in the xy-plane. Find the magnitude and direction of displacement vector of the particle.

Watch Video Solution

3. A particle moves in xy-plane from position (1m,2m) to (3m,4m) in 2s. Find the magnitude and direction of average velocity.

A. $\sqrt{2}ms^{-1}, 60^\circ$

B. $\sqrt{5}ms^{-1}, 45^\circ$

C. $\sqrt{12}ms^{-1}, 45^\circ$

D. $\sqrt{2}ms^{-1}, 45^\circ$

Answer: D

Watch Video Solution

4. Position vector of a particle is given as

$r = 2t\hat{i} + 3t^2\hat{j}$ where t is in second and the coefficients have the proper units, for r to be in metres.

(i) Find instantaneous velocity v(t) of the particle.

(ii) Find magnitude and direction of v(t) at $t = 2s$

Watch Video Solution

5. Velocity of a particle changes from $\left(3\hat{i} + 4\hat{j}\right)m/s$ to $\left(6\hat{i} + 5\hat{j}\right)m/s$ 2s. Find magnitude and direction of average acceleration.

Watch Video Solution

6. The position of a particle is given by

$r = 3t\hat{i} + 2t^2\hat{j} + 8\hat{k}$

where, t is in seconds and the coefficients have the proper units for r to be in meters.

(i) Find v (t) and a(t) of the particles.

(ii) Find the magnitude and direction of v(t) and a(t) at $t = 1s$.

Watch Video Solution

7. A particle starts from origin at $t = 0$ with a velocity of $15\hat{i} ms^{-1}$ and moves in xy-plane under the action of a force which produces a constant acceleration of $15\hat{i} + 20\hat{j} ms^{-2}$. Find the y-coordinate of the particle at the instant its x-coordinate is 180 m.

Watch Video Solution

8. An object has a velocity, $v = \left(2\hat{i} + 4\hat{j}\right) ms^{-1}$ at time $t = 0s$. It undergoes a constant acceleration $a = \left(\hat{i} - 3\hat{j}\right) ms^{-2}$ for 4s. Then

(i) Find the coordinates of the object if it is at origin at $t = 0$

(ii) Find the magnitude of its velocity at the end of 4s.

A. $10cm, 8m, \Rightarrow v = 6\hat{i} - 8\hat{j}$

B. $16cm, 18m, \Rightarrow v = 6\hat{i} - 8\hat{j}$

C. $16cm, 8m, \Rightarrow v = 2\hat{i} - 8\hat{j}$

D. $16cm, 8m, \Rightarrow v = 6\hat{i} - 8\hat{j}$

Answer: D

Watch Video Solution

9. A body is projected with a velocity of $20ms^{-1}$ in a direction making an angle of 60° with the horizontal. Determine its (i) position after 0.5 s and (ii) the velocity after $0.5s$.

A. $15m, 7.43m, 10ms^{-1}, 12.42ms^{-1}$

B. $5m, 6.43m, 10ms^{-1}, 12.42ms^{-1}$

C. $5m, 7.43m, 10ms^{-1}, 12.42ms^{-1}$

D. $15m, 7.43m, 10ms^{-1}, 1.42ms^{-1}$

Answer: C

Watch Video Solution

10. A stone is thrown with a speed of $10ms^{-1}$ at an angle of projection 60°. Find its height above the point of projection when it is at a horizontal distance of 3m from the thrower ? (Take $g = 10ms^{-2}$)

A. $2.396m$

B. $3.396m$

C. $4.396m$

D. $5.396m$

Answer: B

Watch Video Solution

11. A cricket ball is thrown at a speed of $28 ms^{-1}$ in a direction 30° above the horizontal. Calculate the time taken by the ball to return to the same level.

Watch Video Solution

12. Assume that a ball is kicked at an angle of 60° with the horizontal, so if the horizontal component of its velocity is $19.6 ms^{-1}$, determine its maximum height.

A. $58.8m$

B. $40m$

C. $120m$

D. $60m$

Answer: A

Watch Video Solution

13. An object is projected with a velocity of $30ms^{-1}$ at an angle of 60° with the horizontal. Determine the horizontal range covered by the object.

Watch Video Solution

14. A projectile has a range of $40m$ and reaches a maximum height of $10m$. Find the angle at which the projectile is fired.

A. 55°

B. 45°

C. 60°

D. 65°

Answer: B

Watch Video Solution

15. Find the angle of projection of a porjectile for which for horizontal range and maximum height are equal.

Watch Video Solution

16. There are two angles of projection for which the horizontal range is the same. Show that the sum of the maximum heights for these two angles is independent of the angle of projection.

Watch Video Solution

17. Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum horizontal range.

Watch Video Solution

18. A football is kicked at an angle of 30° with the vertical, so if the horizontal component of its velocity is $20ms^{-1}$, determine its maximum height.

Watch Video Solution

19. A bomb is released from an aeroplane flying at a speed of $720km/h$ in the horizontal direction $8000m$ above the ground. At what horizontal distance from the initial position of areoplane it strikes the ground.

Watch Video Solution

20. A body is thrown horizontally from the top of a tower and strikes the ground after three seconds at an angle of 45° with the horizontal. Find the height of the tower and the speed with which the body was projected. (Take $g = 9.8m/s^2$)

Watch Video Solution

21. A body is thrown horizontally from the top of a tower and strikes the ground after three seconds at an angle of 45° with the horizontal. Find the height of the tower and the speed with which the body was projected. (Take $g = 9.8m / s^2$)

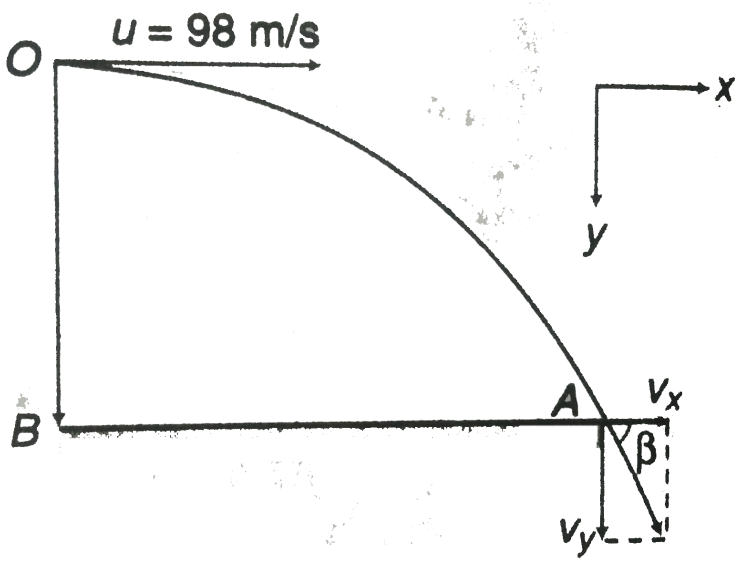
Watch Video Solution

22. A projectile is fired horizontally with velocity of 98 m/s from the top of a hill 490 m high. Find

(a) the time taken by the projectile to reach the ground,

(b) the distance of the point where the particle hits the ground from foot of the hill and

(c) the velocity with which the projectile hits the ground. $(g = 9.8 m/s^2)$



Watch Video Solution

23. A boy playing on the roof of a $10m$ high building throws a ball with a speed of $10m/s$ at an angle of $30(\circ)$ with the horizontal. How far from the throwing point will the ball be at the height of $10m$ from the ground ?

$$\left[g = 10m/s^2, \sin 30^\circ = \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}\right]$$

Watch Video Solution

24. A boy standing on the top of a tower 36 m high has a throw a packet to his friend standing on the ground 48 m horizontally away. If the throws a packet directly aiming the friend with a speed of $10ms^{-1}$, how short will be packet fall ?

Watch Video Solution

Check Point 4.1

1. The x and y components of a position vector P have numerical values 5 and 6 respectively. Direction and magnitude of vector P are

A. $\tan^{-1}\left(\frac{6}{5}\right)$ and $\sqrt{61}$

B. $\tan^{-1}\left(\frac{5}{6}\right)$ and $\sqrt{61}$

C. 60° and 8

D. 30° and 9

Answer: A

Watch Video Solution

2. An object moves from position (6,8) to (12,10) in the x-y plane. Magnitude and direction of displacement is

A. $\sqrt{40}$ and 18.43°

B. $\sqrt{40}$ and 61.56°

C. 10 and 53°

D. $\sqrt{244}$ and 53°

Answer: A

Watch Video Solution

3. A particle moves in xy-plane from position (2m, 4m) to (6m,8m) is 2s. Magnitude and direction of average velocity is

A. $\sqrt{2}ms^{-1}$ and 45°

B. $2\sqrt{2}ms^{-1}$ and 45°

C. $4\sqrt{2}ms^{-1}$ and 30°

D. $3\sqrt{2}ms^{-1}$ and 60°

Answer: B

Watch Video Solution

4. The distance travelled by an object along the axes are iven by $x = 2t^2, y = t^2 - 4t, z = 3t - 5$. The initial velocity of the particle is .

A. 10 units

B. 12 units

C. 5 units

D. 2 units

Answer: C

Watch Video Solution

5. A particle moves along the positive branch of the curve $y = \frac{x^2}{2}$ where $x = \frac{t^2}{2}$, x and y are measured in metres and t in second. At $t = 2s$, the velocity of the particle is

A. $2\hat{i} - 4\hat{j}ms^{-1}$

B. $4\hat{i} + 2\hat{j}ms^{-1}$

C. $2\hat{i} + 4\hat{j}ms^{-1}$

D. $4\hat{i} - 2\hat{j}ms^{-1}$

Answer: C

Watch Video Solution

6. The position vector of a particle is $r = a \sin \omega t \hat{i} + a \cos \omega t \hat{j}$

The velocity of the particle is

A. parallel to position vecor

B. perpendicular to position vector

C. directed towards origin

D. directed awa from the origin

Answer: B

Watch Video Solution

7. The position vector of an object at any time t is given by $3t^2\hat{i} + 6thayj + \hat{k}$. Its velocity along y-axis has the magnitude

A. 6t

B. 6

C. 0

D. 9

Answer: B

Watch Video Solution

8. The height y and distance x along the horizontal plane of a projectile on a certain planet are given by $x = 6tm$ and $y = \left(8t^2 - 5t^2\right)m$. The velocity with which the projectile is projected is

A. $8ms^{-1}$

B. $9ms^{-1}$

C. $10ms^{-1}$

D. $(10/3)ms^{-1}$

Answer: C

Watch Video Solution

9. The co-ordinates of a moving particle at any time t are given by $x = ct^2$ and $y = bt^2$The speed of the particle is

A. $2t\sqrt{c^2 + b^2}$

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

C. $t\sqrt{c^2 + b^2}$

D. $\frac{t}{\sqrt{c^2 + b^2}}$

Answer: A

Watch Video Solution

10. The coordinates of a moving particle at any time t are given by, $x = 2t^3$ and $y = 3t^3$. Acceleration of the particle is given by

A. $468t$

B. $t\sqrt{468}$

C. $234t^2$

D. $t\sqrt{234}$

Answer: B

Watch Video Solution

11. The position of a particle moving in the xy plane at any time t is given by $x = (3t^2 - 6t)$ metres, $y = (t^2 - 2t)$ metres. Select the correct statement about the moving particle from the following

A. The acceleration of the particle is zero at $t = 0s$

B. The velocity of the particle is zero at $t = 0s$

C. The velocity of the particle is zero at $t = 1s$

D. The velocity and acceleration of the particle are zero

Answer: C

Watch Video Solution

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

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

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

C. zero

D. $\left(\hat{i}-5\hat{j}\right)/2$

Answer: D

Watch Video Solution

13. A particle has an initial velocity of $4\hat{i}+3\hat{j}$ and an acceleration of $0.4\hat{i}+0.3\hat{j}$. Its speed after 10s is

A. 10 units

B. 7 units

C. $7\sqrt{2}$ units

D. 8.5 units

Answer: A

Watch Video Solution

14. A body lying initially at point (3,7) starts moving with a constant acceleration of $4\hat{i}$. Its position after 3s is given by the coordinates

A. (7,3)

B. (7,18)

C. (21,7)

D. (3,7)

Answer: C

Watch Video Solution

15. The initial position of an object at rest is given by $3\hat{i} - 8\hat{j}$. It moves with constant acceleration and reaches to the position $2\hat{i} + 4\hat{j}$ after 4s. What is its acceleration ?

A. $-\frac{1}{8}\hat{i}+\frac{3}{2}\hat{j}$

B. $2\hat{i}-\frac{1}{8}\hat{j}$

C. $-\frac{1}{2}\hat{i}+8\hat{j}$

D. $8\hat{i}-\frac{3}{2}\hat{j}$

Answer: A

Watch Video Solution

Check Point 4.2

1. At the top of the trajectory of a projectile, the directions of its velocity and acceleration are

A. parallel to each other

B. antiparallel to each other

C. inclined to each other at an angle of 45°

D. perpendicular to each other

Answer: D

Watch Video Solution

2. At the top of the trajectory of a projectile, the directions of its velocity and acceleration are

A. maximum

B. minimum

C. zero

D. g

Answer: D

Watch Video Solution

3. In the motion of a projectile freely under gravity, its

A. total mechanical energy is conserved

B. momentum is conserved

C. mechanical energy and momentum both are conserved

D. None is conserved

Answer: A

Watch Video Solution

4. When a stone is projected which remains constant?

A. Angular momentum

B. Linear momentum

C. Vertical component of velocity

D. Horizontal component of velocity

Answer: D

Watch Video Solution

5. A stone is projected with speed of $50ms^{-1}$ at an angle of 60° with the horizontal. The speed of the stone at highest point of trajectory is

A. $75ms^{-1}$

B. $25ms^{-1}$

C. $50ms^{-1}$

D. cannot find

Answer: B

Watch Video Solution

6. A football player throws a ball with a velocity of 50 metre/sec at an angle 30 degrees from the horizontal. The ball remains in the air for

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

A. $2.5s$

B. $1.25s$

C. $5s$

D. $0.625s$

Answer: C

Watch Video Solution

7. A particle is projected with a velocity of $20ms^{-1}$ at an angle of 60° to the horizontal. The particle hits the horizontal plane again during its journey. What will be the time of impact ?

A. $3.53s$

B. $2.4s$

C. $1.7s$

D. 1s

Answer: A

Watch Video Solution

8. If 2 balls are projected at angles 45° and 60° and the maximum heights reached are same, what is the ratio of their initial velocities ?

A. $\sqrt{2} : \sqrt{3}$

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

C. $3 : 2$

D. $2 : 3$

Answer: B

Watch Video Solution

9. If the initial velocity of a projectile be doubled, keeping the angle of projection same, the maximum height reached by it will

A. remain the same

B. be doubled

C. become four times

D. be halved

Answer: C

Watch Video Solution

10. For a projectile, the ratio of maximum height reached to the square of flight time is $(g = 10ms^{-2})$

A. $5:4$

B. $5:2$

C. $5:1$

D. $10:1$

Answer: A

Watch Video Solution

11. A particle is projected from ground with speed u and at an angle θ with horizontal. If at maximum height from ground, the speed of particle is $1/2$ times of its initial velocity of projection, then find its maximum height attained.

A. $\frac{u^2}{g}$

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

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

D. $\frac{3u^2}{8g}$

Answer: D

Watch Video Solution

12. A projectile, thrown with velocity v_0 at an angle α to the horizontal, has a range R. it will strike a vertical wall at a distance $R/2$ from the point of projection with a speed of

A. v_0

B. $v_0 \sin \alpha$

C. $v_0 \cos \alpha$

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

Answer: C

Watch Video Solution

13. A particle is projected at an angle of 45° with a velocity of $9.8ms^{-1}$. The horizontal range will be (Take, $g = 9.8ms^{-2}$)

A. $9.8m$

B. $4.9m$

C. $\frac{9.8}{\sqrt{2}}$

D. $9.8\sqrt{2}$

Answer: A

Watch Video Solution

14. Two projectiles are fired from the same point with the same speed at angles of projection 60° and 30° respectively. Which one of the following is true?

A. $R_A = R_B$

B. $H_B = 3H_A$

C. $T_B = \sqrt{3}T_A$

D. None of these

Answer: D

Watch Video Solution

15. A projectile fired with initial velocity u at some angle θ has a range R . If the initial velocity be doubled at the same angle of projection, then the range will be

A. 2R

B. $R/2$

C. R

D. 4R

Answer: D

Watch Video Solution

16. An object is thrown along a direction inclined at an angle of 45° with the horizontal direction. The horizontal range of the particle is equal to

A. vertical height

B. twice the vertical height

C. thrice the vertice height

D. four times the vertical height

Answer: D

Watch Video Solution

17. An object is projected at an angle of 45° with the horizontal. The horizontal range and the maximum height reached will be in the ratio.

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: D

Watch Video Solution

18. The horizontal range of a projectile is $4\sqrt{3}$ times its maximum height. Its angle of projection will be

A. 60°

B. 37°

C. 30°

D. 45°

Answer: C

Watch Video Solution

19. A ball is projected with a velocity $20\sqrt{3}ms^{-1}$ at angle 60° to the horizontal. The time interval after which the velocity vector will make an angle 30° to the horizontal is (Take, $g = 10ms^{-2}$)

A. 5s

B. 2s

C. 1s

D. 3s

Answer: B

Watch Video Solution

20. A projectile is thrown with a velocity of $10ms^{-1}$ at an angle of 60° with horizontal. The interval between the moments when speed is $\sqrt{5g}m/s$ is (Take, $g=10ms^{-2}$)

A. 1s

B. 3s

C. 2s

D. 4s

Answer: C

Watch Video Solution

Check Point 4.3

1. A bomb is dropped from an aeroplane moving horizontally at constant speed. When air resistance is taken into consideration, the bomb

A. falls on the earth exactly below the aeroplane

B. falls on the earth behind the aeroplane

C. falls on the earh ahead of the aeroplane

D. flies with the aeroplane

Answer: A

Watch Video Solution

2. A body is projected horizontally with a velocity of $4ms^{-1}$ from the top of a high tower. The velocity of the body after 0.7 is nearly (Take,

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

A. $10ms^{-1}$

B. $8ms^{-1}$

C. $19.2ms^{-1}$

D. $11ms^{-1}$

Answer: B

Watch Video Solution

3. A particle is projected horizontally will speed $20ms^{-1}$ from the top of a tower. After what time velocity of particle will be at 45° angle from initial direction of projection.

A. 1s

B. 2s

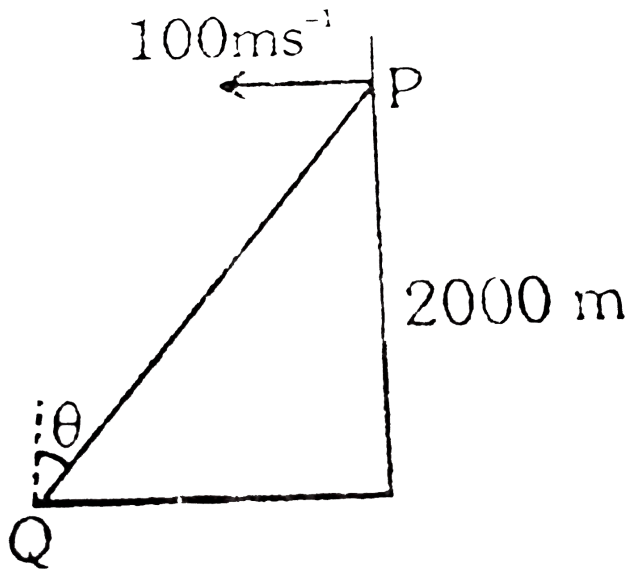
C. 3s

D. 4s

Answer: B

Watch Video Solution

4. An aeroplane is travelling at a height of 2000 m from the ground. The aeroplane, when at a point P, drops a bomb to hit a stationary target Q on the ground. In order that the bomb hits the target, what angle θ must the line PQ make with the vertical? $\left[g = 10ms^{-2}\right]$



A. 45°

B. 30°

C. 60°

D. 90°

Answer: A

Watch Video Solution

5. An aeroplane is flying at a constant height of 1960 m with speed $600 kmh^{-1}$ above the ground towards point directly over a person struggling in flood water. At what angle of sight with the vertical should be pilot release a survival kit if it is to reach the person in water ? $(g = 9.8 ms^{-2})$

A. 45°

B. 30°

C. 60°

D. 90°

Answer: C

Watch Video Solution

6. A bomber moving horizontally with $500m/s$ drops a bomb which strikes ground in 10s. The angle of strike with horizontal is

A. $\tan^{-1}\left(\frac{1}{5}\right)$

B. 60°

C. 45°

D. $\tan^{-1}(5)$

Answer: A

Watch Video Solution

7. A ball is projected horizontal from the top of a tower with a velocity v_0. It will be moving at an angle of 60° with the horizontal after time.

A. $\frac{v_0}{\sqrt{3}g}$

B. $\frac{\sqrt{3}v_0}{g}$

C. $\frac{v_0}{g}$

D. $\frac{v_0}{g}$

Answer: B

Watch Video Solution

8. An aeroplane is flying in a horizontal direction with a velocity $600km/h$ at a height of 1960 m. When it is vertically above the point A on the ground, a body is dropped from it. The body strikes the ground at point B. Calculate the distance AB.

