1. A river is flowing from W to E with a speed of $5\ m/min$. A man can swim in still water with a velocity $10\ m/min$. In which direction should the man swim so as to take the shortest possible path to go to the south

a) 30° with downstream b) 60° with downstream
c) 120° with downstream d) South

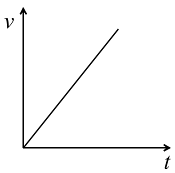
2. A train started from rest from a station and accelerated at $2\ \text{ms}^{-2}$ for 10 s. Then, it ran at constant speed for 30 s and thereafter it decelerated at $4\ \text{ms}^{-2}$ until it stopped at the next station. The distance between two stations is

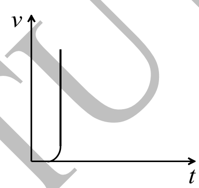
a) 650 m b) 700 m
c) 750 m d) 800 m

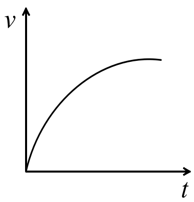
3. From a balloon rising vertically upwards as $5\ \text{ms}^{-1}$ a stone is thrown up at $10\ \text{ms}^{-1}$ relative to the balloon. Its velocity with respect to ground after 2 s is
(assume $\text{g} = 10\ \text{ms}^{-2}$)

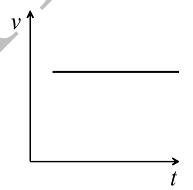
a) Zero b) 5ms^{-1}
c) $10\ \text{ms}^{-1}$ d) $20\ \text{ms}^{-1}$

4. An object is dropped from rest. Its v-t graph is

a) 

b) 

c) 

d) 

5. A stone is allowed to fall from the top of a tower 100m high and at the same time another stone is projected vertically upwards from the ground with a velocity of 254ms^{-1}. The two stones will meet after

a) 4 s b) 0.4 s
c) 0.04 s d) 40 s

6. A body starting from rest moves with constant acceleration. The ratio of distance covered by the body during the 5th sec to that covered in 5 sec is

a) 9/15 b) 3/5
c) 25/9 d) 1/25

7. If a car at rest accelerates uniformly to a speed of 144 km/h in 20 s. Then it covers a distance of

a) 20 m b) 400 m
c) 1440m d) 2880 m

8. A body is projected up with a speed 'u' and the time taken by it is T to reach the maximum height H. Pick out the correct statement

a) It reaches $H/2$ in $T/2\ sec$ b) It acquires velocity $u/2$ in $T/2 sec$

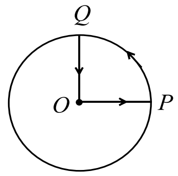
c) Its velocity is $u/2$ at $H/2$
d) Same velocity at $2T$

9. Two balls are dropped to the ground from different heights. One ball is dropped $2s$ after the other but they both strike the ground at the same time. If the first ball takes $5s$ to reach the ground, then the difference in initial heights is $(g = 10\ ms^{-2})$
a) $20m$
b) $80m$
c) $170m$
d) $40m$

10. A car accelerates from rest at a constant rate of $2ms^{-2}$ for sometime. Then, it retards at a constant rate of $4ms^{-2}$and comes to rest. If the total time for which it remains in motion is 3s, what is the total distance travelled?
a) 2m
b) 3m
c) 4m
d) 6m

11. 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) $3/2V_0$

12. A cyclist starts from the centre O of a circular park of radius one kilometre, reaches the edge P of the park, then cycles along the circumference and returns to the centre along QO as shown in figure. If the round trip takes ten minutes, the net displacement and average speed of the cyclist (in metre and kilometre per hour) is



a) $0, 1$
b) $\frac{\pi + 4}{2}, 0$
c) $21.4, \frac{\pi + 4}{2}$
d) $0, 21.4$

13. A train of 150 m length is going towards north direction at a speed of $10m/\text{sec}$. A parrot flies at the speed of $5\ m/sec$ towards south direction parallel to the railway track. The time taken by the parrot to cross the train is
a) 12 sec
b) 8 sec
c) 15 sec
d) 10 sec