A. $3.33km$

B. $4.33km$

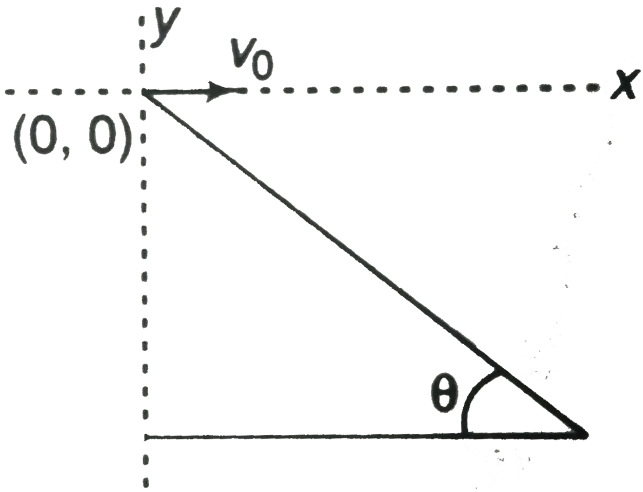
C. $5.33km$

D. $6.33km$

Answer: A

Watch Video Solution

9. A man standing on a hill top projects a stone horizontally with speed v_0 as shown in figure. Taking the co-ordinate system as given in the figure. Find the co-ordinates of the point where the stone will hit the hill surface.



A. $\left(\frac{2v_0^2\tan\theta}{g}, -\frac{2v_0^2\tan^2\theta}{g}\right)$

B. $\left(\frac{2v_0^2}{g}, -\frac{2v_0^2\tan^2\theta}{g}\right)$

C. $\left(\frac{2v_0^2\tan\theta}{g}, -\frac{2v_0^2}{g}\right)$

D. $\left(\frac{2v_0^2\tan^2\theta}{g}, -\frac{2v_0^2\tan\theta}{g}\right)$

Answer: A

Watch Video Solution

10. A ball is dropped from a height of 49 m. The wind is blowing horizontally. Due to wind a constant horizontal acceleration is provided to the ball. Choose the correct statement (s).

A. Path of the ball is circular one

B. Path of the ball is a curved one

C. The time taken by the ball to reach the ground is 3.16 s

D. Actual distance travelled by the ball is less than 49m

Answer: C

Watch Video Solution

A. Taking it together

1. In a two dimensional motion,instantaneous speed v_0 is a positive constant.Then which of the following are necessarily true?

A. The average velocity is not zero at any time

B. Average acceleration must always vanish

C. Displacements in equal time intervals are equal

D. Equal path lengths are traversed in equal intervals

Answer: D

Watch Video Solution

Taking it together

1. In a two dimensional motion,instantaneous speed v_0 is a positive constant.Then which of the following are necessarily true?

A. The acceleration of the particle is zero

B. The acceleration of the particle is bounded

C. The acceleration of the particle is necessarily in the plane of motion

D. The particle must be undergoing a uniform circular motion.

Answer: C

Watch Video Solution

2. A particle velocity changes from $\left(2\hat{i}-3\hat{j}\right)ms^{-1}$ to $\left(3\hat{i}-2\hat{j}\right)ms^{-1}$ in 2s. If its mass is 1kg, the acceleraton $\left(ms^{-2}\right)$ is

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

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

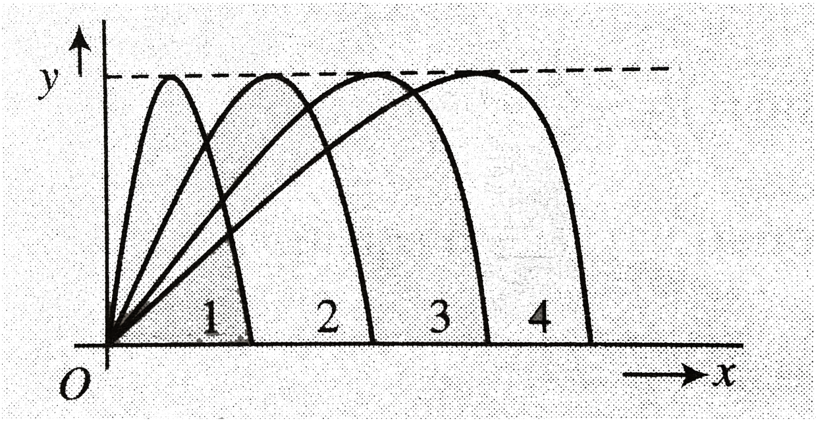
C. zero

D. $\left(\hat{i}-\hat{j}\right)/2$

Answer: B

Watch Video Solution

3. Figure shows four paths for a kicked football. Ignoring the effects of air on the flight, rank the paths according to the initial horizontal velocity component, highest first.



A. 1,2,3,4

B. 2,3,4,1

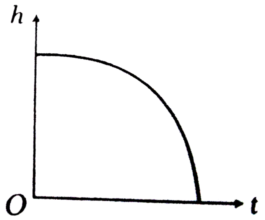
C. 3,4,1,2

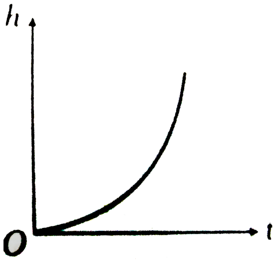
D. 4,3,2,1

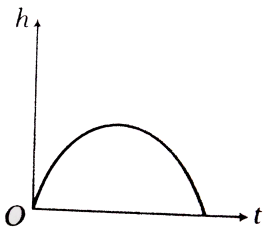
Answer: D

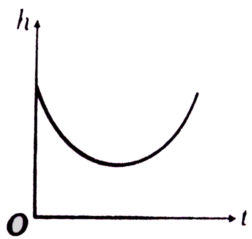
Watch Video Solution

4. Which of the following is the graph between the height (h) of a projectile and time (t), when it is projected from the ground

A. 

B. 

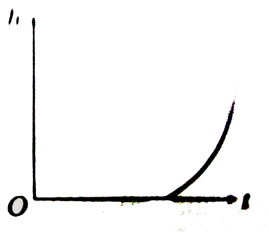
C. 

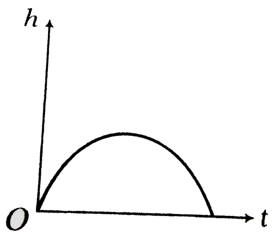
D. 

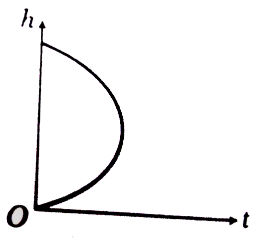
Answer: C

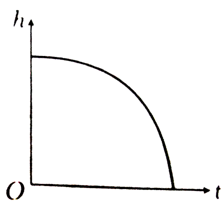
Watch Video Solution

5. Which of the following is the altitude-time graph for a projectile thrown horizontally from the top of the tower

A. 

B. 

C. 

D. 

Answer: D

Watch Video Solution

6. Two projectiles A and B are thrown from the same point with velocities v and $\frac{v}{2}$ respectively. If B is thrown at an angle 45° with horizontal.What is the inclination of A.when their ranges are the same?

A. $\sin^{-1}\left(\frac{1}{4}\right)$

B. $\frac{1}{2}\sin^{-1}\left(\frac{1}{4}\right)$

C. $2\sin^{-1}\left(\frac{1}{4}\right)$

D. $\frac{1}{2}\sin^{-1}\left(\frac{1}{8}\right)$

Answer: D

Watch Video Solution

7. Two stones having different masses m_1 and m_2 are projected at an angle α and $(90^\circ - \alpha)$ with same speed from same point. The ratio of their maximum heights is

A. $1:1$

B. $1:\tan\alpha$

C. $\tan\alpha:1$

D. $\tan^2\alpha:1$

Answer: D

Watch Video Solution

8. A projectile is thrown at an angle θ with the horizontal and its range is R_1. It is then thrown at an angle θ with vertical anf the range is R_2, then

A. $R_1 = 4R_2$

B. $R_1 = 2R_2$

C. $R_1 = R_2$

D. None of these

Answer: C

Watch Video Solution

9. The range of a projectile launched at an angle of 15° with horizontal is 1.5km. The range of projectile when launched at an angle of 45° to the horizontal is

A. 1.5 km

B. 3 km

C. 6km

D. 0.75km

Answer: B

Watch Video Solution

10. A body is thrown horizontally from the top of a tower of height $5m$. It touches the ground at a distance of $10m$ from the foot of the tower. Find the initial velocity of the body.

A. $2.5ms^{-1}$

B. $5ms^{-1}$

C. $10ms^{-1}$

D. $20ms^{-1}$

Answer: C

Watch Video Solution

11. Velocity and acceleration of a particle at some instant of time are $v=\left(3\hat{i}+4\hat{j}\right)ms^{-1}$ and $a=-\left(6\hat{i}+8\hat{j}\right)ms^{-2}$ respectively. At the same instant particle is at origin. Maximum x-coordinate of particle will be

A. 1.5 m

B. 0.75m

C. 2.25m

D. 4m

Answer: B

Watch Video Solution

12. A particle moves in the XY-plane according to the law $x = kt, y = kt(1 - \alpha t)$, where k and α are positive constants and t is time. The trajectory of the particle is

A. $y = kx$

B. $y = x - \frac{\alpha x^2}{k}$

C. $y = -\frac{ax^2}{k}$

D. $y = \alpha x$

Answer: B

Watch Video Solution

13. A projectile is thrown upward with a velocity v_0 at an angle α to the horizontal. The change in velocity of the projectile when it strikes the same horizontal plane is

A. $v_0 \sin \alpha$ vertically downward

B. $2v_0 \sin \alpha$ vertically downward

C. $2v_0 \sin \alpha$ vertically upward

D. zero

Answer: B

Watch Video Solution

14. The equation of trajectory of an oblique projectile $y = \sqrt{3}x - \frac{gx^2}{2}$.

The angle of projection is

A. 90°

B. zero

C. 60°

D. 30°

Answer: C

Watch Video Solution

15. The maximum range of a gun on horizontal terrain is 1km. If $g = 10ms^{-2}$, what must be the muzzle velocity of the shell ?

A. $400ms^{-1}$

B. $200ms^{-1}$

C. $100ms^{-1}$

D. $50ms^{-1}$

Answer: C

Watch Video Solution

16. Two paper screens A and B are separated by a distance of $100m$. A bullet pierces A and B. The hole in B is $10cm$ below the hole in A. If the bullet is travelling horizontally at the time of hitting the screen A, calculate the velocity of the bullet when it hits the screen A. Neglect resistance of paper and air.

A. $100ms^{-1}$

B. $200ms^{-1}$

C. $600ms^{-1}$

D. $700ms^{-1}$

Answer: D

Watch Video Solution

Watch Video Solution

17. A body is projected at an angle of 30° with the horizontal with momentum P.At its highest point the magnitude of the momentum is:

A. $\frac{\sqrt{3}}{2}p$

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

C. p

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

Answer: A

Watch Video Solution

18. The maximum height attaine by a projectile is increased by 10% by increasing its speed of projecton, without changing the angle of projection. What will the percentage increase in the horizontal range.

A. 0.2

B. 0.15

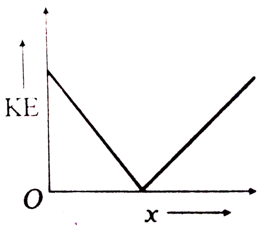
C. 0.1

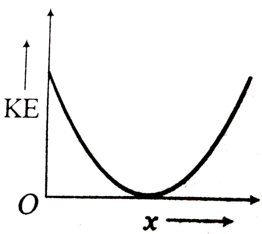
D. 0.05

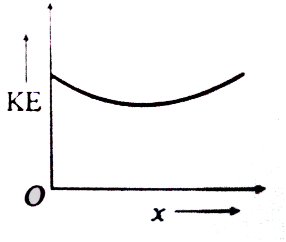
Answer: C

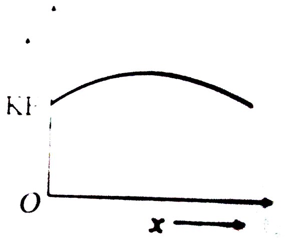
Watch Video Solution

19. A ball is thrown up with a certain velocity at anangle θ to the horizontal. The kinetic energy KE of the ball varies with horizontal displacements as:

A. 

B. 

C. 

D. 

Answer: C

Watch Video Solution

20. A ball is thrown at different angles with the same speed u and from the same points and it has same range in both the cases. If y_1 and y_2 be the heights attained in the two cases, then find the value of $y_1 + y_2$.

A. $\dfrac{u^2}{g}$

B. $\dfrac{2u^2}{g}$

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

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

Answer: C

Watch Video Solution

21. A projectile is fired from level ground at an angle θ above the horizontal. The elevation angle ϕ of the highest point as seen from the launch point is related to θ by the relation.

A. $\tan\phi = \frac{1}{4}\tan\theta$

B. $\tan\phi = \tan\theta$

C. $\tan\phi = \frac{1}{2}\tan\theta$

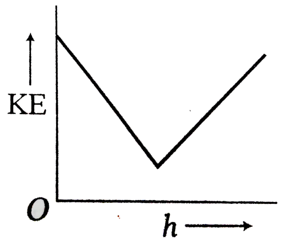
D. $\tan\phi = 2\tan\theta$

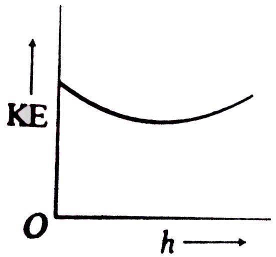
Answer: C

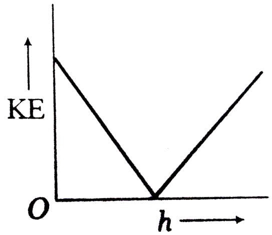
Watch Video Solution

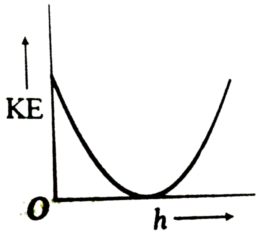
22. A ball is thrown up with a certain velocity at angle θ to the horizontal.

The kinetic energy varies with height h of the particle as:

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

23. A body of mass m is thrown upwards at an angle θ with the horizontal with velocity v. While rising up the velocity of the mass after t second will be

A. $\sqrt{\left(v\cos\theta^2\right)+(v\sin\theta)^2}$

B. $\sqrt{(v\cos\theta-v\sin\theta)^2-gt}$

C. $\sqrt{v^2+g^2t^2-(2b\sin\theta)gt}$

D. $\sqrt{v^2+g^2t^2-(2v\cos\theta)gt}$

Answer: C

Watch Video Solution

24. A projectile is thrown with an initial velocity of $\left(a\hat{i}+\hat{j}\right)ms^{-1}$. If the range of the projectile is twice the maximum height reached by it, then

A. $a = 2b$

B. $b = a$

C. $b = 2a$

D. $b = 4a$

Answer: C

Watch Video Solution

25. A projectile thrown with a speed v at an angle θ has a range R on the surface of earth. For same v and θ, its range on the surface of moon will be

A. 36R

B. $\frac{R}{36}$

C. $\frac{R}{16}$

D. 6R

Answer: D

Watch Video Solution

26. Three balls of same masses are projected with equal speeds at angle $15^{\circ}, 45^{\circ}, 75^{\circ}$, and their ranges are respectively R_1, R_2 and R_3, then

A. $R_1 > R_2 > R_3$

B. $R_1 < R_2 < R_3$

C. $R_1 = R_2 = R_3$

D. $R_1 = R_3 < R_2$

Answer: D

Watch Video Solution

27. A man can thrown a stone such that it acquires maximum horizontal range 80 m. The maximum height to which it will rise for the same projectile in metre is

A. 10

B. 20

C. 40

D. 50

Answer: B

Watch Video Solution

28. The ratio of the speed of a projectile at the point of projection to the speed at the top of its trajectory is x. The angle of projection with the horizontal is

A. $\sin^{1} x$

B. $\cos^{-1} x$

C. $\sin^{-1}(1/x)$

D. $\cos^{-1}(1/x)$

Answer: D

Watch Video Solution

29. The velocity at the maximum height of a projectile is half of its velocity of projection u. Its range on the horizontal plane is

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

B. $\frac{3}{2}, \frac{u^2}{g}$

C. $\frac{u^2}{3g}$

D. $\frac{\sqrt{3}}{2}, \frac{u^2}{g}$

Answer: D

Watch Video Solution

30. A projectile is thrown from a point in a horizontal plane such that the horizontal and vertical velocities are $9.8ms^{-1}$ and $19.6ms^{-1}$. It will strike the plane after covering distance of

A. $39.2m$

B. $19.6m$

C. $9.8m$

D. $4.9m$

Answer: A

Watch Video Solution

31. A stone is projected in air. Its time of flight is 3s and range is 150m. Maximum height reached by the stone is (Take, $g = 10ms^{-2}$)

A. $37.5m$

B. $22.5m$

C. $90m$

D. $11.25m$

Answer: D

Watch Video Solution

32. The greatest height to which a boy can throw a stone is (h). What will be the greatest distance on horizontal surface upto which the boy can throw the stone with the same speed ? Neglect the air friction.

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

B. h

C. 2h

D. 3h

Answer: C

Watch Video Solution

33. The range of a projectile when launched at angle θ is same as when launched at angle 2θ. What is the value of θ ?

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B

Watch Video Solution

34. A boy throws a ball with a velocity u at an angle θ with the horizontal. At the same instant he starts running with uniform velocity to catch the ball before it hits the ground. To achieve this he should run with a velocity of

A. $u \cos \theta$

B. $u \sin \theta$

C. $u \tan \theta$

D. $u \sec \theta$

Answer: A

Watch Video Solution

35. For angles of projection of a projectile at angle $(45^\circ - \theta)$ and $(45^\circ + \theta)$, the horizontal ranges described by the projectile are in the ratio of :

A. $2:1$

B. $1:2$

C. $1:1$

D. $2:3$

Answer: C

Watch Video Solution

36. The time of flight of a projectile is 10 s and range is 500m. Maximum height attained by it is $[g = 10m/s^2]$

A. 125m

B. 50m

C. 100m

D. 150m

Answer: A

Watch Video Solution

37. Four bodies A,B,C and D are projected with equal velocities having angles of projection $15^\circ, 30^\circ, 45^\circ$ and 60° with the horizontal respectively. The body having the shortest range is

A. P

B. Q

C. R

D. S

Answer: A

Watch Video Solution

38. A stone is thrown at an angle θ to the horizontal reaches a maximum height H. Then the time of flight of stone will be:

A. $\sqrt{\frac{2H}{g}}$

B. $2\sqrt{\frac{2H}{g}}$

C. $\frac{2\sqrt{2H\sin\theta}}{g}$

D. $\frac{\sqrt{\circ H\sin\theta}}{g}$

Answer: B

Watch Video Solution

39. For a given velocity, a projectile has the same range R for two angles of projection. If t_1 and t_2 are the time of flight in the two cases, then $t_1 = t_2$ is equal to

A. $\frac{2R}{g}$

B. $\frac{R}{g}$

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

D. $\frac{R}{2g}$

Answer: A

Watch Video Solution

40. Two particles are projected obliquely from ground with same speed such that their range $'R'$ are same but they attain different maximum heights h_1 and h_2 then relation between R, h_1 and h_2 is:

A. $R = \sqrt{h_1 h_2}$

B. $R = \sqrt{2h_1 h_2}$

C. $R = 2\sqrt{h_1 h_2}$

D. $R = 4\sqrt{h_1 h_2}$

Answer: D

Watch Video Solution

41. A cricket ball is hit for a six the bat at an angle of 45° to the horizontal with kinetic energy K. At the highest point, the kinetic energy of the ball is

A. zero

B. K

C. $K / 2$

D. $K / \sqrt{2}$

Answer: C

Watch Video Solution

42. The equation of motion of a projectile is $y = 12x - \frac{3}{4}x^2$. The horizontal component of velocity is $3ms^{-1}$. What is the range of the projectile ?

A. 12m

B. 16m

C. 20m

D. 24m

Answer: B

Watch Video Solution

43. A particle is thrown with a speed u at an angle θ with the horizontal. When the particle makes an angle ϕ with the horizontal. Its speed changes to v :

A. $v = u\cos\theta$

B. $v = u\cos\theta\cos\phi$

C. $v = u\cos\theta\sec\phi$

D. $v = u\sec\theta\cos\phi$

Answer: C

Watch Video Solution

44. A particle is projected in $x - y$ plane with $y -$ axis along vertical, the point of projection being origin. The equation of projectile is

$y = \sqrt{3}x - \frac{gx^2}{2}$. The angle of projectile is ....and initial velocity is

....

A. $1ms^{-1}$

B. $2ms^{-1}$

C. $3ms^{-1}$

D. $1.2ms^{-1}$

Answer: B

Watch Video Solution

45. A ball of mass m is projected from the ground with an initial velocity u making an angle of θ with the vertical. What is the change in velocity between the point of projection and the highest point ?

A. $u \cos \theta$ downward

B. $u \cos \theta$ upward

C. $u \sin \theta$ upward

D. $u \sin \theta$ downward

Answer: A

Watch Video Solution

46. A ball is projected form ground with a speed of `20 ms^(-1)

A. 5m

B. 7.5m

C. 10m

D. 12.5m

Answer: B

View Text Solution

47. A particle (A) is dropped from a height and another particles (B) is thrown into horizontal direction with speed of 5m/s sec from the same height. The correct statement is

A. both particles will reach at ground simultaneously

B. both particles will reach at ground with same speed

C. particle (A) will reach at ground first with respect to particle (B)

D. particle (B) will reach at ground first with respect to particle (A)

Answer: A

Watch Video Solution

48. A bullet is to be fired with a speed of $2000m/s$ to hit a target $200m$ away on a level ground. If $g = 10m/s^2$, the gun should be aimed

A. directly at the target

B. 5 cm below the target

C. 5 cm below the target

D. 2 cm above the target

Answer: C

Watch Video Solution

49. An aeroplane moving horizontally with a speed of $720km/h$ drops a food pocket, while flying at a height of 396.9 m . the time taken by a food pocket to reach the ground and its horizontal range is (Take $g = 9.8m/\sec$)

A. 3s and 2000m

B. 5s and 500 m

C. 8s and 1500m

D. 9s and 1800 m

Answer: D

Watch Video Solution

50. A boy can throw a stone up to a maximum height of $10m$. The maximum horizontal distance that the boy can throw the same stone up to will be :

A. $20\sqrt{2}m$

B. 10m

C. $10\sqrt{2}m$

D. 20m

Answer: D

Watch Video Solution

51. At the height 80 m , an aeroplane is moving with $150m/s$. A bomb is dropped from it so as to hit a target. At what distance from the target should the bomb be dropped (given $g = 10m/s$)

A. 605.3 m

B. 600 m

C. 80m

D. 230 m

Answer: A

Watch Video Solution

52. A particle moves along a parabolic path $y = -9x^2$ in such a way that the x component of velocity remains constant and has a value $\frac{1}{3}m/s$. Find the instantaneous acceleration of the projectile (in m/s^2)

A. $\frac{1}{3}ms^{-2}$

B. $3ms^{-2}$

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

D. $2ms^{-2}$

Answer: D

Watch Video Solution

53. A projectile has the maximum range of $500m$. If the projectile is now thrown up on an inclined plane of 30° with the same speed, what is the distance covered by it along the inclined plane?

A. 250m

B. 500m

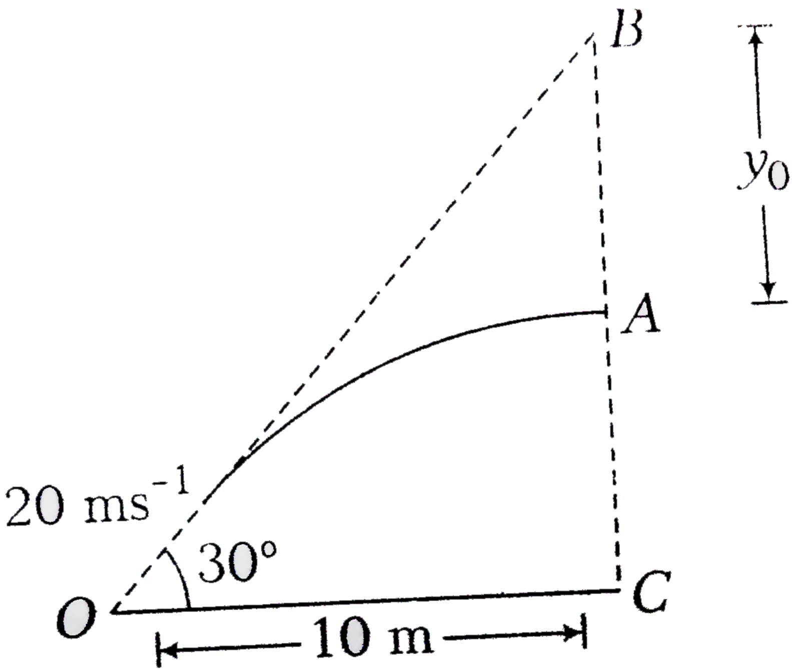
C. 750m

D. 1000m

Answer: B

Watch Video Solution

54. A ball is thrown from a point O aiming a target at angle 30° with the horizontal so that the ball hits the target at B but the ball hits at point A, a vertical distance h below B. If the intial velocity of the ball is $20ms^{-1}$ and the horizontal distance between O and C is 10 m. Find the value of h.



A. $\frac{g}{6}m$

B. $\frac{g}{10}m$

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

D. $\frac{g}{12}m$

Answer: A

Watch Video Solution

55. The range of a projectile fired at an angle of 15° is 50 m. If it is fired with the same speed at an angle of 45° its range will be

A. 60m

B. 71m

C. 100m

D. 141m

Answer: C

Watch Video Solution

56. A cricket fielder can throw the cricket ball with a speed v_0.If the throws the ball while running with speed u at an angle θ to the horizontal.

The effective angle to the horizontal at which the ball is projected in air as seen by a spectator is

A. $\tan^{-1}\left[\frac{v_0 \cos\theta}{u + v_0 \sin\theta}\right]$

B. $\tan^{-1}\left[\frac{v_0 \sin\theta}{u + v_0 \cos\theta}\right]$

C. $\tan^{-}\left[\frac{u}{v_0 \cos\theta + v_0 \sin\theta}\right]$

D. $\tan^{-1}\left[\frac{v_0 \sin\theta + v_0 \cos\theta}{u}\right]$

Answer: B

Watch Video Solution

57. Two stones are projected so as to reach the same distance from the point of projection on a horizontal surface. The maximum height reached by one exceeds thr other by an amount equal to half the sum of the height attained by them. Then angle of projection of the stone which attains smaller height is

A. 45°

B. 60°

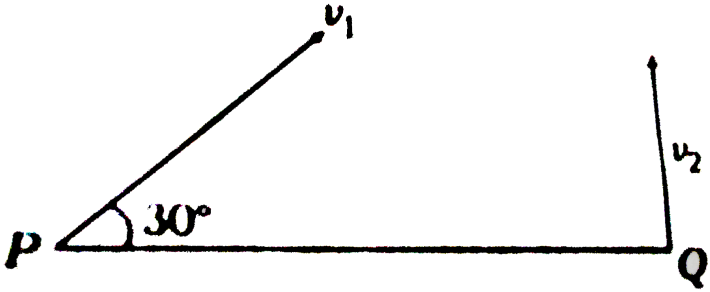
C. 30°

D. $\tan^{-1}(3/4)$

Answer: C

Watch Video Solution

58. A projectile A is thrown at an angle 30° to the horizontal from point P. At the same time, another projectile B is thrown with velocity v_2 upwards from the point Q vertically below the highest point A would reach. For B to collide with A the ratio $\frac{v_2}{v_1}$ should be



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

B. 2

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

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

Answer: C

Watch Video Solution

59. The equations of motion of a projectile are given by $x = 36tm$ and $2y = 96t - 9.8t^2m$. The angle of projection is

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\sin^{-1}\left(\frac{3}{5}\right)$

C. $\sin^{-1}\left(\frac{4}{5}\right)$

D. $\sin^{-1}\left(\frac{3}{4}\right)$

Answer: A

Watch Video Solution

60. A ball is thrown from a point with a speed 'v^(0)' at an elevation angle of θ . From the same point and at the same instant , a person starts running with a constant speed $\frac{'v_0'}{2}$ to catch the ball . Will the person be able to catch the ball ? If yes, what should be the angle of projection θ ?

A. Yes, 60°

B. Yes, 30°

C. No

D. Yes, 45°

Answer: A

Watch Video Solution

61. An arrow is shot into air. Its range is 200m and its time of flight is 5s. If $g = 10ms^{-2}$. If $g = 10ms^{-2}$, then horizontal component of velocity and the maximum height will be respectively

A. $20ms^{-1}, 62.50m$

B. $40ms^{-1}, 31.25m$

C. $80ms^{-1}, 62.5m$

D. None of these

Answer: B

Watch Video Solution

62. A particle of mass 2kg moves with an initial velocity of $\overrightarrow{v} = 4\hat{i} + 4\hat{j}ms^{-1}$. A constant force of $\overrightarrow{F} = 20\hat{j}N$ is applied on the particle. Initially, the particle was at (0,0). The x-coordinates of the particle when its y-coordinates again becomes zero is given by

A. 3.2m

B. 6m

C. 4.8m

D. 1.2m

Answer: A

Watch Video Solution

63. Two balls are thrown simultaneously from ground with same velocity of $10ms^{-1}$ but different angles of projection with horizontally. Both balls fall at same distance $5\sqrt{3}m$ from point of projection. What is the time interval between balls striking the ground ?

A. $(\sqrt{3}-1)s$

B. $(\sqrt{3}+1)s$

C. $\sqrt{3}s$

D. 1s

Answer: A

Watch Video Solution

64. A piece of marble is projected from earth's surface with velocity of $19.6\sqrt{2}ms^{-1}$ at 45°. 2 s later its velocity makes an angle α with horizontal, where α is

A. 45°

B. 30°

C. 60°

D. 0°

Answer: D

Watch Video Solution

65. An object of mass m is projected with a momentum p at such an angle that its maximum height is $1/4$ th of its horizontal range. Its minimum kinetic energy in its path will be

A. $\frac{p^2}{8m}$

B. $\frac{p^2}{4m}$

C. $\frac{3p^2}{4m}$

D. $\frac{p^2}{m}$

Answer: B

Watch Video Solution

66. A particle is projected with a velocity of $30ms^{-1}$, at an angle of $\theta_0 = \tan^{-1}\left(\frac{3}{4}\right)$. After 1s, the particle is moving at an angle θ to the horizontal, where $\tan\theta$ will be equal to (Take, $g = 10ms^{-2}$)

A. 1

B. 2

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

D. $\frac{1}{3}$

Answer: D

Watch Video Solution

67. A body is projected from the ground with a velocity $v = \left(3\hat{i} + 10\hat{j}\right)ms^{-1}$. The maximum height attained and the range of the body respectively are (given $g = 10ms^{-2}$)

A. 5 m and 6m

B. 3m and 10m

C. 6m and 5m

D. 3m and 5m

Answer: A

Watch Video Solution

68. A bomber moving horizontally with $500m/s$ drops a bomb which strikes ground in 10s. The angle of strike with horizontal is

A. $\tan^{-1}\left(\frac{1}{5}\right)$

B. $\tan^{-1}\left(\frac{1}{2}\right)$

C. $\tan^{-1}(1)$

D. $\tan^{-1}(5)$

Answer: A

Watch Video Solution

69. A ball rolls off the edge of a horizontal table top 4 m high. If it strikes the floor at a point 5 m horizontally away from the edge of the table, what was its speed at the instant it left the table?

A. $2.5ms^{-1}$

B. $3.5ms^{-1}$

C. $5.5ms^{-1}$

D. $6.5ms^{-1}$

Answer: C

Watch Video Solution

70. A ball is projected upwards from the top of a tower with a velocity $50ms^{-1}$ making an angle 30° with the horizontal. The height of tower is 70m. After how many seconds from the instant of throwing, will the ball reach the ground. $(g = 10ms^{-2})$

A. 2s

B. 5s

C. 7s

D. 9s

Answer: C

Watch Video Solution

71. From the top of a tower of height 40m, a ball is projected upward with a speed of $20ms^{-1}$ at an angle of elevation of 30°. Then the ratio of the total time taken by the ball to hit the ground to the time taken to ball come at same level as top of tower.

A. $2:1$

B. $3:1$

C. $3:2$

D. $1:5:1$

Answer: A

Watch Video Solution

72. The coordinates of a moving particle at any time t are given by $x = ct$ and $y = bt^2$. The speed of the particle is given by

A. $2t\sqrt{b^2 - c^2}$

B. $\sqrt{4b^2t^2 + c^2}$

C. $2t(b + c)$

D. $2t(b - c)$

Answer: B

Watch Video Solution

73. Two particles A and B are projected simultaneously from a fixed point of the ground. Particle A is projected on a smooth horizontal surface with speed v, while particle B is projected in air with speed v, while particle B is projected in air with speed $\frac{2v}{\sqrt{3}}$. If particle B hits the particle A, the angle of projection of B with the vertical is

A. 30°

B. 60°

C. Both (a) and (b)

D. 45°

Answer: A

Watch Video Solution

74. An object is projected with a velocity of $20\frac{m}{s}$ making an angle of 45° with horizontal. The equation for the trajectory is $h = Ax - Bx^2$ where h is height, x is horizontal distance, A and B are constants. The ratio A:B is (g $= ms^{-2}$)

A. $1:5$

B. $5:1$

C. $1:40$

D. $40:1$

Answer: D

Watch Video Solution

75. A particle is projected from horizontal making an angle of 53° with initial velocity $100ms^{-1}$. The time taken by the particle to make angle 45° from horizontal is

A. 14s

B. 2s

C. Both (a) and (b)

D. None of these

Answer: C

Watch Video Solution

76. A ground to ground projectile is at point A at $t = \frac{T}{3}$, is at point B at $t = \frac{5T}{6}$ and reaches the ground at $t = T$. The difference in heights between points A and B is

A. $\frac{gT^2}{6}$

B. $\frac{gT^2}{12}$

C. $\frac{gT^2}{18}$

D. $\frac{gT^2}{24}$

Answer: D

Watch Video Solution

77. A particle is projected form a horizontal plane ($x - z$ plane) such that its velocity vector at time t is gives by $\vec{V} = a\hat{i} + (b - ct)\hat{j}$. Its range on the horizontal plane is given by

A. $2ab/c$

B. ab/c

C. ac/b

D. $a/2bc$

Answer: A

Watch Video Solution

78. A ball is thrown from the ground to clear a wall 3 m high at a distance of 6 m and falls 18 m away from the wall. Find the angle of projection of ball.

A. $\tan^{-1}\left(\frac{3}{2}\right)$

B. $\tan^{-1}\left(\frac{2}{3}\right)$

C. $\tan^{-1}\left(\frac{1}{2}\right)$

D. $\tan^{-1}\left(\frac{3}{4}\right)$

Answer: B

Watch Video Solution

79. The horizontal range and miximum height attained by a projectile are R and H, respectively. If a constant horizontal acceleration $a = g/4$ is imparted to the projectile due to wind, then its horizontal range and maximum height will be

A. $(R+H), \frac{H}{2}$

B. $\left(R+\frac{H}{2}\right), 2H$

C. $(R+2H), H$

D. $(R+H), H$

Answer: D

Watch Video Solution

80. A large number of bullets are fired in all directions with the same speed v. Find the maximum area on the ground on which these bullets will spread.

A. $\pi\frac{v^2}{g}$

B. $\pi\frac{v^4}{g^2}$

C. $\pi^2\frac{v^2}{g^2}$

D. $\pi^2\frac{v^2}{g^2}$

Answer: B

Watch Video Solution

81. A cart is moving horizontally along a straight line with constant speed $30ms^{-1}$. A particle is to be fired vertically upwards from the moving cart in such a way that it returns to the cart at the same point from where it was projected after the cart has moved $80m$. At what speed (relative to the cart) must the projectile be fired? (Take $g = 10ms^{-2}$)

A. $10ms^{-1}$

B. $\frac{20}{3}ms^{-1}$

C. $\frac{40}{3}ms^{-1}$

D. $\frac{80}{3}ms^{-1}$

Answer: C

Watch Video Solution

82. A particle is projected with velocity u at angle θ with horizontal. Find the time when velocity vector is perpendicular to initial velocity vector.

A. $u / g \sin \theta$

B. $u / g \cos \theta$

C. $2u / g \sin \theta$

D. $2u \tan \theta$

Answer: A

Watch Video Solution

83. Two particles are simultaneously projected in opposite directions horizontally from a given point in space where gravity g is uniform. If u_1 and u_2 be their initial speeds, then the time t after which their velocitites are mutually perpendicular is given by

A. $\dfrac{\sqrt{u_1 u_2}}{g}$

B. $\dfrac{\sqrt{u_1^2 + u_2^2}}{g}$

C. $\dfrac{\sqrt{u_1(u_1 + u_2)}}{g}$

D. $\dfrac{\sqrt{u_2(u_1 + u_2)}}{g}$

Answer: A

Watch Video Solution

84. A hill is $500m$ high. Supplies are to be across the hill using a canon that can hurl packets at a speed of $125m/s$ over the hill . The canon is located at a distance of $800m$ from the foot to hill and can be veoved on the ground at a speed of 2 m//s , so that its distance from the hill can be adjusted. What is the shortest time inwhich a pachet can reach on the ground across the hill ? Taje $g=10m/s^2$.

A. 10s

B. 25s

C. 35s

D. 45s

Answer: D

Watch Video Solution

85. A ball is rolled off the edge of a horizontal table at a speed of $4m/\text{second}$. It hits the ground after 0.4 second . Which statement given below is true

A. It hits the ground at a horizontal distance 1.6 m from the edge of the table

B. The speed with which it hits the ground is $4.0ms^{-1}$

C. Height of the table 1m

D. It hits the ground at an angle of 60° to the horizontal

Answer: A

Watch Video Solution

86. A jet aeroplane is flying at a constant height of 2 km with a speed $360kmh^{-1}$ above the ground towards a target and releases a bomb. After how much time it will hit the target and what will be the horizontal distance of the aeroplane from the target so that the bomb should hit the target ? (Take $g = 10ms^{-2}$)

A. 10s, 1km

B. 20 s, 2km

C. 30s, 3km

D. 40s, 4km

Answer: B

Watch Video Solution

87. Two second after projection, a projectile is travelling in a direction inclined at 30° to the horizontal. After one more second, it is travelling horizontally. Find the magnitude and direction of the velocity of projection.

A. the velocity of projection is $20\sqrt{3}ms^{-1}$

B. the angle of projection is 30° with horizontal

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

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

Answer: C

Watch Video Solution

88. A projectile is fired at an angle of 30° to the horizontal such that the vertical component of its initial velocity is $80m/s$. Its time of fight is T. Its velocity at $t = T/4$ has a magnitude of nearly.

A. $200ms^{-1}$

B. $300ms^{-1}$

C. $100ms^{-1}$

D. None of these

Answer: D

Watch Video Solution

89. A very broad elevator is going up vertically with a constant acceleration of $2m/s^2$. At the instant when its velocity is $4m/s$ a ball is projected form the floor of the lift with a speed of $4m/s$ relative to the floor at an elevation of 30°. Time taken by the ball to return the floor is $(g = 10ms^2)$

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

B. $\frac{1}{3}s$

C. $\frac{1}{4}s$

D. 1s

Answer: B

Watch Video Solution

90. The velocity of a projectile when it is at the greatest height is $\left(\sqrt{2/5}\right)$ times its velocity when it is at half of its greatest height. Determine its angle of projection.

A. 30°

B. 45°

C. 60°

D. 37°

Answer: C

Watch Video Solution

91. A body of mass 1kg is projected with velocity $50ms^{-1}$ at an angle of 30° with the horizontal. At the highest point of its path a force 10 N starts acting on body for 5s vertically upward besids gravitational force, what is horizontal range of the body (Take, $g = 10ms^{-2}$)

A. $125\sqrt{3}$

B. $200\sqrt{3}m$

C. $500m$

D. $250\sqrt{3}m$

Answer: D

Watch Video Solution

92. A grass hopper can jump maximum distance $1.6m$. It spends negligible time on ground. How far can it go in $10\left(\sqrt{2}\right)$s?

A. $5\sqrt{2}m$

B. $10\sqrt{2}m$

C. $20\sqrt{2}m$

D. $40\sqrt{2}m$

Answer: C

Watch Video Solution

93. A ball rolls off the top of a staircase with a horizontal velocity um/s. If the steps are h meter high and b meter wide, the ball will hit the edge of the nth steps, if:

A. $\dfrac{hu^2}{gb^2}$

B. $\dfrac{u^2 g}{gb^2}$

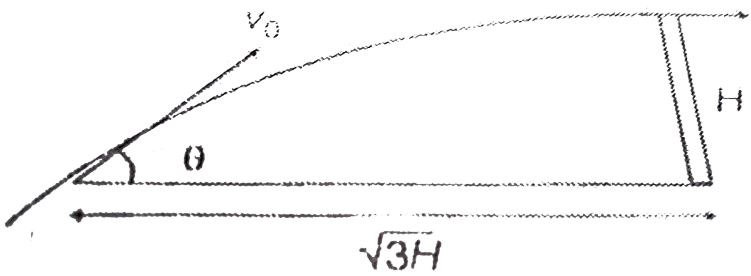
C. $\dfrac{2hu^2}{gb^2}$

D. $\dfrac{2u^2 g}{hb^2}$

Answer: C

Watch Video Solution

94. A projectile is thrown at an angle θ that it is just able to cross a vertical wall at its highest point of journey as shown in the figure. The angle θ at which the projectile is thrown is given by



A. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B. $\tan^{-1}\sqrt{3}$

C. $\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

D. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

Answer: C

Watch Video Solution

95. Two particles projected form the same point with same speed u at angles of projection α and β strike the horizontal ground at the same point. If h_1 and h_2 are the maximum heights attained by the projectile, R is the range for both and t_1 and t_2 are their times of flights, respectively, then

A. $\alpha + \beta = \frac{\pi}{2}$

B. $R = 4\sqrt{h_1 h_2}$

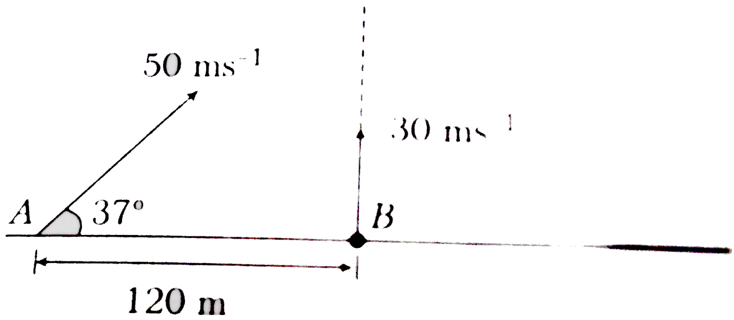
C. $\tan \alpha = \frac{t_1}{t_2} = \sqrt{h_1 h_2}$

D. None of the above

Answer: D

Watch Video Solution

96. Balls A and B are thrown form two points lying on the same horizontal plane separated by a distance 120 m. which of the following statemet (s) is/are correct ?