14. Two cars A and B are moving with same speed of 45 kmh^{-1} along same direction. If a third car C coming from the opposite direction with a speed of 36 kmh^{-1} meets two cars in an interval of 5 min, the distance of separation of two cars A and B should be (in km)
a) 6.75
b) 7.25
c) 5.55
d) 8.35

15. A person travels along a straight road for the first half time with a velocity v_1 and the next half time with a velocity v_2
The mean velocity V of the man is

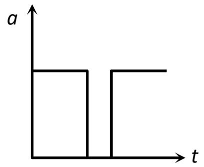
a) $\frac{2}{V} = \frac{1}{v_1} + \frac{1}{v_2}$
b) $V = \frac{v_1 + v_2}{2}$
c) $V = \sqrt{v_1 v_2}$
d) $V = \sqrt{\frac{v_1}{v_2}}$

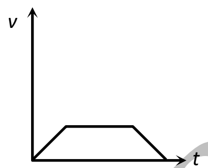
16. A particle starts from rest and traverses a distance $2x$ with uniform acceleration, then moves uniformly over a further distance $4x$ and finally comes to rest after moving a further distance $6x$ under uniform retardation. Assuming entire motion to be rectilinear motion, the ratio of average speed over the journey to the maximum speed on its way is
a) 4/5
b) 3/5
c) 2/5
d) 1/5

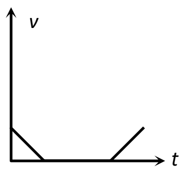
17. A body is projected with a velocity v and after some time it returns to the point from which it was projected. The average velocity and average speed of the body for the total time of flight are
a) $\vec{v}/2$ and $v/2$
b) 0 and $v/2$
c) 0 and 0
d) $\vec{v}/2$ and 0

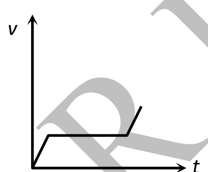
18. An athlete completes one round of a circular track of radius R in 40 sec. What will be his displacement at the end of 2 min. 20 sec
a) Zero
b) $2R$
c) $2\pi R$
d) $7\pi R$

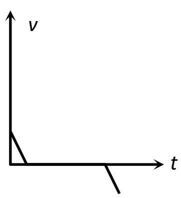
19. Acceleration-time graph of a body is shown. The corresponding velocity-time graph of the same body is



a) 

b) 

c) 

d) 

20. A stone thrown vertically upwards attains a maximum height of 45m. In what time the velocity of stone become equal to one-half the velocity of throw? (Given $g = 10ms^{-2}$)
a) 2 s
b) 1.5 s
c) 1 s
d) 0.5 s

21. A particle starts from the origin and moves along the X-axis such that the velocity at any instant is given by

$4t^3 - 2t$, where t is in second and velocity is in ms^{-1}. What is the acceleration of the particle when it is 2 m from the origin?

a) 10ms^{-2}
b) 12ms^{-2}
c) 22ms^{-2}
d) 28ms^{-2}

22. A body is thrown vertically upwards with velocity u. The distance travelled by it in the fifth and the sixth seconds are equal. The velocity u is given by ($g = 9.8\ \text{ms}^{-2}$)

a) $24.5\ \text{ms}^{-1}$
b) $49.0\ \text{ms}^{-1}$
c) $73.5\ \text{ms}^{-1}$
d) $98.0\ \text{ms}^{-1}$

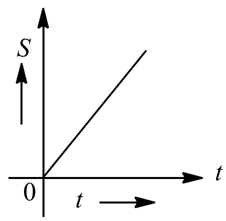
23. A body falling from a high Minaret travels $40\ m$ in the last 2 seconds of its fall to ground. Height of Minaret in meters is (take $g = 10\ m/s^{-2}$)

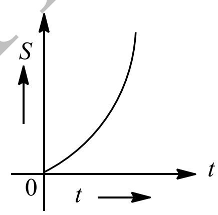
a) 60
b) 45
c) 80
d) 50

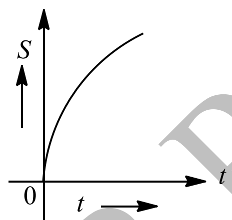
24. A 2 m wide truck is moving with a uniform speed $v_0 = 8\text{ms}^{-1}$ along a straight horizontal road. A pedestrian starts to cross the road with a uniform speed v when the truck is 4m away from him. The minimum value of v, so that he can cross the raod safely is