A. The two balls can never meet

B. The balls can meet if the ball B is thrown 1s later

C. The two balls meet at a height of 45 m

D. None of the above

Answer: C

Watch Video Solution

B. Medical entrance

1. Assertion In projectile motion, if time of flight is made two times, then maximum height will become four times.

Reason $T \propto \sin \theta$ and $H \propto \sin^2 \theta$, where θ is angle of projection.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: A

Watch Video Solution

Medical entrance

1. Assertion If in a projectile motion, we take air friction into consideration, then $t_{\text{ascent}} < t_{\text{descent}}$.

Reason During ascent, magnitude of retardation is greater than magnitude of acceleration during descent.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: A

View Text Solution

2. Assertion In case of projectile motion, the magnitude of rate of change of velocity is variable.

Reason In projectile motion, magnitude of velocity first decreases and then increases during the motion.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: D

Watch Video Solution

3. Assertion At highest point of a projectile, dot product of velocity and acceleration is zero.

Reason At highest point, velocity and acceleration are mutually perpendicular.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: A

Watch Video Solution

4. Assertion A particle is projected with speed u at an angle θ with the horizontal. At any time during motion, speed of particle is v at angle α with the vertical, then $v \sin \alpha$ is always constant throughout the motion.

Reason In case of projectile motion, magnitude of radical acceleration at topmost point is maximum.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: B

Watch Video Solution

5. Assertion In projectile motion, if time of flight is 4s, then maximum height will be 20 m. (Take, $g = 10ms^{-2}$)

Reason Maximum height $= \frac{gT}{2}$.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: C

Watch Video Solution

6. Assertion: For projection angle $\tan^{-1}(4)$, the horizontal range and the maximum height of a projectile are equal.

Reason: The maximum range of projectile is directely proportional to square of velocity and inversely proportional to acceleration due to gravity.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: B

Watch Video Solution

7. A particle is acted simultaneously by mutually perpendicular simple harmonic motion $x = a\cos\omega t$ and $y = a\sin\omega t$. The frequency of motion of the particle will be

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: D

Watch Video Solution

8. Assertion If a particle is projected vertically upwards with velocity u, the maximum height attained by the particle is h_1. The same particle is projected at angle 30° from horizontal with the same speed u. Now the maximum height is h_2. Thus $h_1 = 4h_2$.

Reason In first case, $v = 0$ at highest point and in second case $v \neq 0$ at highest point.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: B

Watch Video Solution

9. Assertion On the surface of moon, value of g is $\frac{1}{6}th$ the value on the surface of earth. A particle is projected as projectile under similar condition on the surface of moon and on the surface of earth. Then values of T,H and R on the surface of moon will become six times.

Reason T, H and $R \propto \frac{1}{g}$

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: A

Watch Video Solution

10. Assertion In projectile motion, the angle between instanteneous velocity vector and acceleration vector can be anything between o to π (excluding the limiting case)

Reason In projectile motion, acceleration vector is always pointing vertically downwards. (Neglect air friction.)

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: A

Watch Video Solution

11. Assertion Particle-1 is dropped from a tower and particle-2 is projected horizontal from the same tower. Then both the particles reach the ground simultaneously.

Reason Both are particles strike the ground with different speeds.

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: B

Watch Video Solution

12. Assertion At height 20 m from ground , velocity of a projectile is $v = \left(20\hat{i} + 10\hat{j}\right)ms^{-1}$. Here, $\hat{i}$ is horizontal and $\hat{j}$ is vertical. Then, the particle is at the same height after 4s.

Reason Maximum height of particle from ground is 40m (take, $g = 10ms^{-2}$)

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

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

C. If Assertion is true but Reason is false

D. If Assertion is false but Reason is true

Answer: B

Watch Video Solution

Match the Columns

1. A particle is projected form ground with velocity u ar angle θ from horizontal. Match the following two columns.

	Column I		Column II
(A)	Average velocity between initial and final points	(p)	$u\sin\theta$
(B)	Change in velocity between initial and final points	(q)	$u\cos\theta$
(C)	Change in velocity between initial and peak points	(r)	zero
(D)	Average velocity between initial and highest points	(s)	None

Watch Video Solution

2. Given that $u_x =$ horizontal component of initial velocity of a projectile, $u_y =$ vertical component of initial velocity, $R =$ horizontal range, T = time of flight and H = maximum height of projectile. Now match the following two columns.

	Column I		Column II
(A)	u_x is doubled, u_y is halved	(p)	H will remain unchanged
(B)	u_y is doubled u_x is halved	(q)	R will remain unchanged
(C)	u_x and u_y both are doubled	(r)	R will become four times
(D)	Only u_y is doubled	(s)	H will become four times

Watch Video Solution

3. A particle is projected horizontally form a tower with velocity $10ms^{-1}$. Taking $g = 10ms^{-2}$. Match the following two columns at time t = 1s.

Column I		Column II	
(A)	Horizontal component of velocity	(p)	5 SI units
(B)	Vertical component of velocity	(q)	10 SI unit
(C)	Horizontal displacement	(r)	15 SI unit
(D)	Vertical displacement	(s)	20 SI unit

Watch Video Solution

4. Trajectory of particle in a projectile motion is given as $y = x - \frac{x^2}{80}$. Here x and y are in metre. For this projectile motion match the following with $g = 10ms^{-2}$.

Column I		Column II	
(A)	Angle of projection	(p)	20 m
(B)	Angle of velocity with horizontal after 4 s	(q)	80 m
(C)	Maximum height	(r)	$45°$
(D)	Horizontal range	(s)	$\tan^{-1}\left(\frac{1}{2}\right)$

Watch Video Solution

C. Medical entrances gallery

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

A. Velocity and acceleration both are parallel to r

B. velocity is perpendicular to r and acceleration is directed towards to origin

C. Velocity is perpendicular to r and acceleration is directed away from the origin

D. Velocity and acceleration both are perpendicular to r

Answer: B

Watch Video Solution

1. A particle is projected with an angle of projection θ to the horizontal line passing through the points (P,Q) and (Q,P) referred to horizontal and vertical axes (can be treated as X-axis and Y-axis respectively). The angle of projection can be given by

A. $\tan^{-1}\left[\frac{P^2+PQ+Q^2}{PQ}\right]$

B. $\tan^{-1}\left[\frac{P^2+Q^2-PQ}{PQ}\right]$

C. $\tan^{-1}\left[\frac{P^2+Q^2}{2PQ}\right]$

D. $\sin^{-1}\left[\frac{P^2+Q^2+PQ}{2PQ}\right]$

Answer: A

Watch Video Solution

2. An object is thrown towards the tower which is at a horizontal distance of 50 m with an initial velocity of $10ms^{-1}$ and making an angle

30° with the horizontal. The object hits the tower at certain height. The height from the bottom of the tower, where the object hits the tower is (Take, $g = 10ms^{-2}$)

A. $\frac{50}{\sqrt{3}}\left[1 - \frac{10}{\sqrt{3}}\right]m$

B. $\frac{50}{3}\left[1 - \frac{10}{\sqrt{3}}\right]m$

C. $\frac{100}{\sqrt{3}}\left[1 - \frac{10}{\sqrt{3}}\right]m$

D. $\frac{100}{3}\left[1 - \frac{10}{\sqrt{3}}\right]m$

Answer: A

Watch Video Solution

3. The range of a projectile is R when the angle of projection is 40°. For the same velocity of projection and range, the other possible angle of projection is

A. 45°

B. 50°

C. 60°

D. 40°

Answer: B

Watch Video Solution

4. A particle with a velcoity (u) so that its horizontal ange is twice the greatest height attained. Find the horizontal range of it.

A. $\frac{4v^2}{5g}$

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

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

D. $\frac{2v^2}{3g}$

Answer: A

Watch Video Solution

5. If the angle of projection of a projector with same initial velocity exceed or fall short of 45° by equal amount α, then the ratio of horizontal rages is

A. $1:2$

B. $1:3$

C. $1:4$

D. $1:1$

Answer: D

Watch Video Solution

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

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

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

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

C. $2\left(\hat{i} - \hat{j}\right)$

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

Answer: D

Watch Video Solution

7. A cricket ball thrown across a field is a heights h_1 and h_2 from the point of projection at time t_1 and t_2 respectively after the throw. The ball is caught by a fielder at the same height as that of projection. The time of flight of the ball in this journey is

A. $\left(\frac{h_1 t_2^2 - h_2 t_1^2}{h_1 t_2 - h_2 t_1}\right)$

B. $\left(\frac{h_1 t_2^2 - h_2 t_1^2}{h_1 t_2 - h_2 t_1}\right)$

C. $\left(\frac{h_1 t_2^2 - h_2 t_1^2}{h_1 t_2 - h_2 t_1}\right)$

D. None of these

Answer: C

Watch Video Solution

8. For an object thrown at 45° to the horizontal, the maximum height H and horizontal range R are related as

A. $R = 16H$

B. $R = 8H$

C. $R = 4H$

D. $R = 2H$

Answer: C

Watch Video Solution

9. A body is projected horizontally from the top of a tower with a velocity of $10m/s$.If it hits the ground at an angle 45°, th vertical component of velocity when it hits ground in m/s is

A. $10\sqrt{2}$

B. $5\sqrt{2}$

C. 5

D. 10

Answer: D

Watch Video Solution

10. A body is projected with an angle θ.The maximum height reached is h .If the time of flight is $4\sec$ and $g=10m/s^2$,then the value of h is

A. 40 m

B. 20 m

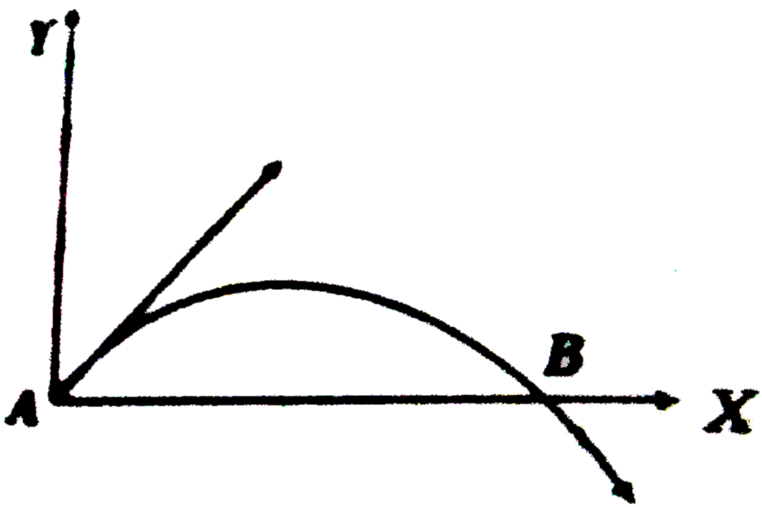
C. 5 m

D. 10 m

Answer: B

Watch Video Solution

11. The velocity of a projectile at the initial point A is $\left(2\hat{i} + 3\hat{j}\right)ms^{-1}$. Its velocity (in ms^{-1}) at point B is



A. $2\hat{i} - 3\hat{j}$

B. $-2\hat{i}+3\hat{j}$

C. $2\hat{i}-3\hat{j}$

D. $2\hat{i}+3\hat{j}$

Answer: C

Watch Video Solution

12. A projectile is thrown with initial velocity u_0 and angle 30° with the horizontal. If it remains in the air for 1s. What was its initial velocity ?

A. $19.6ms^{-1}$

B. $9.8ms^{-1}$

C. $4.9ms^{-1}$

D. $1ms^{-1}$

Answer: B

Watch Video Solution

13. A projectile is projected at $10ms^{-1}$ by making an angle 60° to the horizontal. After sometime, its velocity makes an angle of 30° to the horzontal . Its speed at this instant is:

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

B. $10\sqrt{3}$

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

D. $5\sqrt{3}$

Answer: A

Watch Video Solution

14. two particles are projected upwards with the same initial velocity v_0 in two different angles of projection such that their horizontal ranges are the same. The ratio of the heights of their horizontal ranges are the same. The ratio of the heights of their highest point will be

A. $\tan^2\theta_1$

B. $v_0^2\sin^2\theta_1$

C. $v_0\sin\theta_1$

D. $v_0 / \cos\theta_1$

Answer: A

Watch Video Solution

15. The velocity vector of the motion described by the position vector of a particle, $r = 2t\hat{i} + t^2\hat{j}$ is given by

A. $v = 2\hat{i} + 2t\hat{j}$

B. $v = 2t\hat{I} + 2t\hat{j}$

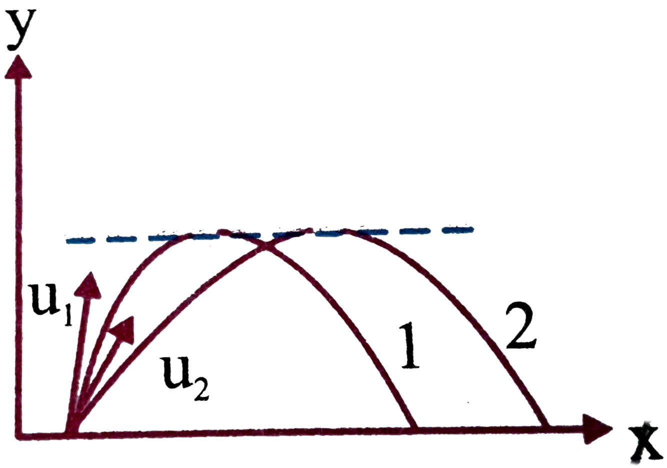
C. $v = t\hat{i} + t^2\hat{j}$

D. $v = 2\hat{i} + t^2\hat{j}$

Answer: A

Watch Video Solution

16. Trajectories of two projectiles are shown in figure.Let T_1 and T_2 be the time periods and u_1 and u_2 their speeds of projection.Then



A. $T_2 > T_1$

B. $T_1 = T_2$

C. $u_1 > u_2$

D. $u_1 < u_2$

Answer: D

Watch Video Solution

17. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is

A. $\theta = \tan^{-1}\left(\frac{1}{4}\right)$

B. $\theta = \tan^{-1}(4)$

C. $\theta = \tan^{-1}(2)$

D. $\theta = 45^{\circ}$

Answer: B

Watch Video Solution

18. If for the same range, the two heights attined are 20 m and 80 m, then the range will be

A. 20 m

B. 40 m

C. 120m

D. 160 m

Answer: D

Watch Video Solution

19. A ball thrown by one player reaches the other in $2s$. The maximum height attained by the ball above the point of projection will be about.

A. $2.5m$

B. $5m$

C. $7.5m$

D. $10m$

Answer: B

Watch Video Solution

Example

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

Watch Video Solution

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

Watch Video Solution

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

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

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

A. $110m$ $150m$

B. $110m$ $50m$

C. $50m$ $50m$

D. $110m$ $110m$

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

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

A. $314m$

B. $200m$

C. $214m$

D. $100m$

Answer: A

Watch Video Solution

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

Watch Video Solution

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

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

Find its speed at t = 2 s.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

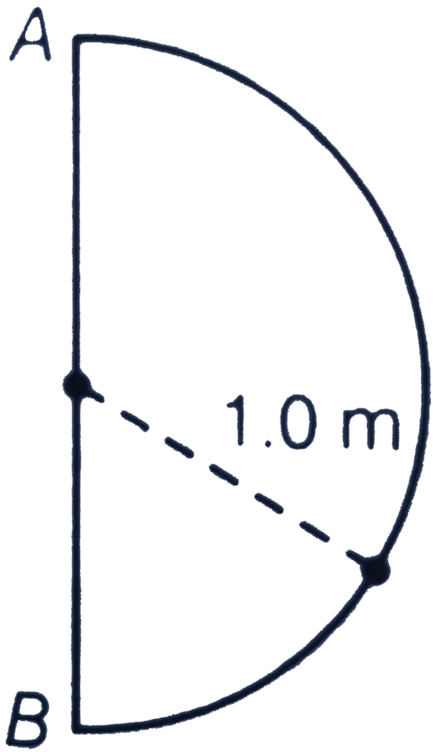
10. A particle travels along a straight line. It covers halg the distance with a speed (v). The remaining part of the distance was covere with speed v_1 for half the time and with speed v_2 for the other half the time . Find the average speed of the particle over the entire motion.

Watch Video Solution

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

Watch Video Solution

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



A. $3m / s$

B. $2m / s$

C. $1m / s$

D. $2.5m/s$

Answer: B

Watch Video Solution

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

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

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

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

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

17. The velocity of a particle moving in the positive direction of x-axis varies as $v = \alpha\sqrt{x}$ where α is positive constant. Assuming that at the moment $t = 0$, the particle was located at $x = 0$, find (i) the time dependance of the velocity and the acceleration of the particle and (ii) the mean velocity of the particle averaged over the time that the particle takes to cover first s meters of the path.

Watch Video Solution

18. The distance travelled by a body is proportional to the square of time. What type of motion this body has ?

A. projectile motion

B. uniform accelerated motion

C. Non uniform accelerated motion

D. none

Answer: B

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

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

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

Watch Video Solution

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

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

(b) the velocity of the particle at origin.

Watch Video Solution

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

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

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

Watch Video Solution

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

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

(ii) instantaneous acceleration at t = 2 s.

Watch Video Solution

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

(ii) Can these be equal ?

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

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

30. A particle starts with an initial velocity and passes successively over the two halves of a given distance with constant accelerations a_1 and a_2 respectively. Show that the final velocity is the same as if the whole distance is covered with a uniform acceleration $\frac{a_1 + a_2}{2}$.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

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

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

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

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

Answer: D

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

42. An open elevator is ascending with constant speed $v = 10m/s$. A ball is thrown vertically up by a boy on the lift when he is at a height

$h = 10m$ from the ground. The velocity of projection is $v = 30m/s$ with respect to elevator. Find

(a) the maximum height attained by the ball.

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

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

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

(b) acceleration-time equation.

Watch Video Solution

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

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

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

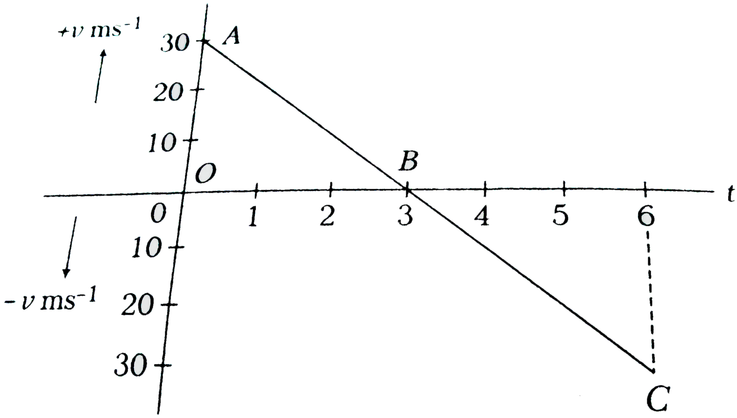
(c) Find position of particle when velocity of particle is zero.

Watch Video Solution

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

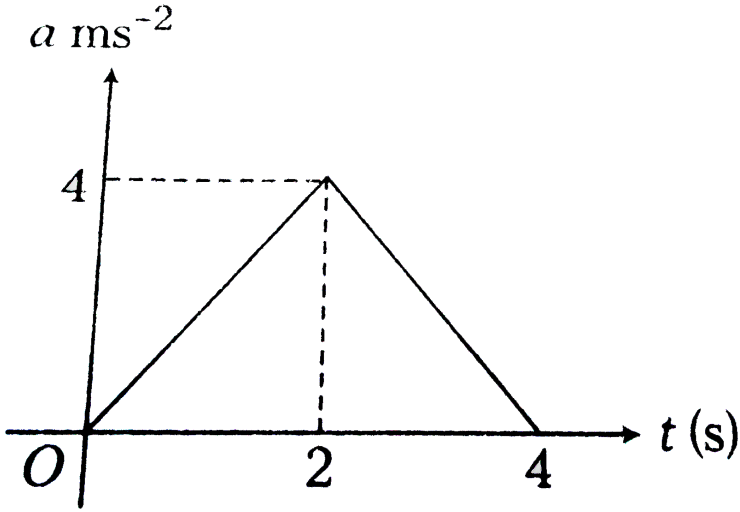
(i) displacement in first three seconds and

(ii) acceleration for the graph.