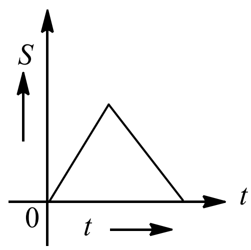
a) 2.62ms^{-1}
b) 4.6ms^{-1}
c) 3.57ms^{-1}
d) 1.414ms^{-1}

25. From a high tower at time $t = 0$, one stone is dropped from rest and simultaneously another stone is projected vertically up with an initial velocity. The graph of the distance S between the two stones, before either his the ground, plotted against time t will be as

a)


b)


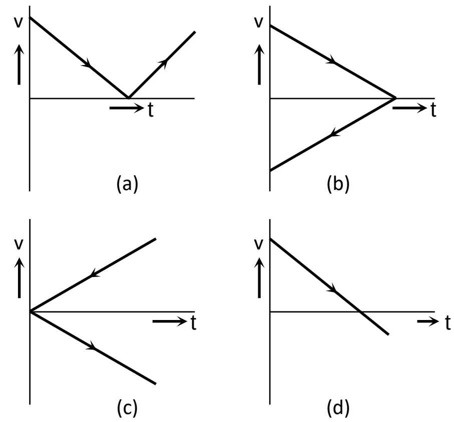
c)


d)


26. A balloon starts rising from the ground with an acceleration of $1.25\ m/s^2$ after 8s, a stone is released from the balloon. The stone will ($g - 10\ m/s^2$)

a) Reach the ground in 4 second
b) Begin to move down after being released
c) Have a displacement of $50\ m$
d) Cover a distance of $40\ m$ in reaching the ground

27. A ball is thrown vertically upwards. Which of the following graph/graphs represent velocity-time graph of the ball during its flight (air resistance is neglected)

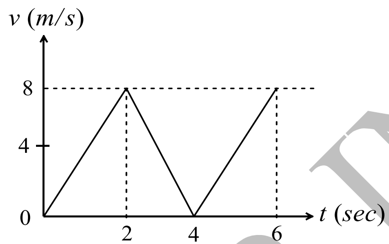


a) A
b) B
c) C
d) D

28. A body starting from rest moves with uniform acceleration. The distance covered by the body in time t is proportional to
a) $\sqrt{t}$
b) $t^{3/2}$
c) t^2
d) t^3

29. A car starts from rest and accelerates uniformly to a speed of 180 kmh^{-1} in 10 $seconds$. The distance covered by the car in this time interval is
a) 500 m
b) 250 m
c) 100 m
d) 200 m

30. $v - t$ graph for a particle is as shown. The distance travelled in the first 4 s is



a) $12m$
b) $16m$
c) $20m$
d) $24m$

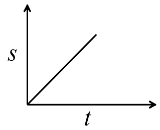
31. A body is moving according to the equation $x = at + bt^2 - ct^3$ where $x =$ displacement and a, b and c are constants. The acceleration of the body is
a) $a + 2bt$
b) $2b + 6ct$
c) $2b - 6ct$
d) $3b - 6ct^2$

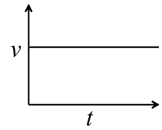
32. A car starts from station and moves along the horizontal road by a machine delivering constant power. The distance covered by the car in time t is proportional to
a) t^2
b) $t^{3/2}$
c) $t^{2/3}$
d) t^3

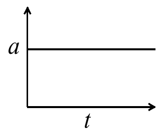
33. A particle when thrown, moves such that it passes from same height at 2 and 10s, the height is

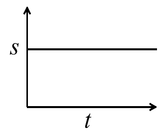
a) g
b) $2g$
c) $5g$
d) $10g$

34. Which graph represents a state of rest for an object

a) 

b) 

c) 

d) 