Watch Video Solution

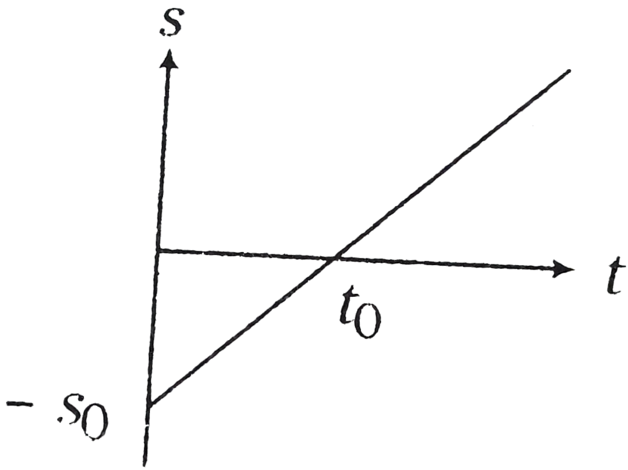
49. Acceleration - time graph of a particle moving in a straight line is shown in figure. Velocity of particle at time t = 0 is $2ms^{-1}$. Find velocity at the end of fourth second.



Watch Video Solution

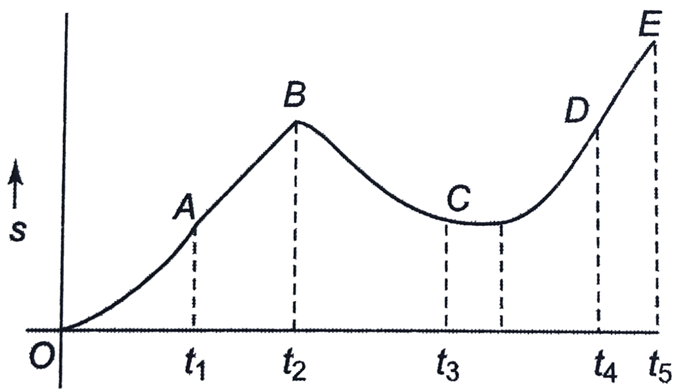
50. Displacement - time graph of particle moving in a straight line is as shown in figure. State whether the motion is accelerated or not. Describe the motion in detail. Given,

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



Watch Video Solution

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

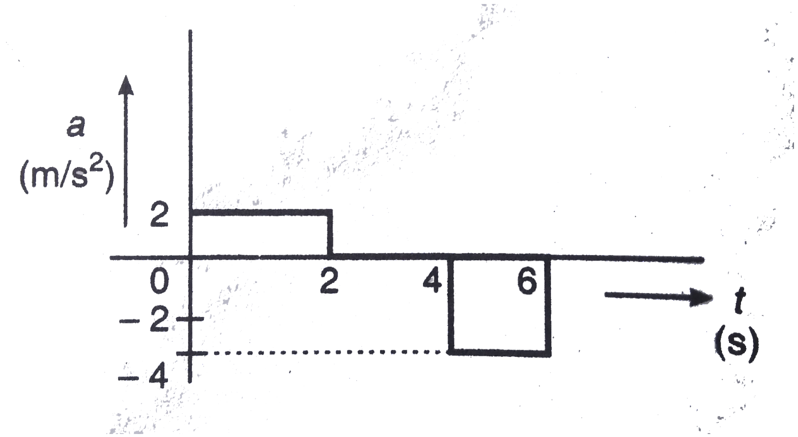


Watch Video Solution

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

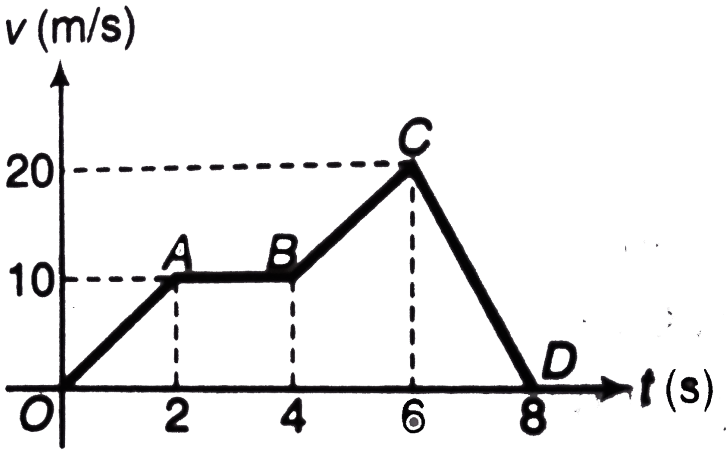
Watch Video Solution

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



Watch Video Solution

54. Velocity-time graph of a particle moving in a straight line is shown in figure. Plot the corresponding displacement-time graph of the particle if at time $t = 0$, displacement $s = 0$.



Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

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

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

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

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

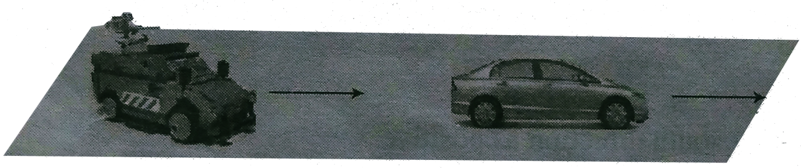
Answer: C

Watch Video Solution

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

Watch Video Solution

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



Watch Video Solution

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

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

A. $4h\ 100km$

B. $2h\ 120km$

C. $4h\ 150km$

D. $4h\ 120km$

Answer: D

View Text Solution

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

View Text Solution

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

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

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

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

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

Answer: B

Watch Video Solution

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

(a) width of the river

(b) velocity of the boat with respect to water

(c) speed of the current

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

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

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

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

Answer: B

Watch Video Solution

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

Watch Video Solution

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

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

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

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

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

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

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

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

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

Answer: A

Watch Video Solution

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

Watch Video Solution

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

A. $2.5s$

B. $2s$

C. $3s$

D. $3.5s$

Answer: A

Watch Video Solution

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

(a) time when ball again meets the lift

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

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

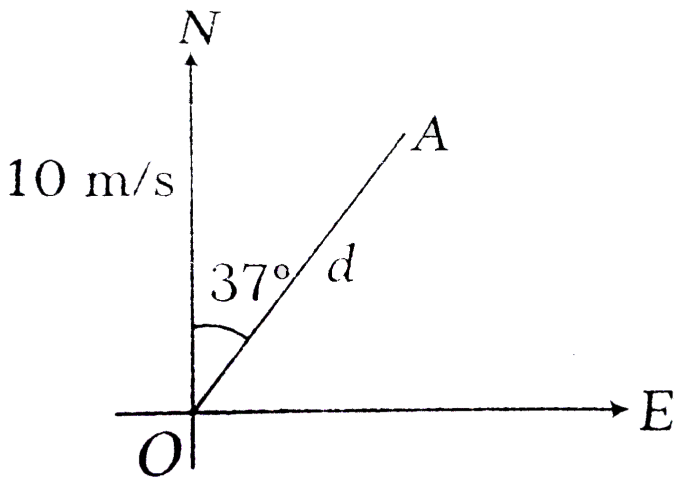
Take $g = 10m/s^2$

Watch Video Solution

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

Watch Video Solution

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



Watch Video Solution

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

Watch Video Solution

Check point 3.1

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

A. Landing of an aircraft

B. Earth revolving around the sun

C. Motion of wheels of moving

D. Train running on a straight track

Answer: D

Watch Video Solution

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

A. $5\sqrt{2}m$

B. 5 m

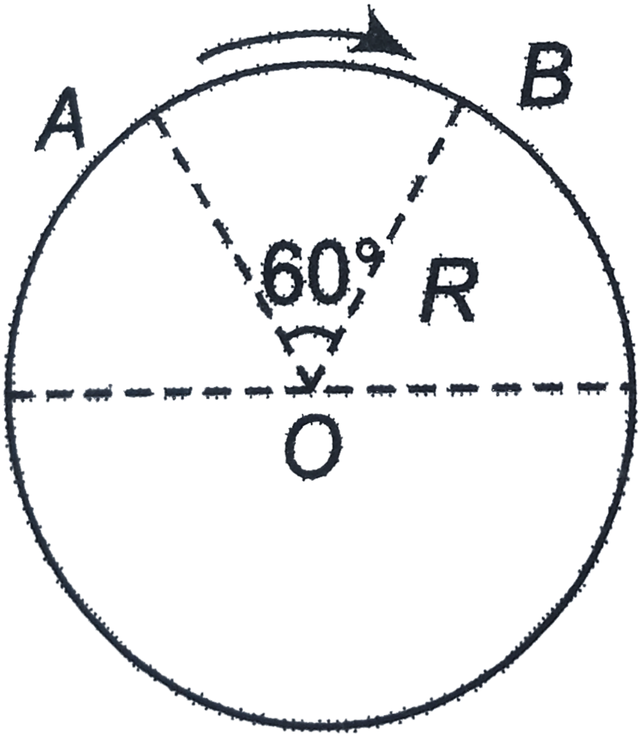
C. 10 m

D. 20 m

Answer: A

Watch Video Solution

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



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

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

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

D. πR

Answer: A

Watch Video Solution

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

A. 10 m along North

B. 10 m long South

C. 10 m along West

D. Zero

Answer: C

Watch Video Solution

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

A. 1200 m

B. 1300 m

C. 1400 m

D. 1500 m

Answer: A

Watch Video Solution

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

A. 2π

B. $\sqrt{2}\pi$

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

D. π

Answer: C

Watch Video Solution

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

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

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

Which pair gives the negative displacement ?

A. (i)

B. (ii)

C. (iii)

D. (i) and (iii)

Answer: B

Watch Video Solution

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

A. $0, 2\pi r$

B. $2\pi r, 0$

C. $0, \pi r$

D. $\pi r, 0$

Answer: B

Watch Video Solution

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

A. 40 m, 0

B. 40 m, 20 m

C. $40m, \ -20m$

D. $60m, \ -20m$

Answer: D

Watch Video Solution

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

A. less than one

B. equal to one

C. equal to or less than one

D. equal to or greater than one

Answer: C

Watch Video Solution

Check point 3.2

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

A. $60 kmh^{-1}$

B. $80 kmh^{-1}$

C. $120 kmh^{-1}$

D. $180 kmh^{-1}$

Answer: A

Watch Video Solution

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

A. $25.3 ms^{-1}$

B. $29.2 ms^{-1}$

C. $31 ms^{-1}$

D. $35.6 ms^{-1}$

Answer: A

Watch Video Solution

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

A. $5 kmh^{-1}$

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

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

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

Answer: D

Watch Video Solution

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

A. Displacement of the particle is zero

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

C. Displacement of the particle 30 m

D. Both (a) and (b)

Answer: D

Watch Video Solution

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

A. 56 s

B. 68 s

C. 80 s

D. 92 s

Answer: C

Watch Video Solution

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

A. 2

B. 4

C. 6

D. 8

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: C

Watch Video Solution

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

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

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

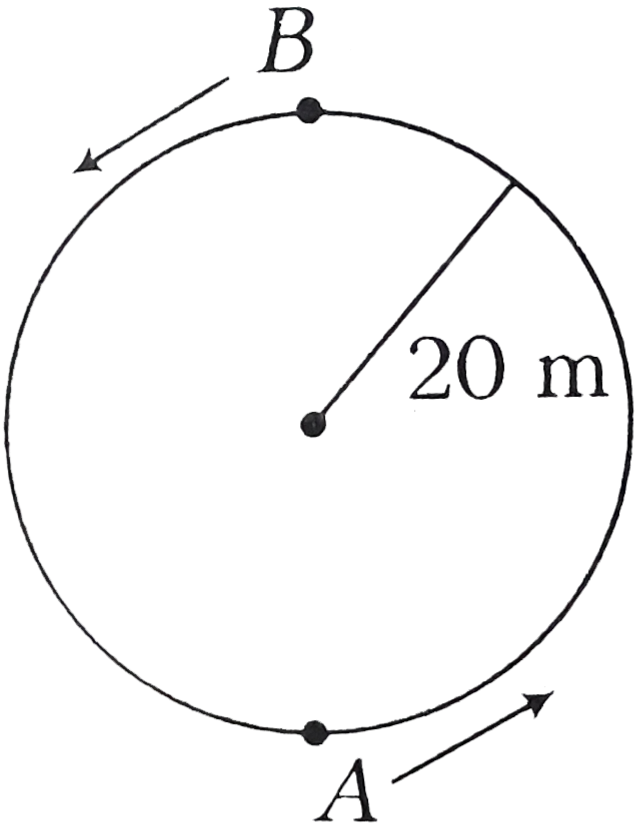
C. $\frac{R\sqrt{2}}{t}$

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

Answer: C

Watch Video Solution

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



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

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

C. 10

D. None of these

Answer: D

Watch Video Solution

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

A. $16ms^{-1}$

B. $14ms^{-1}$

C. $10ms^{-1}$

D. $12ms^{-1}$

Answer: B

Watch Video Solution

Check point 3.3

1. Acceleration of a particle changes when

A. direction of velocity changes

B. magnitude of velocity changes

C. Both (a) and (b)

D. speed changes

Answer: C

Watch Video Solution

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

A. Both speed and velocity

B. Neither speed nor velocity

C. Only the velocity

D. Only the speed

Answer: D

Watch Video Solution

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

A. $0.01ms^{-2}$

B. $0.02ms^{-2}$

C. $0.03ms^{-2}$

D. $0.04ms^{-2}$

Answer: B

Watch Video Solution

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

A. $-\beta$

B. $-\beta+2\gamma$

C. 2γ

D. -2γ

Answer: C

Watch Video Solution

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

A. $0.67ms^{-2}$

B. $1ms^{-2}$

C. $1.25ms^{-2}$

D. $1.5ms^{-2}$

Answer: A

Watch Video Solution

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

A. $7ms^{-2}$

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

C. $5ms^{-2}$

D. $1ms^{-2}$

Answer: C

Watch Video Solution

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

A. $13ms^{-2}$

B. $10ms^{-2}$

C. $27ms^{-2}$

D. $37ms^{-2}$

Answer: B

Watch Video Solution

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

A. $180ms^{-2}$

B. $580ms^{-2}$

C. $100ms^{-2}$

D. $50ms^{-2}$

Answer: C

Watch Video Solution

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

A. $18ms^{-2}$

B. $10ms^{-2}$

C. $5ms^{-2}$

D. $1ms^{-2}$

Answer: B

Watch Video Solution

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

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

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

C. zero

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

Answer: D

Watch Video Solution

Check point 3.4

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

A. $3ms^{-2}$

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

C. $6ms^{-2}$

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

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

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

A. uniform acceleration

B. uniform velocity

C. Both of these

D. speed changes

Answer: A

Watch Video Solution

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

A. 64 m

B. 64 cm

C. 640 cm

D. $0.064m$

Answer: C

Watch Video Solution

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

A. 10 s

B. 20 s

C. 30 s

D. 40 s

Answer: A

Watch Video Solution

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

A. 750 m

B. 800 m

C. 700 m

D. 850 m

Answer: A

Watch Video Solution

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

A. $4a$

B. $12a$

C. $6a$

D. $8a$

Answer: D

Watch Video Solution

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

A. 2 s

B. 4 s

C. 6 s

D. 8 s

Answer: B

Watch Video Solution

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

A. 1 m

B. 2 m

C. 3 m

D. 4 m

Answer: C

Watch Video Solution

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

A. 20 m

B. 32 m

C. 24 m

D. 26 m

Answer: D

Watch Video Solution

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

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

B. $40ms^{-1}$

C. $25ms^{-1}$

D. $30ms^{-1}$

Answer: C

Watch Video Solution

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

A. $1/5$

B. $2/5$

C. $3/5$

D. $4/5$

Answer: C

Watch Video Solution

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

A. $25ms^{-1}$

B. $25.5ms^{-1}$

C. $24ms^{-1}$

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

Answer: B

Watch Video Solution

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

A. $12.5ms^{-2}$

B. $7.5ms^{-2}$

C. $5ms^{-2}$

D. $2.5ms^{-2}$

Answer: A

Watch Video Solution

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

A. $0.20ms^{-2}$

B. $0.027ms^{-2}$

C. $0.218ms^{-2}$

D. $0.03ms^{-2}$

Answer: C

Watch Video Solution

Check point 3.5

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

A. uniform velocity

B. uniform acceleration

C. variable acceleration

D. constant momentum

Answer: B

Watch Video Solution

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

A. $5.84 ms^{-1}$

B. $49ms^{-1}$

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

D. $98ms^{-1}$

Answer: B

Watch Video Solution

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

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

B. $(u + gt)t$

C. ut

D. $gt^2 / 2$

Answer: D

Watch Video Solution

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

A. 2 m

B. 5 m

C. 8 m

D. 10 m

Answer: B

Watch Video Solution

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

A. $52ms^{-1}$

B. $61ms^{-1}$

C. $45ms^{-1}$

D. $26ms^{-1}$

Answer: A

Watch Video Solution

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

A. 1 s

B. 2 s

C. 3 s

D. 4 s

Answer: B

Watch Video Solution

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

A. 5 s

B. 12 s

C. 15 s

D. 8 s

Answer: A

Watch Video Solution

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

A. $3u^2 / g$

B. $4u^2 / g$

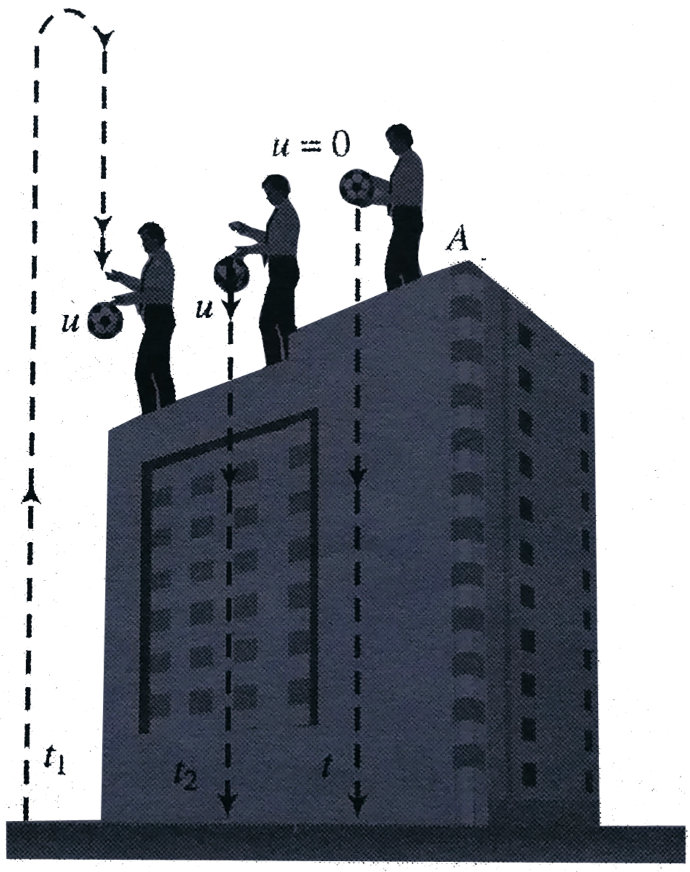
C. $6u^2 / g$

D. $9u^2 / g$

Answer: B

Watch Video Solution

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



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

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

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

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

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

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

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

A. $t_1 < t_2$

B. $t_1 = t_2$

C. $t_1 > t_2$

D. Data insfficient

Answer: A

Watch Video Solution

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

A. ball P reaches the ground first

B. ball Q reaches the ground first

C. Both reach the ground at the same time

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

Answer: C

Watch Video Solution

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

A. 100 m

B. $12.5m$

C. 145 m

D. $167.5m$

Answer: B

Watch Video Solution

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

A. 3 s

B. 4 s

C. 5 s

D. 6 s

Answer: B

Watch Video Solution

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

A. $1:4:9$

B. $1:2:4$

C. $1:3:5$

D. $1:2:3$

Answer: C

Watch Video Solution

16. A stone is thrown vertically upwards. When stone is at a height half of its maximum height, its speed is $10ms^{-1}$, then the maximum height attained by the stone is ($g = 10ms^{-2}$)

A. 16 m

B. 10 m

C. 20 m

D. 40 m

Answer: B

Watch Video Solution

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

A. $\sqrt{3}v_0$

B. $3v_0$

C. $9v_0$

D. $3/2v_0$

Answer: A

Watch Video Solution

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

A. $14.7m$

B. $19.6m$

C. $9.8m$

D. $24.5m$

Answer: A

Watch Video Solution

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

A. 8 h

B. 6 h

C. 4 h

D. 5 h

Answer: C

Watch Video Solution

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

A. $1:\sqrt{2}$

B. $\sqrt{2}:1$

C. $2:1$

D. $1:2$

Answer: A

Watch Video Solution

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

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

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

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

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

Answer: D

Watch Video Solution

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

A. only on α and γ

B. only on β and γ

C. only on α and β

D. only on α

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

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

A. $12ms^{-1}$

B. $14ms^{-1}$

C. $16ms^{-1}$

D. $18ms^{-1}$

Answer: C

Watch Video Solution

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

A. $29ms^{-1}$

B. $5ms^{-1}$

C. $6ms^{-1}$

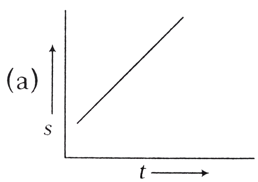
D. $12ms^{-1}$

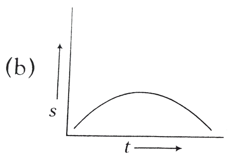
Answer: C

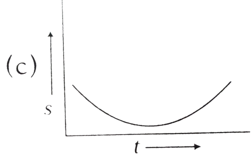
Watch Video Solution

Check point 3.6

1. Which of the following graph represents uniform motion

A. 

B. 