35. Rain drops fall vertically at a speed of 20ms^{-1}. At what angle do they fall on the wind screen of a car moving with a velocity of 15ms^{-1}, if the wind screen velocity inclined at an angle of $23°$ to the vertical?
$\left(\cot^{-1}\left[\frac{4}{3}\right] \approx 36°\right)$

a) $60°$
b) $30°$
c) $45°$
d) $90°$

36. Time taken by an object falling from rest to cover the height of h_1 and h_2 is respectively t_1 and t_2 then the ratio of t_1 to t_2 is

a) $h_1 : h_2$
b) $\sqrt{h_1} : \sqrt{h_2}$
c) $h_1 : 2h_2$
d) $2h_1 : h_2$

37. A body starts to fall freely under gravity. The distance covered by it in first, second and third *second* are in ratio

a) $1:3:5$
b) $1:2:3$
c) $1:4:9$
d) $1:5:6$

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

a) Velocity of A is more than B at the ground
b) Velocity of B is more than A at the ground
c) Both A & B strike the ground with same velocity
d) None of these

39. A body is thrown vertically up from the ground. It reaches a maximum height of $100m$ in $5sec$. After what time it will reach the ground from the maximum height position

a) $1.2\ sec$
b) $5\ sec$
c) $10\ sec$
d) $25\ sec$

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

a) Uniform acceleration
b) Uniform velocity
c) Increasing acceleration
d) Decreasing velocity

41. A packet is dropped from a balloon which is going upwards with the velocity $12\ m/s$, the velocity of the packet after 2 seconds will be

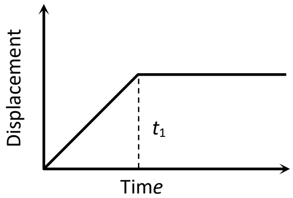
a) $-12\ m/s$
b) $12\ m/s$
c) $-7.6\ m/s$
d) $7.6\ m/s$

42. The position x of a particle with respect to time t along x-axis is given by $x = 9t^2 - t^3$ where x is in metres and

t in second. What will be the position of this particle when it achieves maximum speed along the $+x$ direction

a) $32\ m$
b) $54\ m$
c) $81\ m$
d) $24\ m$

43. The $x - t$ graph shown in the figure represents



a) Constant velocity
b) Velocity of the body is continuously changing
c) Instantaneous velocity
d) The body travels with constant speed upto time t_1 and then stops

44. Two bodies are thrown simultaneously from a tower with same initial velocity v_0: one vertically upwards, the other vertically downwards. The distance between the two bodies after time t is

a) $2v_0t + \frac{1}{2}gt^2$
b) $2v_0t$
c) $v_0t + \frac{1}{2}gt^2$
d) v_0t

45. The velocity of a body depends on time according to the equation $v = 20 + 0.1t^2$. The body is undergoing

a) Uniform acceleration
b) Uniform retardation
c) Non-uniform acceleration
d) Zero acceleration

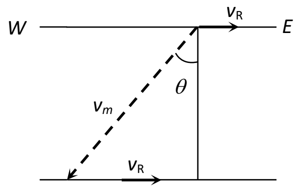
Answer key

1)	**c**	**2)**	**d**	**3)**	**b**	**4)**	**a**
5)	**a**	**6)**	**a**	**7)**	**b**	**8)**	**b**
9)	**b**	**10)**	**d**	**11)**	**a**	**12)**	**d**
13)	**d**	**14)**	**a**	**15)**	**b**	**16)**	**b**
17)	**b**	**18)**	**b**	**19)**	**c**	**20)**	**b**
21)	**c**	**22)**	**b**	**23)**	**b**	**24)**	**c**
25)	**a**	**26)**	**a**	**27)**	**d**	**28)**	**c**
29)	**b**	**30)**	**b**	**31)**	**c**	**32)**	**b**
33)	**d**	**34)**	**d**	**35)**	**a**	**36)**	**b**
37)	**a**	**38)**	**c**	**39)**	**b**	**40)**	**a**
41)	**c**	**42)**	**b**	**43)**	**d**	**44)**	**b**
45)	**c**						

Solutions:

1 **(c)**

For shortest possible path man should swim with an angle $(90 + \theta)$ with downstream



From the fig,

$\sin\theta = \dfrac{v_r}{v_m} = \dfrac{5}{10} = \dfrac{1}{2}$

$\Rightarrow \therefore\ \theta = 30°$

So angle with downstream $= 90° + 30° = 120°$

2 **(d)**

From first equation of motion, we have

$$v = u + at$$

Given, $u = 0, a_1 = 2\ \text{ms}^{-2}$

$$t = 10\ \text{s},$$

$\therefore \quad v_1 = 2 \times 10 = 20\ \text{ms}^{-1}$

In the next 30 s, the constant velocity becomes

$$v_2 = v_1 + a_2 t_2$$

Given, $v_1 = 20\ \text{ms}^{-1}, a_2 = 2\ \text{ms}^{-2}, t_2 = 30\ \text{s}$

$\therefore \qquad v_2 = 20 + 2 \times 30 = 80\ \text{ms}^{-1}.$

When it decelerates, then

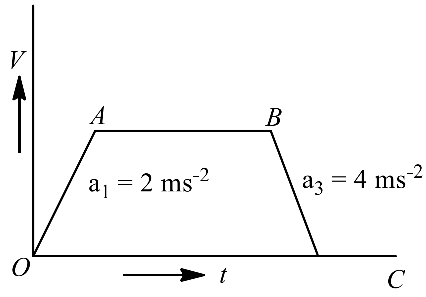
$$v_3^2 = u^2 - 2a_3 s$$

Here, $v_3 = 0$ (train stops), $v_2 = 80\ \text{ms}^{-1}$,

$$a_3 = 4\ \text{ms}^{-2}$$

$$0 = (80)^2 - 2 \times 4 \times s$$

Or $\qquad s = \frac{80 \times 80}{8} = 800\ \text{m}.$



3 **(b)**

From equation of motion, we have

$v = u + gt$

Taking downward direction negative

$u = 10 + 5 = 15\text{ms}^{-1}, \text{g} = 10 \text{ ms}^{-2}, t - 2 \text{ s}$

$\therefore v = 15 - 2 \times 10 = -2 \text{ ms}^{-1}$

4 **(a)**

Using
$V = u + at$
$V = gt$ ...(i)
Comparing with $y = mx + c$
Equation (i) represents a straight line passing through origin inclined x-axis (slope -g)

5 **(a)**

$x = \frac{1}{2}\text{g}t^2, 100 - x = 25x - \frac{1}{2}\text{g}t^2;$
Adding $25t = 100$ or $t = 4$ s

6 **(a)**

Distance covered in 5^{th} second
$S_{5^{th}} = u + \frac{a}{2}(2n - 1) = 0 + \frac{a}{2}(2 \times 5 - 1) = \frac{9a}{2}$
and distance covered in 5 second,
$S_5 = ut + \frac{1}{2}at^2 = 0 + \frac{1}{2} \times a \times 25 = \frac{25a}{2}$
$\therefore \frac{S_{5^{th}}}{S_5} = \frac{9}{25}$

7 **(b)**

Here $v = 144\ km/h = 40m/s$
$v = u + at \Rightarrow 40 = 0 + 20 \times a \Rightarrow a = 2\ m/s^2$

$\therefore s = \frac{1}{2}at^2 = \frac{1}{2} \times 2 \times (20)^2 = 400\ m$

8 **(b)**

At maximum height velocity $v = 0$

We know that $v = u + at$, hence

$0 = u - gT \Rightarrow u = gT$

When $v = \frac{u}{2}$, then

$\frac{u}{2} = u - gt \Rightarrow gt = \frac{u}{2} \Rightarrow gt = \frac{gT}{2} \Rightarrow t = \frac{T}{2}$

Hence at $t = \frac{T}{2}$, it acquires velocity $\frac{u}{2}$

9 **(b)**

$S_2 = \frac{1}{2}gt_2^2 = \frac{10}{2} \times (3)^2 = 45\ m$

$S_1 = \frac{1}{2}gt_1^2 = \frac{10}{2} \times (5)^2 = 125\ m$

$\therefore S_1 - S_2 = 125 - 45 = 80\ m$

10 **(d)**

Using, $v = u + at$ or $v - u = at$, we find that if $|\vec{a}|$ is, it t is the time for acceleration, then $\frac{t}{2}$ is the time for retardation

Now, $t + \frac{t}{2} = 3$ or $\frac{3t}{2} = 3$ or $t = 2s$

$S = \frac{1}{2} \times 2 \times 2 \times 2 + \frac{1}{2} \times 4 \times 1 \times 1 = (4 + 2)$m=6m