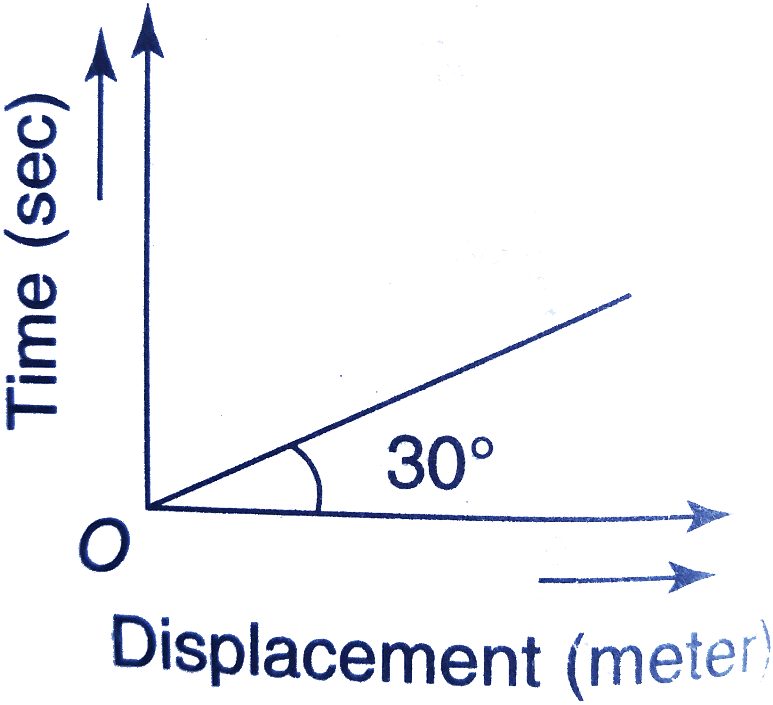
C. 

D. None of these

Answer: A

Watch Video Solution

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



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

B. $3ms^{-1}$

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

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

Answer: C

Watch Video Solution

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

A. $\sqrt{3}-1$

B. $\sqrt{3}+1$

C. $\sqrt{3}$

D. 1

Answer: A

Watch Video Solution

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

A. straight line with a positive slope

B. parabola

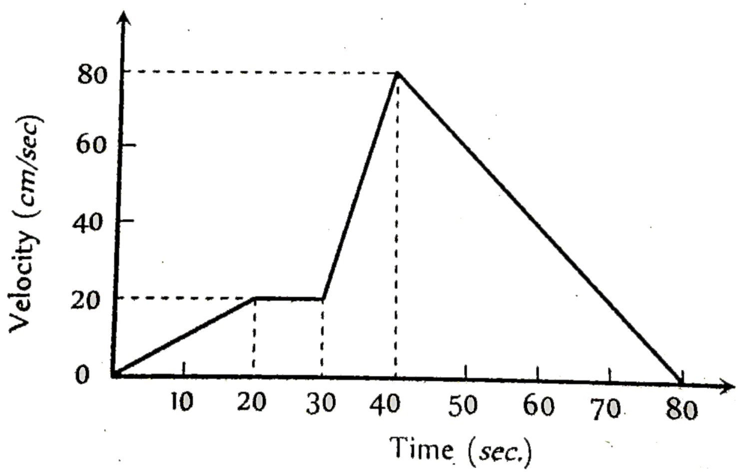
C. ellipse

D. straight line parallel to time axis

Answer: B

Watch Video Solution

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



A. $1cm^{-2}$

B. $2cm^{-2}$

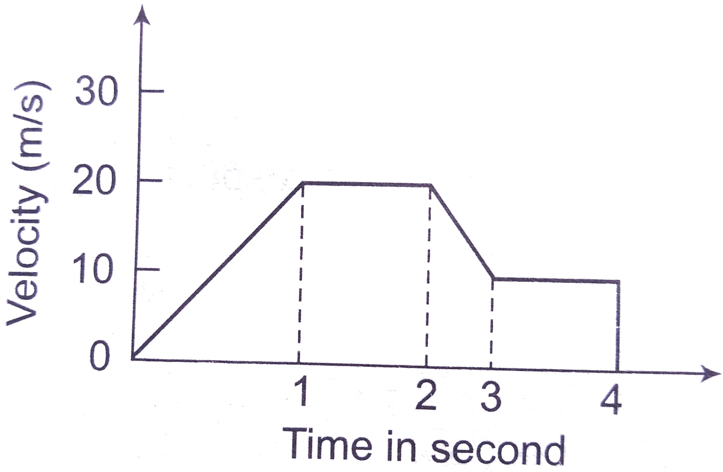
C. $3cm^{-2}$

D. $6cm^{-2}$

Answer: D

Watch Video Solution

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



A. 60 m

B. 55 m

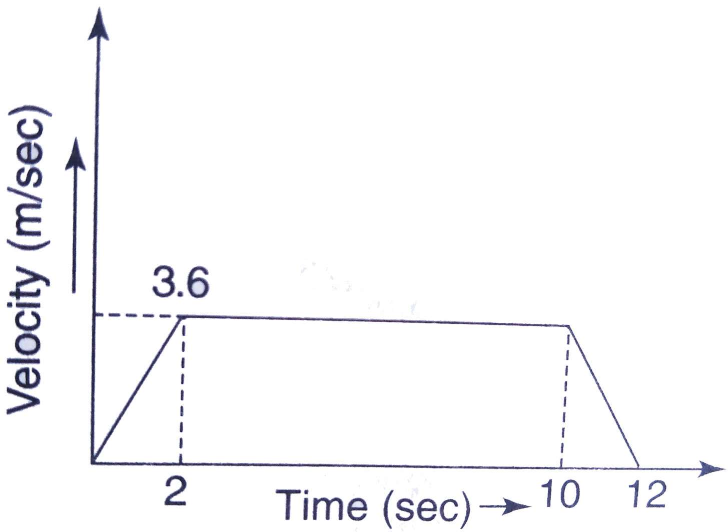
C. 25 m

D. 30 m

Answer: B

Watch Video Solution

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



A. $3.6m$

B. $28.8m$

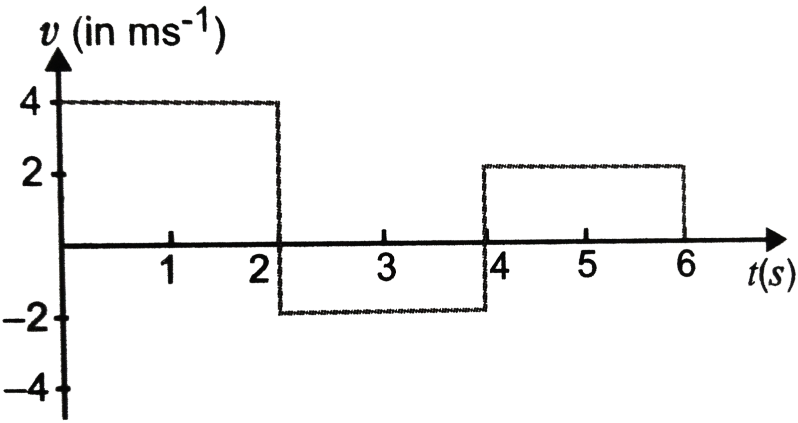
C. $36.0m$

D. Cannot be calculated from the above graph

Answer: C

Watch Video Solution

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



A. 8m, 16m

B. 16m, 32m

C. 16m, 16m

D. 8m, 18m

Answer: A

Watch Video Solution

Watch Video Solution

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

A. a straight line passing through origin

B. a straight line not passing through origin

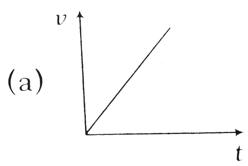
C. a parabola

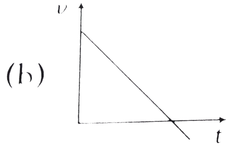
D. None of the above

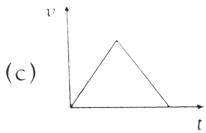
Answer: B

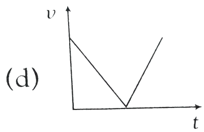
Watch Video Solution

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

A. 

B. 

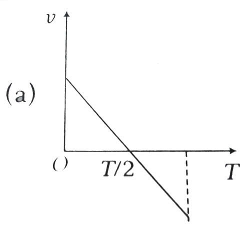
C. 

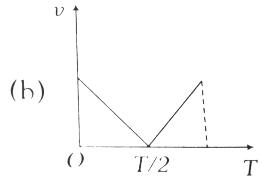
D. 

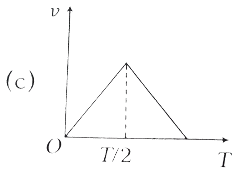
Answer: A

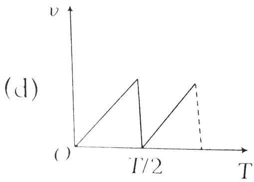
Watch Video Solution

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

A. 

B. 

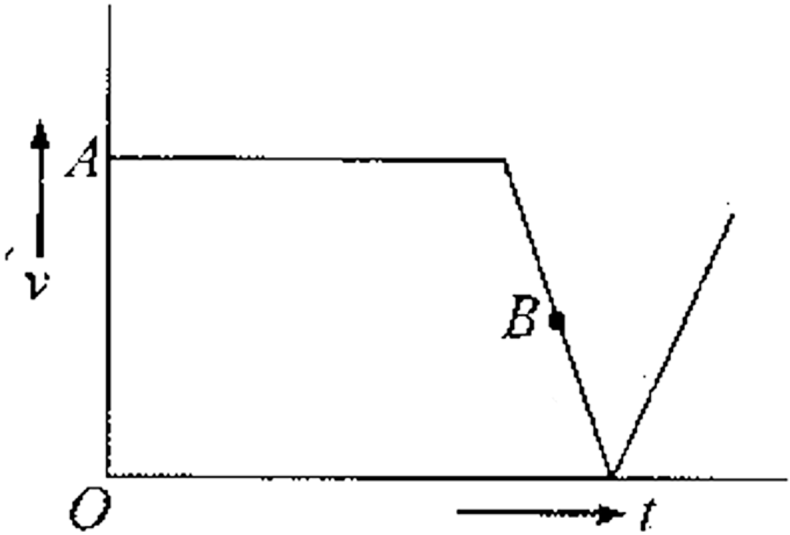
C. 

D. 

Answer: A

Watch Video Solution

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



A. the is zero

B. there is at force towards motion

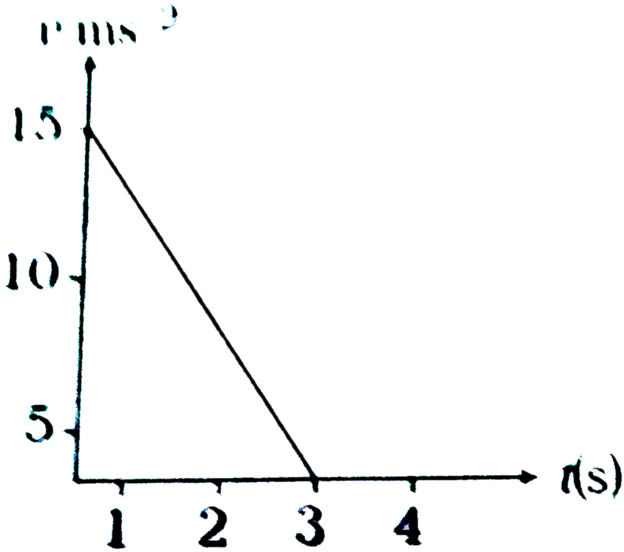
C. there is a force which opposes motion

D. there is only gravitational force

Answer: C

Watch Video Solution

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



A. $22.5ms^{-2}$

B. $5ms^{-2}$

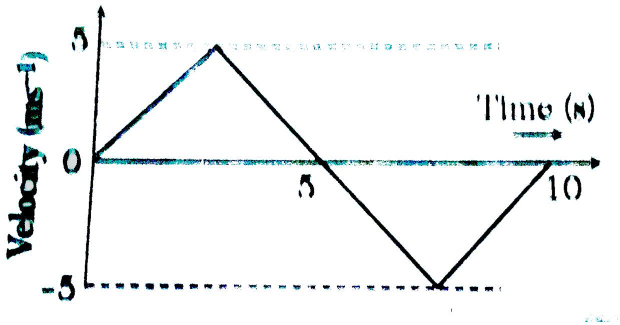
C. $-5ms^{-2}$

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

Answer: C

Watch Video Solution

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



A. zero

B. $2.5ms^{-1}$

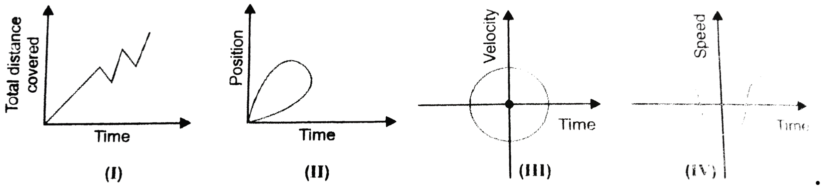
C. $5ms^{-1}$

D. $2ms^{-1}$

Answer: A

Watch Video Solution

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



A. I and II

B. II and III

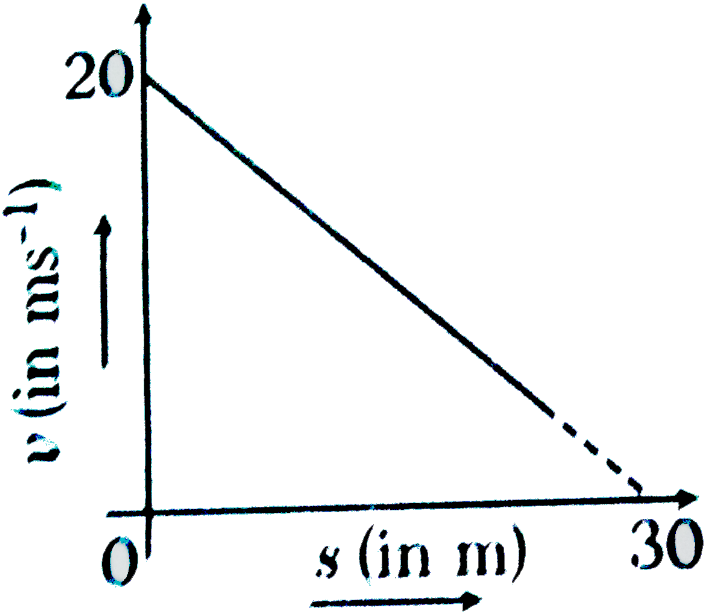
C. II and IV

D. All four

Answer: D

Watch Video Solution

16. If the velocity v of particle moving along a straight line decreases linearly with its displacement s from $20ms^{-1}$ to a value approaching zero at s = 30 m, then acceleration of the particle at v=10ms^(-1)` is



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

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

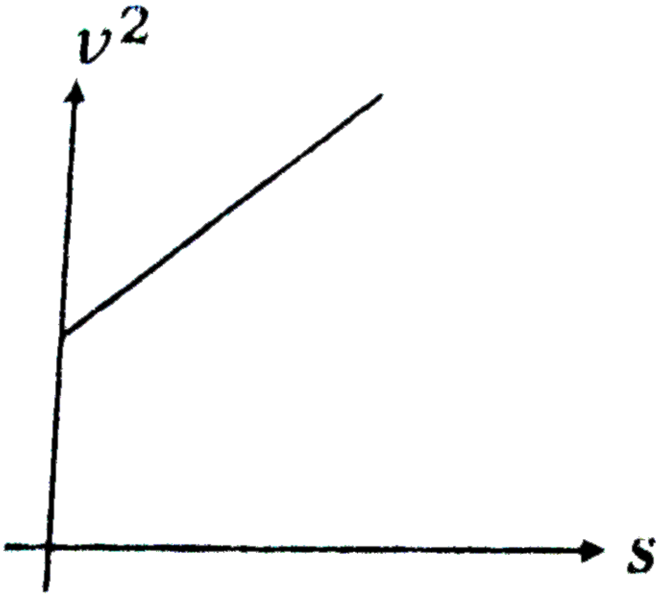
C. $\frac{20}{3}ms^{-2}$

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

Answer: D

Watch Video Solution

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



A. The given graph shown a uniformly accelerated motion

B. Initial velocity of particle is zero

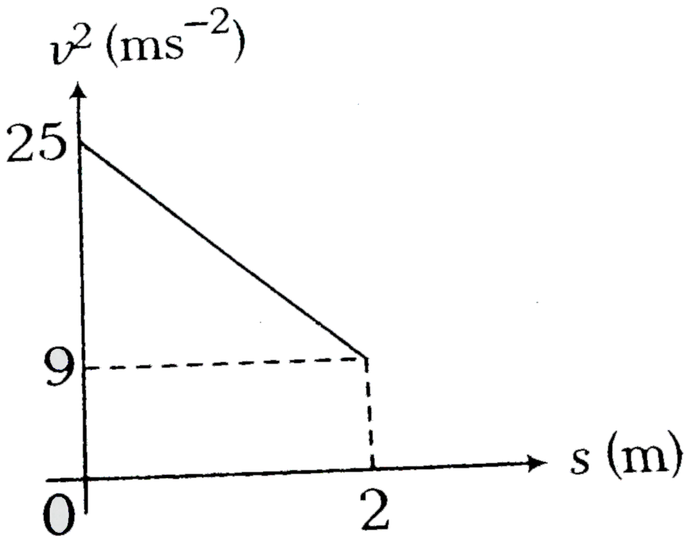
C. Corresponding s-t graph will be a parabola

D. None of the above

Answer: B

Watch Video Solution

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



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

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

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

D. None of these

Answer: B

Watch Video Solution

19. The area under acceleration-time graph gives

A. distance travelled

B. change in acceleration

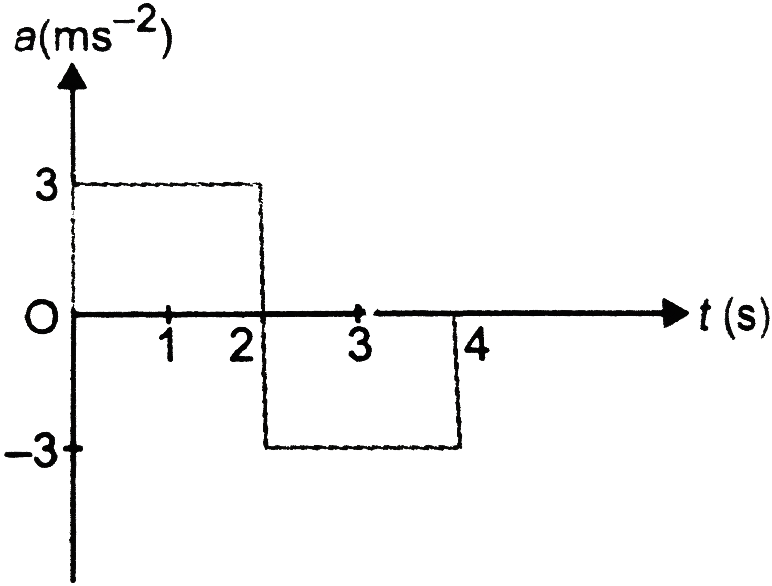
C. force acting

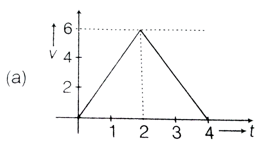
D. change in velocity

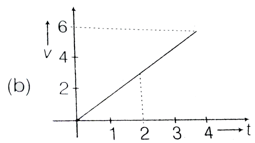
Answer: D

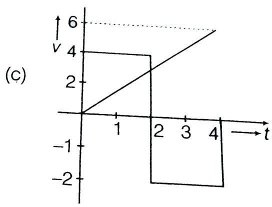
Watch Video Solution

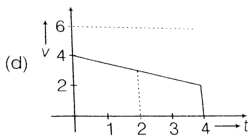
20. A particle starts from rest at $t = 0$ and undergoes and acceleration (a) in ms^{-2} with time (t) in seconds which is shown in Fig. 2 (DF) .16 . Which one of the following plot represents velocity (v) (in ms^{-1}) verses time (in seconds) ?