11 **(a)**

$H_{\max} \propto u^2 \therefore u \propto \sqrt{H_{\max}}$

$i.e.$ to triple the maximum height, ball should be thrown with velocity $\sqrt{3}\,u$

12 **(d)**

Net displacement = 0 and total distance $= OP + PQ + QO$

$= 1 + \frac{2\pi \times 1}{4} + 1 = \frac{14.28}{4}\ km$

Average speed $= \frac{14.28}{4 \times 10/60}$

$= \frac{6 \times 14.28}{4} = 21.42\ km/h$

13 **(d)**

Relative velocity

$= 10 + 5 = 15\ m/sec$

$\therefore t = \frac{150}{15} = 10\ sec$

14 **(a)**

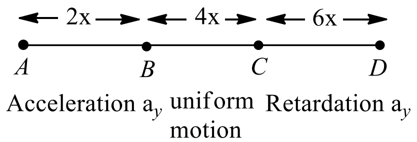
$$v_{\text{rel}} = 45 + 36 = 81 \text{ kmh}^{-1} = 81 \times \frac{5}{18} \text{ms}^{-1}$$

$$s_{\text{rel}} = v_{\text{rel}} \times t = 81 \times \frac{5}{18} \times (5 \times 60)$$

$$= \frac{81 \times 5 \times 5 \times 60}{18} - 6750 \text{ m} = 6.75 \text{ km}$$

16 **(b)**

Let t_1,t_2 and t_3 be the time taken by the particles to cover the distance $2x$, $4x$ and $6x$ respectively. Let v be the velocity of the particle at B ie, maximum velocity. The particle moves with uniform acceleration from A to B.



For motion for A to B.

Average velocity $= \frac{0+v}{2} = \frac{v}{2}$

Time taken, $t_1 = \frac{2x}{v/2} = \frac{4x}{v}$

Particle moves with uniform retardation from C to D.

Time taken , $t_3 = \frac{6x}{(0+v)/2} = \frac{12x}{v}$

Total time $= t_1 + t_2 + t_3$

$$= \frac{4x}{v} + \frac{4x}{v} + \frac{12x}{v} = \frac{20x}{v}$$

$$v_{\text{av}} = \frac{2x + 4x + 6x}{20x/v} = \frac{12v}{20}$$

or $\frac{v}{v} = \frac{12}{20} = \frac{3}{5}$.

17 **(b)**

$$Average\ velocity = \frac{Total\ distance\ covered}{Time\ of\ flight} = \frac{2H_{max}}{2u/g}$$

$$\Rightarrow v_{av} = \frac{2u^2/2g}{2u/g} \Rightarrow v_{av} = u/2$$

Velocity of projection $= v$ [Given]

$\therefore v_{av} = u/2$

18 **(b)**

Total time of motion is $2\,min\,20\,sec = 140\,sec$

As time period of circular motion is 40 sec so in 140 sec. Athlete will complete 3.5 revolution $i.e.$, He will be at diametrically opposite point $i.e.$,Displacement $= 2R$

19 **(c)**

From acceleration time graph, acceleration is constant for first part of motion so, for this part velocity of body increases uniformly with time and as $a = 0$ then the velocity becomes constant. Then again increased because of acceleration

20 **(b)**

Let us solve the problem in terms initial velocity, relative acceleration and relative displacement of the coin with respect to floor of the lift.

$u = 10 - 10 = \text{ms}^{-1}, a = 9.8\text{ms}^{-2}, S = 4.9\text{m}, t = ?$

$4.9 = 0 \times t + \frac{1}{2} \times 9.8 \times t^2$ or $4.9t^2 = 4.9$ or $t = 1\text{s}$