A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

Check point 3.7

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

A. East-North direction

B. West-North direaction

C. South-East direction

D. None of these

Answer: B

Watch Video Solution

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

A. $40ms^{-1}$

B. $25ms^{-1}$

C. $20ms^{-1}$

D. $45ms^{-1}$

Answer: D

Watch Video Solution

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

A. $4.9m$

B. $19.6m$

C. $9.8m$

D. $392m$

Answer: C

Watch Video Solution

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

A. $5kmh^{-1}, 37^\circ$ North of East

B. $5kmh^{-1}, 37^\circ$ East of North

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

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

Answer: B

Watch Video Solution

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

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

B. $20kmh^{-1}$

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

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

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

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

A. $4.5kmh^{-1}$

B. $4kmh^{-1}$

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

D. $3kmh^{-1}$

Answer: D

Watch Video Solution

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

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

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

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

D. v towards North-East

Answer: B

Watch Video Solution

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

A. due North

B. 30° East of North

C. 30° West of North

D. 60° East of North

Answer: A

Watch Video Solution

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

A. 127°

B. 143°

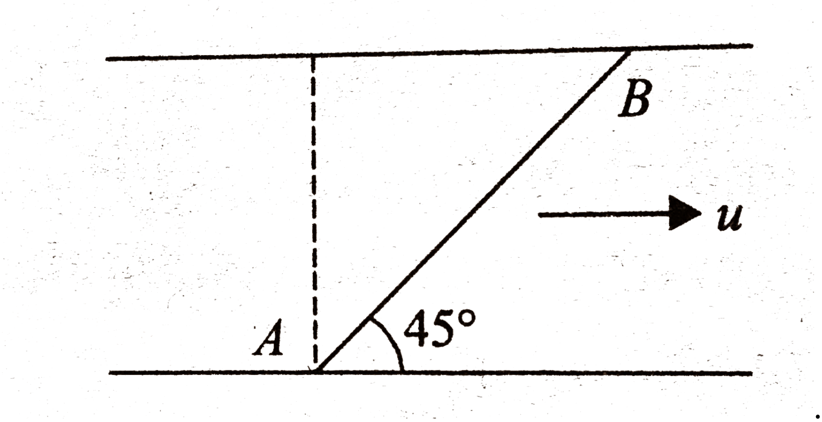
C. 120°

D. 150°

Answer: A

Watch Video Solution

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



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

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

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

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

Answer: C

Watch Video Solution

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

A. 8 s

B. 4 s

C. 2 s

D. 6 s

Answer: B

Watch Video Solution

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

A. 2 s

B. 3 s

C. 4 s

D. 5 s

Answer: D

Watch Video Solution

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

A. 5 s

B. $2.5s$

C. 2 s

D. 3 s

Answer: B

Watch Video Solution

(A) Taking it together

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

A. 24/13

B. 40/13

C. 3

D. $1/2$

Answer: B

Watch Video Solution

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

A. $5kmh^{-1}$

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

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

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

Answer: C

Watch Video Solution

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

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

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

C. 6 m

D. 4 m

Answer: A

Watch Video Solution

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

A. 12

B. 9

C. 10

D. 1.8

Answer: B

View Text Solution

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

Which of the following is true?

A. The initial velocity of particle is 4

B. The acceleration of particle is 2a

C. The particle is at origin at t = 0

D. None of the above

Answer: B

Watch Video Solution

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

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

B. 20 m

C. 60 m

D. 180 m

Answer: D

Watch Video Solution

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

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

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

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

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

Answer: C

Watch Video Solution

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

A. zero

B. $8ms^{-2}$

C. $20ms^{-2}$

D. $40ms^{-2}$

Answer: A

Watch Video Solution

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

A. $5:9$

B. $5:7$

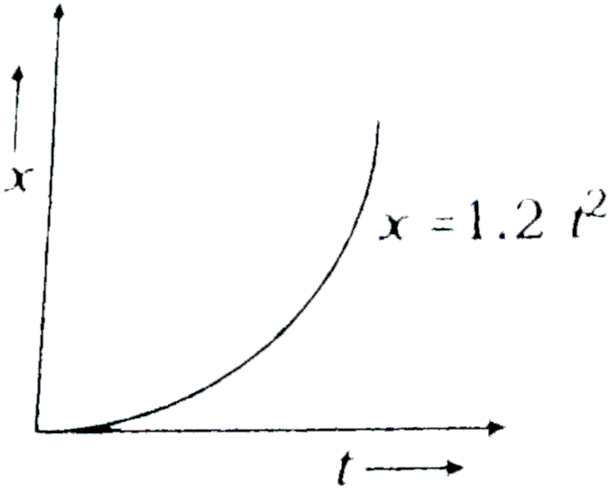
C. $9:5$

D. $9:7$

Answer: B

Watch Video Solution

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



A. at rest

B. in uniform motion

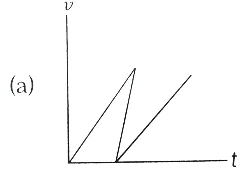
C. in non-uniform acceleration

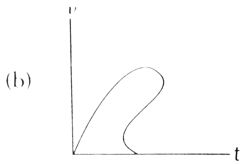
D. uniformly accelerated

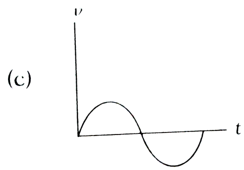
Answer: D

Watch Video Solution

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

A. 

B. 

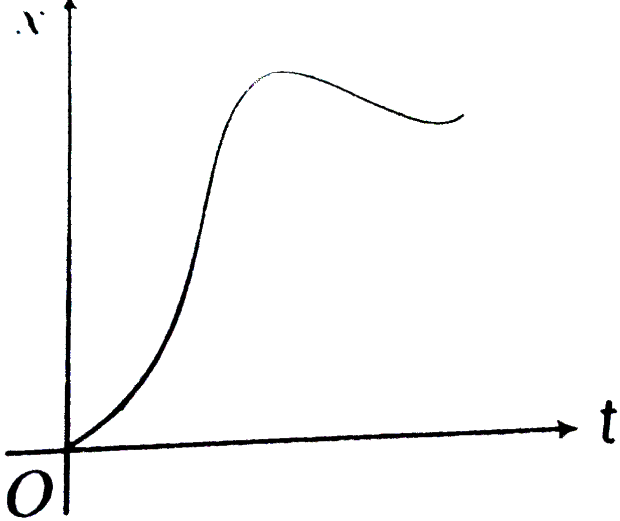
C. 

D. All of these

Answer: D

Watch Video Solution

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



A. Particle starts with zero velocity and variable acceleration

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

C. Particle starts with zero velocity and uniform acceleration

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

Answer: A

Watch Video Solution

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

A. uniform acceleration

B. Uniform retardation

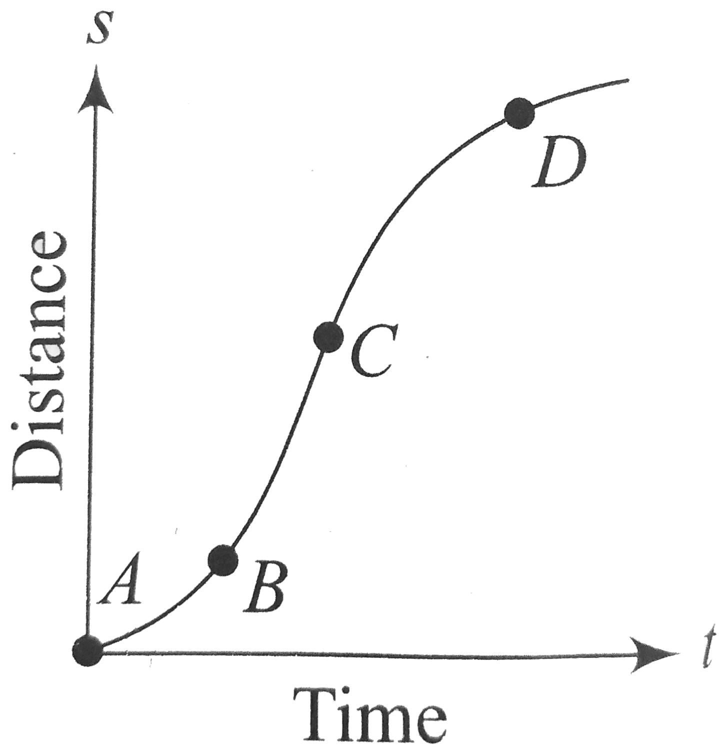
C. Non-uniform acceleration

D. Zero acceleration

Answer: C

Watch Video Solution

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



A. A

B. B

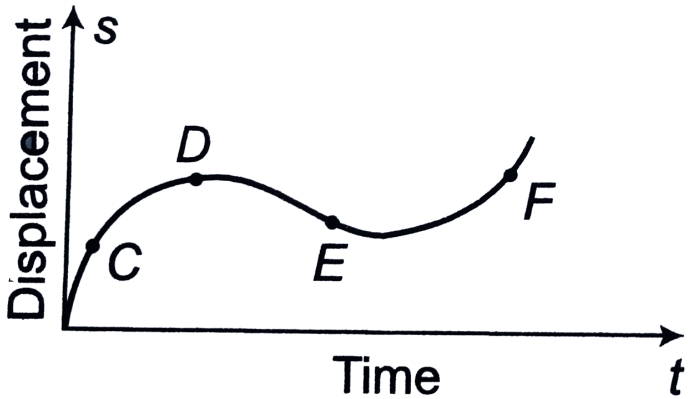
C. C

D. D

Answer: C

Watch Video Solution

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



The instantaneous velocity of the particle in negative at the point

A. E

B. F

C. C

D. D

Answer: A

Watch Video Solution

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

A. c_2

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

C. $c_1 - c_2$

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

Answer: B

Watch Video Solution

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

A. 27 s

B. 50 s

C. 18 s

D. 36 s

Answer: D

Watch Video Solution

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

A. 10 s

B. 12 s

C. 20 s

D. 15 s

Answer: D

Watch Video Solution

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

A. The particle never returns to its starting point

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

C. The initial velocity of the particle is zero

D. The initial acceleration of the particle is zero

Answer: D

Watch Video Solution

20. A starts from rest, with uniform acceleration a. The acceleration of the body as function of time t is given by the equation a = pt, where p is a constant, then the displacement of the particle in the time interval t = 0 to $t = t_1$ will be

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

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

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

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

Answer: D

Watch Video Solution

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

A. $2414ms^{-2}$

B. $1735ms^{-2}$

C. $3120 ms^{-2}$

D. $4105 ms^{-2}$

Answer: A

Watch Video Solution

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

A. 24 m

B. 36 m

C. 20 m

D. 42 m

Answer: A

Watch Video Solution

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

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

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

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

D. t_1-t_2

Answer: C

Watch Video Solution

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

A. increases with time

B. decreases with time

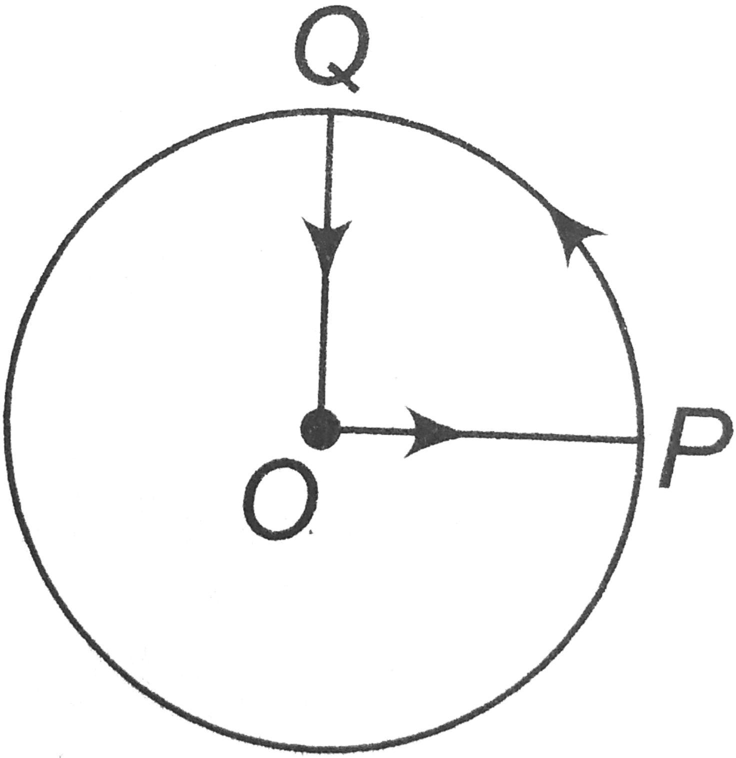
C. independent of time

D. None of these

Answer: A

Watch Video Solution

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



A. 0, 1

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

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

D. $0, 21.4$

Answer: D

Watch Video Solution

Watch Video Solution

26. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metre) of the particle is given by $x = 40 + 12t - t^3$. How long would the particle travel before coming to rest ?

A. 24m

B. 40m

C. 56m

D. 16m

Answer: C

Watch Video Solution

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

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

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

C. $a/(v-v_1)$

D. $a/(v+v_1)$

Answer: B

Watch Video Solution

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

A. 4m

B. 40m

C. 400us

D. 1s

Answer: B

Watch Video Solution

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

A. 6s,64m

B. 6s,48m

C. 4s,32m

D. 4s,16m

Answer: C

Watch Video Solution

Watch Video Solution

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

A. Both will be equal

B. First will be half of second

C. First will be 1/4 of second

D. No definite ratio

Answer: B

Watch Video Solution

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

A. $12ms^{-1}$

B. $14ms^{-1}$

C. $15ms^{-1}$

D. $16ms^{-1}$

Answer: C

Watch Video Solution

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

A. 3s

B. 4.5s

C. 5s

D. 6s

Answer: D

Watch Video Solution

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

A. 20m

B. 18m

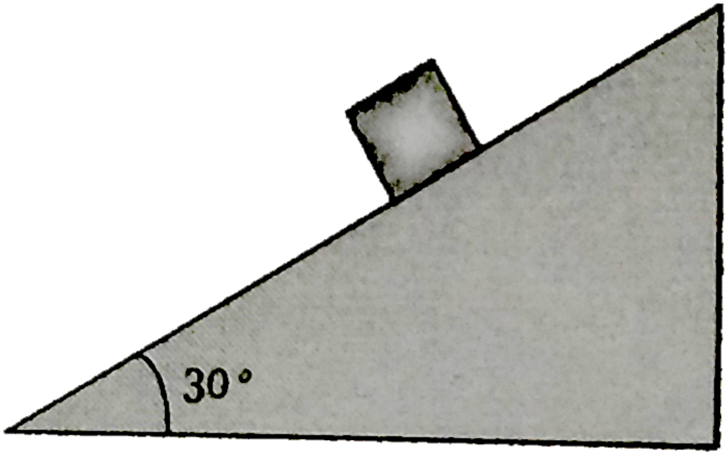
C. 16m

D. 25m

Answer: B

Watch Video Solution

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



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

B. 2 s

C. 4 s

D. 1 s

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

36. A ball is thrown straight upward with a speed v from a point h meter above the ground. The time taken for the ball to strike the ground is

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

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

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

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

Answer: D

Watch Video Solution

37. The position of a particle along X-axis at time t is given by $x = 2 + t - 3t^2$. The displacement and the distance travelled in the interval, t = 0 to t = 1 are respectively

A. 2, 2

B. $-2, 2.5$

C. 0, 2

D. $-2, 2.1$

Answer: D

Watch Video Solution

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

A. $\sqrt{2}-1$

B. $\sqrt{2}+1$

C. $\sqrt{2}$

D. None of these

Answer: B

Watch Video Solution

39. Which of the following represents uniformly accelerated motion ?

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

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

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

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

Answer: C

Watch Video Solution

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

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

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

C. $32ms^{-2}$

D. $16ms^{-2}$

Answer: B

Watch Video Solution

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

A. 1/x

B. $1/x^3$

C. $-1/x^2$

D. $-1/x^3$

Answer: B

Watch Video Solution

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

The velocity of the particle will.

A. go on decreasing with time

B. be independent of α and β

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

D. go on increasing with time

Answer: D

Watch Video Solution

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

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

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

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

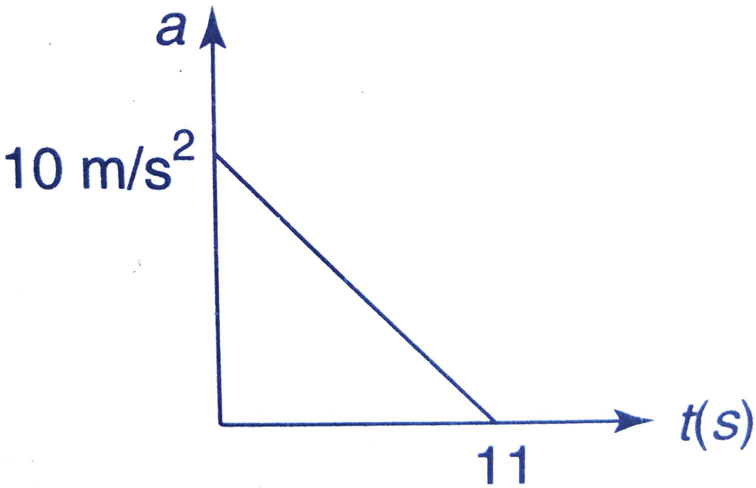
D. None of the above

Answer: A

Watch Video Solution

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

The maximum speed of the particle will be.



A. $110 ms^{-1}$

B. $55 ms^{-1}$

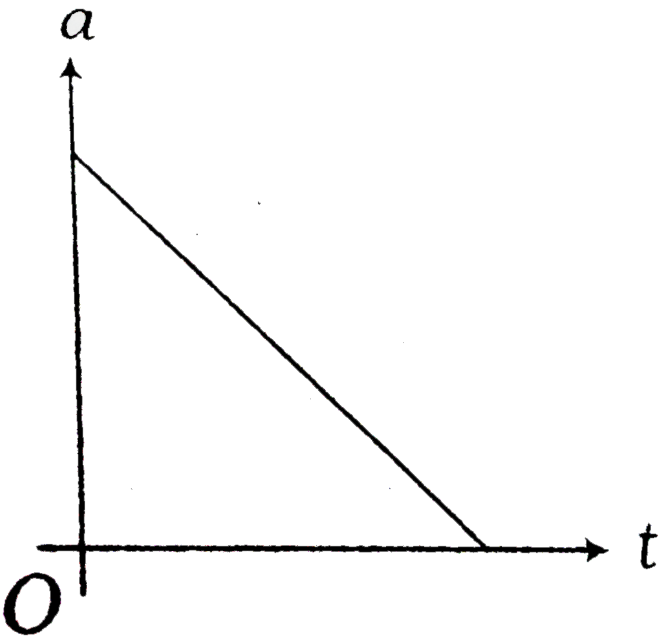
C. $550 ms^{-1}$

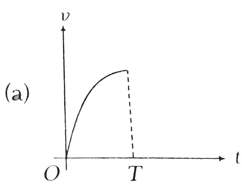
D. $660 ms^{-1}$

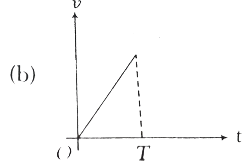
Answer: B

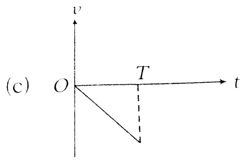
Watch Video Solution

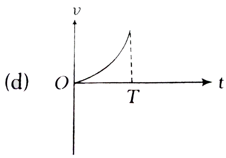
45. The acceleration (a)-time(t) graph for a particle moving along a straight from rest is shown in figur. Which of the following graph is the best representation of its velocity (v) with time (t) ?



A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

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

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

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

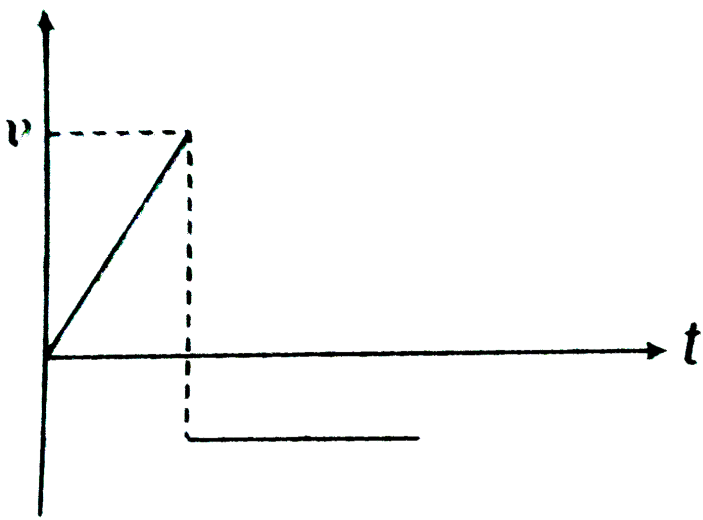
C. $(i\psi lon_1 - v_2) : (v_2 - v_3) = (t_1 - t_2) : (t_1 - t_3)$

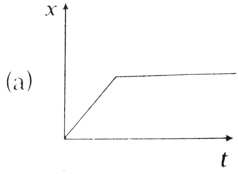
D. $(v_1 - v_2) : (v_2 - v_2 - v_3) = (t_1 - t_2) : (t_2 - t_3)$

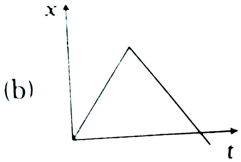
Answer: B

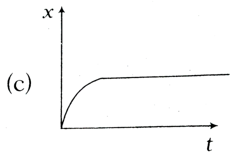
Watch Video Solution

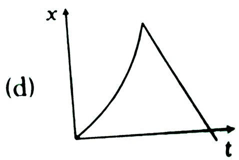
47. The velocity-time graph for a particle moving along X-axis is shown in the figure. The corresponding displacement-time graph is correctly shown by



A. 

B. 