$15 = 30 - 10t$ or $10t = 15$ or $t = 1.5\text{s}$

21 **(c)**

$$\frac{dx}{dt} = 4t^3 - 2t$$

or $dx = 4t^3 dt - 2t\, dt$

Integrating, $x = \frac{4t^4}{4} - \frac{2t^2}{2} = t^3 - t^2$

When $x = 2, t^4 - t^2 - 2 = 0,$

$$t^2 = \frac{-(-1) \pm \sqrt{1+8}}{2}$$

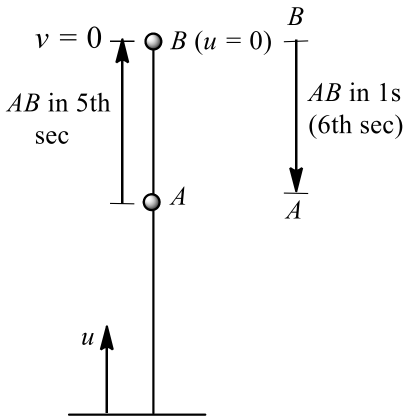
or $t^2 = \frac{1 \pm 3}{2} = 2$ (ignoring – ve sign)

Again, $\frac{d^2x}{dt^2} = 12t^2 - 2$

When $t^2 = 2$, acceleration$=12 \times 2 - 2 = 22\text{ms}^{-2}$

22 **(b)**

The distance travelled in t sec in upward motion is



$$s = u - \frac{1}{2}\, g(2t - 1)$$

$$\therefore \quad AB = u - \frac{1}{2} g(2 \times 5 - 1)$$

$$AB = u - \frac{1}{2}\, 9g$$

Distance travelled in 1 s in the downward direction is

$$BA = 0 + \frac{1}{2}\, g(1)^2$$

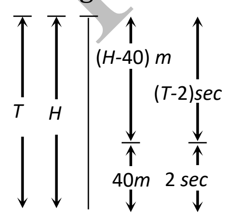
It is given that these distance are equal. Therefore,

$$u - \frac{9g}{2} = \frac{1}{2} g$$

$$\Rightarrow \quad u = 5 \times 9.8 = 49 \text{ ms}^{-1}$$

23 **(b)**

Let height of minaret is H and body take time T to fall from top to bottom



$H = \frac{1}{2}gT^2$ ...(i)

In last 2 sec body travels distance of 40 m so in $(T-2)$ sec distance travelled $= (H-40)m$

$(H-40) = \frac{1}{2}g(T-2)^2$ ...(ii)

By solving (i) and (ii), $T = 3$ sec and $H = 45m$

24 **(c)**

Let the man starts crossing the road at an angle θ with the roadside. For safe crossing, the condition is that the man must cross the road by the time truck describes the distance(4+2 cot θ),

So, $\frac{4+2\cot\theta}{8} = \frac{2l\sin\theta}{v}$

or $v = \frac{8}{2\sin\theta=2\cos\theta}$

For minimum $v = \frac{dv}{d\theta} = 0$

or $\frac{-8(2\cos\theta-\sin\theta)}{(2\sin\theta+\cos\theta)^2} = 0$

or $2\cos\theta - \sin\theta = 0$

or $\tan\theta = 2$, so, $\sin\theta = \frac{2}{\sqrt{5}}$, $\cos\theta = \frac{1}{\sqrt{5}}$

$$\therefore\ v_{\min} = \frac{6}{2\left(\frac{2}{\sqrt{5}}\right) + \frac{1}{\sqrt{5}}}$$

$$= \frac{8}{\sqrt{5}} = 3.57\text{ms}^{-1}$$

25 **(a)**

$S_1 = \frac{1}{2}ft^2, S_2 = -v_0t - \frac{1}{2}\text{g}t^2$, Clearly, $(S_1 - S_2) \propto t$

26 **(a)**

When the stone is released from the balloon. Its height

$h = \frac{1}{2}at^2 = \frac{1}{2} \times 1.25 \times (8)^2 = 40$ m and velocity

$v = at = 1.25 \times 8 = 10$ m/s

Time taken by the stone to reach the ground

$$t = \frac{v}{g}\left[1 + \sqrt{1 + \frac{2gh}{v^2}}\right] = \frac{10}{10}\left[1 + \sqrt{1 + \frac{2 \times 10 \times 40}{(10)^2}}\right] = 4sec$$

27 **(d)**

In the positive region the velocity decreases linearly (during rise) and in the negative region velocity increases linearly (during fall) and the direction is opposite to each other during rise and fall, hence fall is shown in the negative region

28 **(c)**

Given : Initial velocity of a body $u = 0$ ... (i)

Let s be the distance covered by a body in time t

$\therefore s = ut + \frac{1}{2}\, at^2$ or $s = \frac{1}{2}\, at^2$ [Using (i)]

$\Rightarrow s \propto t^2$

29 **(b)**

$u = 0, v = 180\ km\ h^{-1} = 50\ ms^{-1}$

Time taken $t = 10s$

$$a = \frac{v-u}{t} = \frac{50}{10} = 5\ ms^{-2}$$

$\therefore$ Distance covered $S = ut + \frac{1}{2}at^2$

$$= 0 + \frac{1}{2} \times 5 \times (10)^2 = \frac{500}{2} = 250\ m$$

30 **(b)**

Distance covered =Area enclosed by $v - t$ graph

$=$ Area of triangle $= \frac{1}{2} \times 4 \times 8 = 16\ m$

31 **(c)**

$$x = at + bt^2 - ct^3, a = \frac{d^2x}{dt^2} = 2b - 6ct$$

32 **(b)**

Power, $P = \frac{W}{t}$

$P = \frac{Fs}{t}, P = \frac{mas}{t}$ $(\because F = ma)$

$P = \frac{mv\,s}{t^2},$ $\left(\because a = \frac{v}{t}\right)$

$P = \frac{ms \cdot s}{t^3}$ $\left(\because v = \frac{s}{t}\right)$

$Pt^2 = ms^3$

$\therefore\ s \propto t^{3/2}$

33 **(d)**

If t_1 and t_2 are the time, when body is at the same height then,

$$h = \frac{1}{2}gt_1t_2 = \frac{1}{2} \times g \times 2 \times 10 = 10\ g$$

34 **(d)**

In 's-t' graph (positive -time)

The straight line parallel with time axis represent state of rest

35 **(a)**

$\tan(90° - \theta) = \frac{20}{15}$

$$\therefore \cot\theta = \frac{20}{15} = \frac{4}{3}$$

$\Rightarrow\ \theta = 37°$

$\therefore\ \theta = 37° + 23°$

$= 60°$

36 **(b)**

$$t = \sqrt{\frac{2h}{g}} \Rightarrow \frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}}$$

37 **(a)**

$S_n = u + \frac{g}{2}(2n-1)$; when $u = 0, S_1 : S_2 : S_3 = 1:3:5$

38 **(c)**

$v^2 = u^2 + 2gh \Rightarrow v = \sqrt{u^2 + 2gh}$

So for both the cases velocity will be equal

39 **(b)**

Time of ascent = Time of descent=5sec

40 **(a)**

$s \propto t^2$[Given] $\therefore s = Kt^2$

Acceleration $a = \frac{d^2s}{dt^2} = 2k$ [constant]

It means the particle travels with uniform acceleration

41 **(c)**

When packet is released from the balloon, it acquires the velocity of balloon of value 12 m/s. Hence velocity of packet after 2 sec, will be

$v = u + gt = 12 - 9.8 \times 2 = -76\ m/s$

42 **(b)**

$x = 9t^2 - t^3; v = \frac{dx}{dt} = 18t - 3t^2$, For maximum speed

$\frac{dv}{dt} = \frac{d}{dt}[18t - 3t^2] = 0 \Rightarrow 18 - 6t = 0\ \therefore t = 3$ sec

i.e., Particle achieve maximum speed at $t = 3$ sec. At this instant position of this particle, $x = 9t^2 - t^3$ $= 9(3)^2 - (3)^3 = 81 - 27 = 54\ m$

43 **(d)**

Up to time t_1 slope of the graph is constant and after $t_1$slope is zero $i.e.$ the body travel with constant speed up to time t_1 and then stops

44 **(b)**

For vertically upward motion, $h_1 = v_0 t - \frac{1}{2}gt^2$ and for vertically downward motion, $h_2 = v_0 t + \frac{1}{2}g\,t^2$

$\therefore$ Total distance covered in t sec $h = h_1 + h_2 = 2v_0 t$

45 **(c)**

Acceleration $= a = \frac{dv}{dt} = 0.1\ \times 2t = 0.2t$

Which is time dependent $i.e.$ non-uniform acceleration