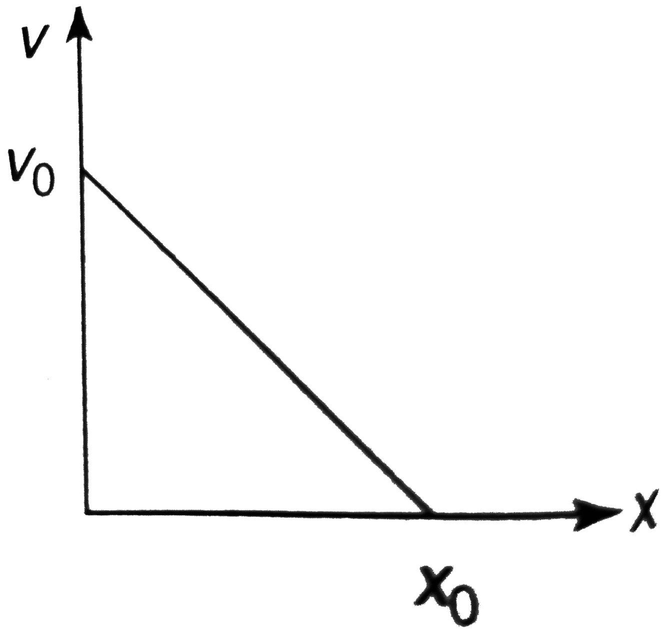
C. 

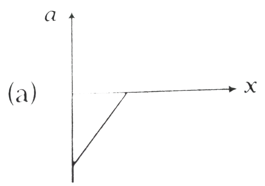
D. 

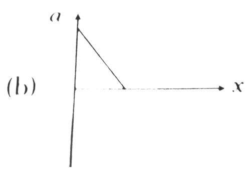
Answer: D

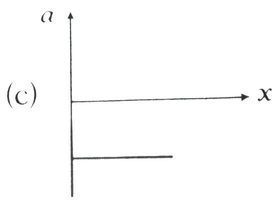
Watch Video Solution

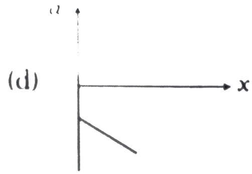
48. The given graph shows the variation of velocity with displacement. Which one of the graphs given below correctly represents the variation of acceleration with displacement ?



A. 

B. 

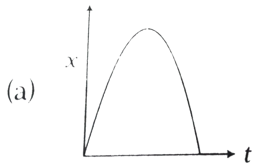
C. 

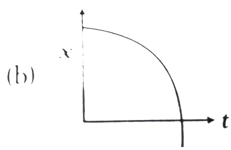
D. 

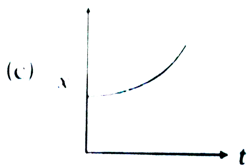
Answer: A

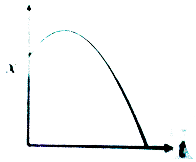
Watch Video Solution

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

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

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

A. PQ = 30 m

B. time of flight of stones = 3 s

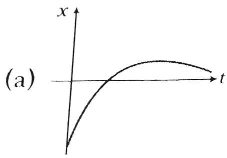
C. Both (a) and (b) are correct

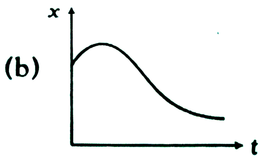
D. Both (a) and (b) are wrong

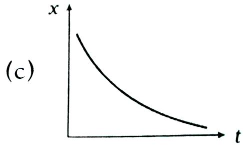
Answer: C

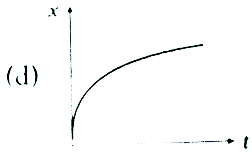
Watch Video Solution

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

A. 

B. 

C. 

D. 

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: A

Watch Video Solution

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

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

B. The displacement x in time T satisfies $-v_0T < x < v_0T$

C. The acceleration is always a non-negative number

D. The motion has no turning points

Answer: B

Watch Video Solution

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

A. 4 m

B. 8 m

C. 12 m

D. 16 m

Answer: B

Watch Video Solution

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

A. 293 m

B. 111 m

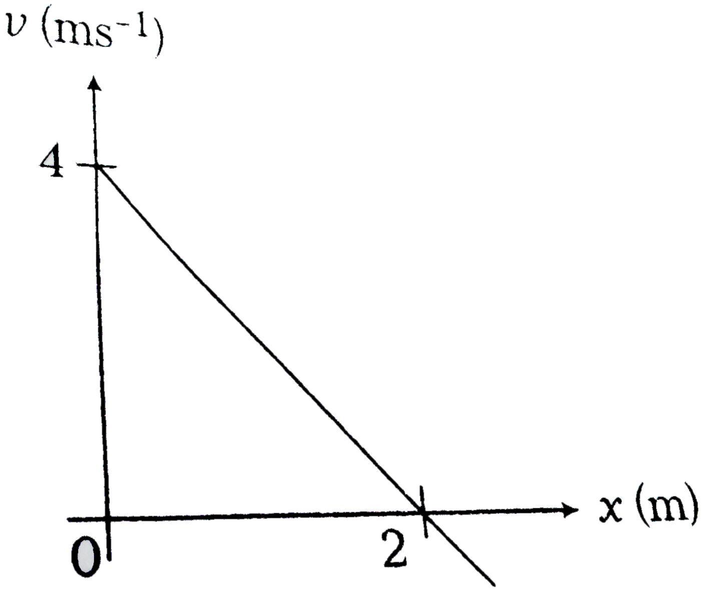
C. 91 m

D. 182 m

Answer: A

Watch Video Solution

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



A. $a^2 = x + 3$

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

C. $2a = 3x + 5$

D. $a = 4x - 8$

Answer: D

Watch Video Solution

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

A. 50 km/h North - East

B. 50 km/h North-West

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

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

Answer: C

Watch Video Solution

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

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

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

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

D. Both (a) and (b)

Answer: D

Watch Video Solution

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

A. 30 km/h

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

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

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

Answer: A

Watch Video Solution

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

A. $3.5h$

B. 4 h

C. $4.5h$

D. 5 h

Answer: B

Watch Video Solution

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

A. 30 s

B. 40 s

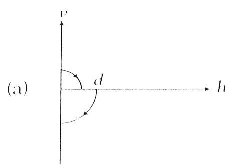
C. 50 s

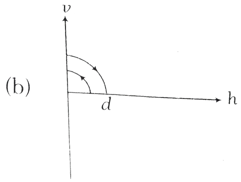
D. 60 s

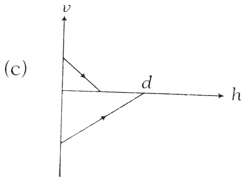
Answer: C

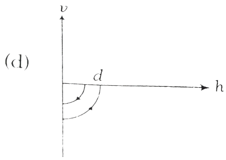
Watch Video Solution

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

A. 

B. 

C. 

D. 

Answer: A

Watch Video Solution

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

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

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

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

D. None of these

Answer: C

Watch Video Solution

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

A. 1 km/h

B. 3 km/h

C. 4 km/h

D. 5 km/h

Answer: B

Watch Video Solution

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

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

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

Watch Video Solution

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

A. $2.50m$

B. $3.75m$

C. $4.00m$

D. $1.25m$

Answer: B

Watch Video Solution

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

A. 1

B. 2

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

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

Answer: D

Watch Video Solution

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

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

A. $\dfrac{1}{2}f_0T$

B. f_0T

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

D. f_0T^{-2}

Answer: A

Watch Video Solution

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

A. 24 m

B. 32 m

C. 54 m

D. 81 m

Answer: C

Watch Video Solution

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

A. $30ms^{-1}$

B. $5ms^{-1}$

C. $20ms^{-1}$

D. $15ms^{-1}$

Answer: B

Watch Video Solution

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

A. 60

B. 45

C. 80

D. 50

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: C

Watch Video Solution

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

A. t

B. $t^{1/2}$

C. t^3

D. t^2

Answer: D

Watch Video Solution

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

A. 50 m

B. 75 m

C. 100 m

D. 125 m

Answer: D

Watch Video Solution

75. An elevator car whose floor to ceiling distance is equal to $2.7m$ starts ascending with constant acceleration $1.2m/s^2$, 2 sec after the start a bolt begins falling from the ceiling of the car. Answer the following question $\left(g = 9.8m/s^2\right)$

The bolt's free fall time is

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

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

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

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

Answer: D

Watch Video Solution

(B) Meical entrance special format questions (Assertion and reason)

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

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

Reason : The above equation is dimensionally incorrect.

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

Watch Video Solution

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

Reason : Infinite acceleration cannot be realised in particle.

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

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

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

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

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

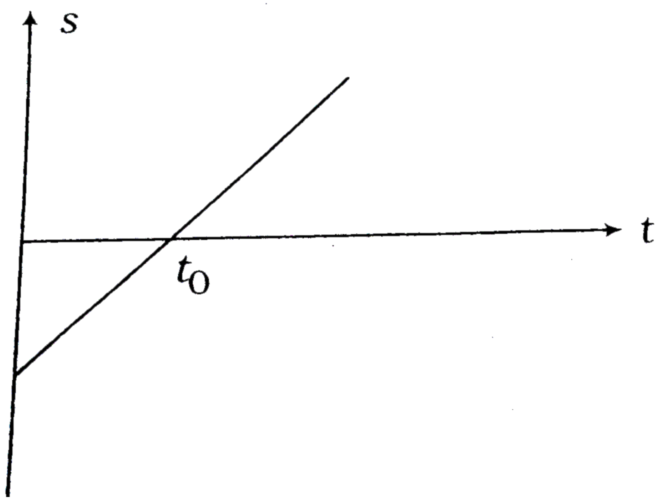
C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

Watch Video Solution

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



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

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

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

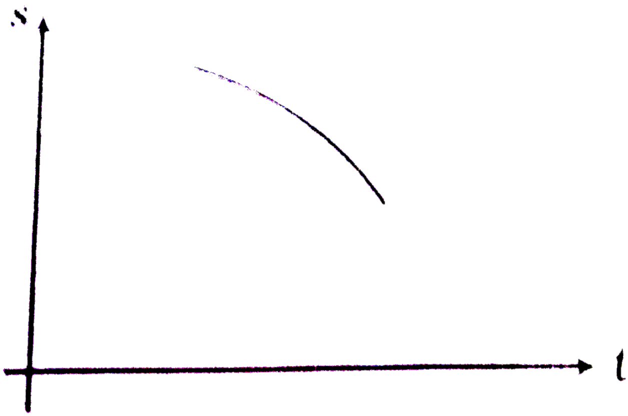
C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

Watch Video Solution

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



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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: D

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

Watch Video Solution

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

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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: B

Watch Video Solution

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

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

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

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

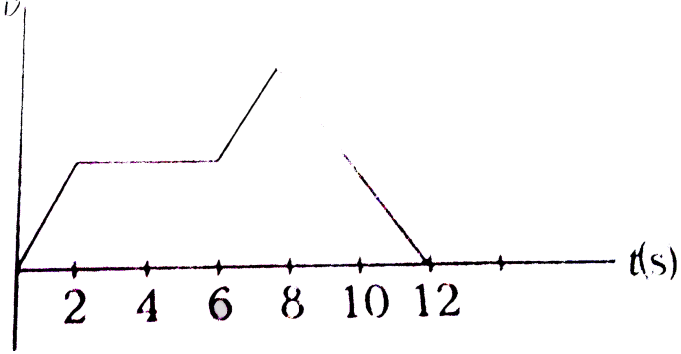
C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: C

Watch Video Solution

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



Reason : For unidirectional motion of a body,

|displacement|=distance

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

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

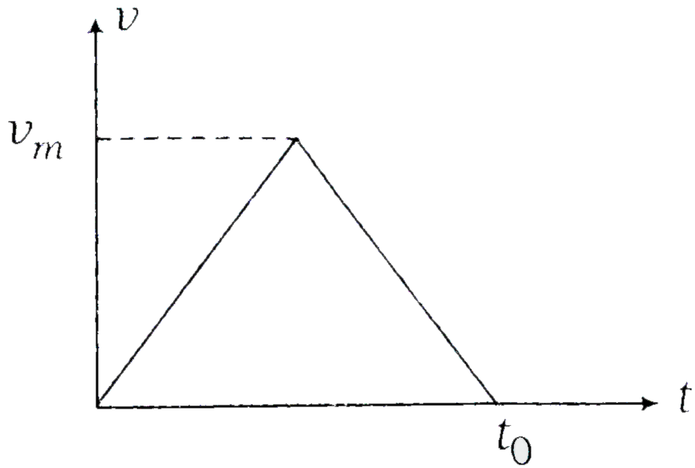
C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

Watch Video Solution

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



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

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

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

C. If Assertion is true but Reason is false.

D. If Assertion is false but Reason is true.

Answer: A

Watch Video Solution

(B) Meical entrance special format questions (Mathch the columns)

1. Match the following columns.

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

Watch Video Solution

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

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

Watch Video Solution

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

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

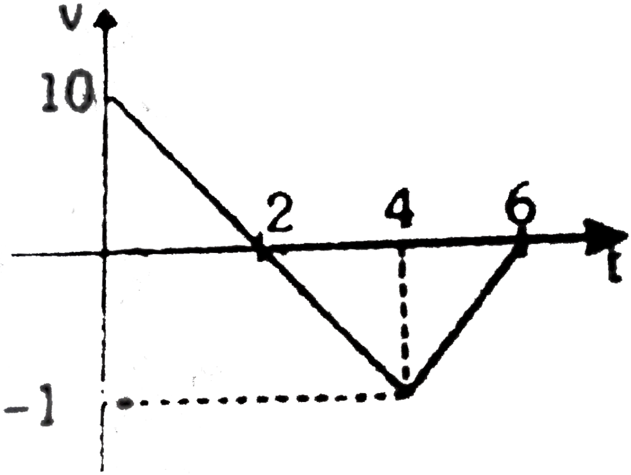
Watch Video Solution

4. Match the following columns.

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

View Text Solution

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



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

Watch Video Solution

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

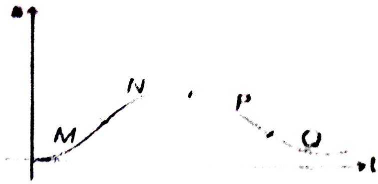


Table-1		Table-2	
(A)	M	(P)	A^{-1}
(B)	N	(Q)	R^{-1}
(C)	P	(R)	A
(D)	Q	(S)	R

Watch Video Solution

(C)Medical entrances gallery

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

A. $3A + 7B$

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

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

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

Answer: B

Watch Video Solution

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

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

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

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

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

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

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

Answer: B

Watch Video Solution

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

A. $40ms^{-1}$

B. $55.5ms^{-1}$

C. $26.1ms^{-1}$

D. $9.6ms^{-1}$

Answer: C

Watch Video Solution

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

A. $2.75s, 3.24m$

B. $25.7s, 34.2m$

C. $2.57s, 32.4m$

D. $27.5s, 3.42m$

Answer: C

Watch Video Solution

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

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

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

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

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

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

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

Answer: B

Watch Video Solution

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

A. 5 u

B. 6 u

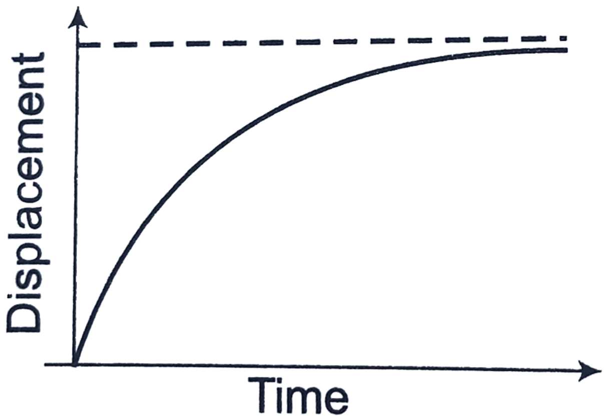
C. 7 u

D. 8 u

Answer: C

Watch Video Solution

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



A. the velocity of the particle is constant throughout

B. the acceleration of the particle is constant throughout

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

D. the motion is retarded and finally the particle stops

Answer: D

Watch Video Solution

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

A. 200 m

B. 300 m

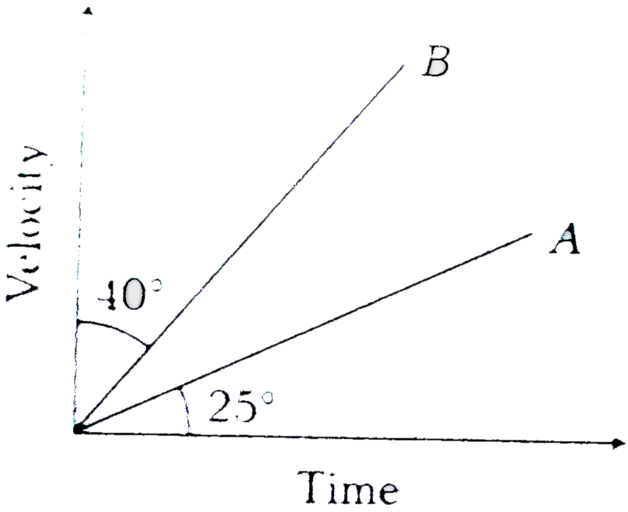
C. 500 m

D. 250 m

Answer: D

Watch Video Solution

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



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

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

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

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

Answer: D

Watch Video Solution

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

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

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

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

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

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

Answer: D

Watch Video Solution

11. A ball thrown vertically upwards after reaching a maximum height h returns to the starting point after a time of 10 s. Its displacement after 5 s is

A. h

B. 2h

C. 10h

D. 20h

Answer: A

Watch Video Solution

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

A. $150ms^{-1}$

B. $27ms^{-1}$

C. $450ms^{-1}$

D. $250ms^{-1}$

Answer: A

Watch Video Solution

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

A. $33\ \%$

B. $40\ \%$

C. $66\ \%$

D. $77\ \%$

Answer: B

Watch Video Solution

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

A. $40 kmh^{-1}$

B. $48 kmh^{-1}$

C. $50 kmh^{-1}$

D. $60 kmh^{-1}$

Answer: B

Watch Video Solution

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

A. y = 3x

B. y = 4x

C. y = x

D. y = 2x

Answer: A

Watch Video Solution

16. At time t = 0, two bodies A and B at the same point. A moves with constant velocity v and B starts from rest and moves with constant acceleration. Relative velocity of B w.r.t. A when the bodies meet each other is

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

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

C. v

D. $2v$

Answer: C

Watch Video Solution

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

A. $25 kmh^{-1}$

B. $24 kmh^{-1}$

C. $50 kmh^{-1}$

D. $10 kmh^{-1}$

Answer: B

Watch Video Solution

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

A. $x_2 = x_1$

B. $x_2 = 2x_1$

C. $x_2 = 3x_1$

D. $x_2 = 4x_1$

Answer: D

Watch Video Solution

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

A. area under velocity - time graph

B. area under displacement - time graph

C. slope of distance - time graph

D. slope of velocity - time graph

Answer: D

Watch Video Solution

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

A. $h_1 = 2h_2 = 3h_3$

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

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

D. $h_1 = h_2 = h_3$

Answer: B

Watch Video Solution

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

A. constant velocity motion

B. uniformly acceleration motion

C. non-uniformly acceleration motion

D. zero velocity motion

Answer: B

Watch Video Solution

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

A. uniform velocity motion

B. uniformly accelerated motion

C. non-uniform accelerated motion

D. Nothing can be said about the motion

Answer: C

Watch Video Solution

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

A. 28.2

B. 9.4

C. 2

D. 84.6

Answer: A

Watch Video Solution

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

A. $50ms^{-1}$

B. $60ms^{-1}$

C. $80ms^{-1}$

D. $20ms^{-1}$

Answer: B

Watch Video Solution

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

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

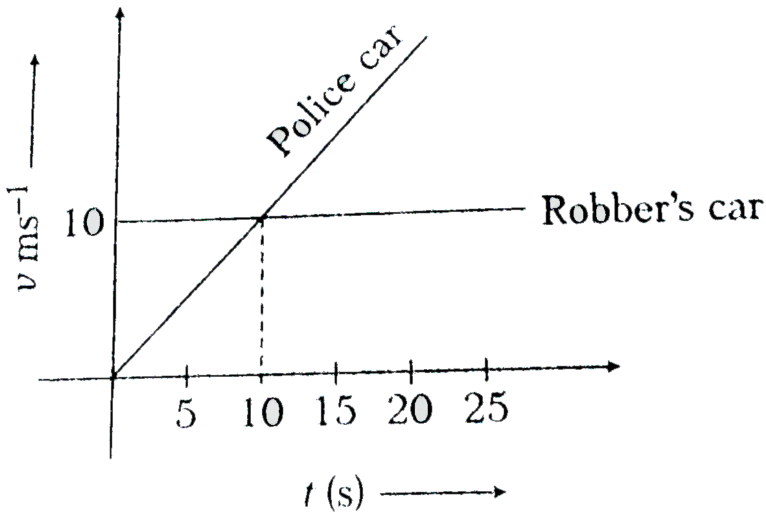
C. $\sqrt{2}m/s^2$ (North-West)

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

Answer: C

Watch Video Solution

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



A. 10 s after it starts

B. 1 s after it starts

C. 20 s after it starts

D. Never crosses

Answer: C

Watch Video Solution

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

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

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

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

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

Answer: B

Watch Video Solution

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

A. 8 s

B. 10 s

C. 12 s

D. 14 s

Answer: C

Watch Video Solution

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

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

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

A. 1 m/s

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

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

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

Answer: C

Watch Video Solution

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

A. $24ms^{-2}$

B. zero

C. $6ms^{-2}$

D. $12ms^{-2}$

Answer: D

Watch Video Solution

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

A. $\sqrt{700}s$

B. $\sqrt{300}s$

C. $\sqrt{150}s$

D. None of the above

Answer: B

Watch Video Solution

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

A. b_0

B. b_1

C. b_2

D. $2b_2$

Answer: D

Watch Video Solution