

TEST

JEE Mains PYQS Motion in Straight Line (Physics Master Academy)

QUESTIONS

SECTIONS

1. Section A - 35 Questions

Section 1 : Section A - 35 Questions

SECTION INSTRUCTIONS

1 This section contains 35 questions. Every question is compulsory. 4 marks for every correct answer, - 1 mark for every incorrect answer

1 A particle is moving with speed $v = b\sqrt{x}$ along positive x axis. Calculate the speed of the particle at time $t = \tau$ (assume that the particle is at origin at $t = 0$)

$\frac{b^2\tau}{4}$

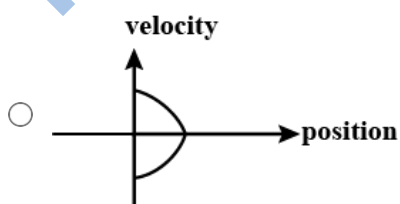
$\frac{b^2\tau}{2}$

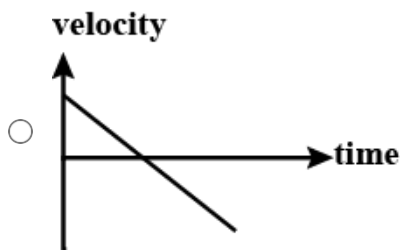
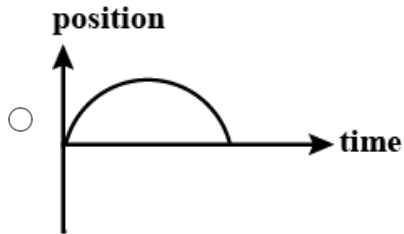
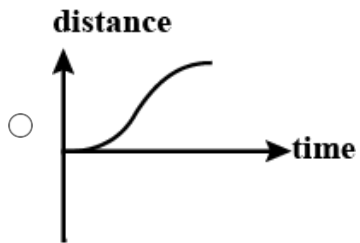
$b^2\tau$

$\frac{b^2\tau}{\sqrt{2}}$

Correct: +4 · Incorrect: -1

2 All the graphs below are intended to represent the same motion. One of them does it incorrectly. Pick it up.





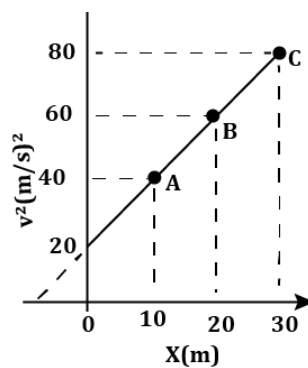
Correct: +4 · Incorrect: -1

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

- $v_0 + g/2 + f$
- $v_0 + 2g + 3f$
- $v_0 + g/2 + f/3$
- $v_0 + g + f$

Correct: +4 · Incorrect: -1

4 A particle is moving with constant acceleration 'a' following graphs shows v^2 versus x (displacement) plot. The acceleration of the particle is ___ m/s^2 .



- 1
- 2
- 0
- None of these

Correct: +4 · Incorrect: -1

5 The velocity of a body related to displacement x is given by $v = \sqrt{5400 + 24x}$ m/s, then the acceleration of the body is ___ m/s².

- 9
- 10
- 11
- 12

Correct: +4 · Incorrect: -1

6 The instantaneous velocity of a particle moving in a straight line is given as $v = \alpha t + \beta t^2$, where α and β are constants. The distance travelled by the particle between 1s and 2s is

- $3\alpha + 7\alpha$
- $3/2\alpha + 7/3\alpha$
- $1/2 + \alpha/3$
- $3/2\alpha + 7/2\alpha$

Correct: +4 · Incorrect: -1

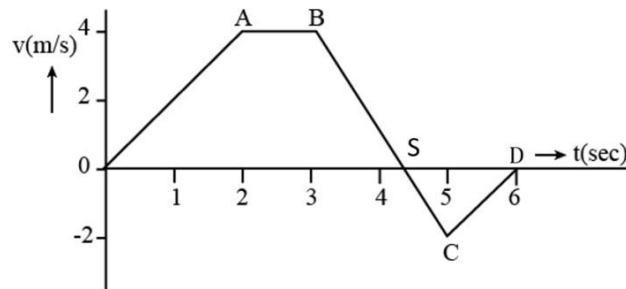
7 A scooter accelerates from rest for time t_1 at constant rate a_1 and then retards at constant rate a_2 for time t_2 and comes to rest. The correct value of t_1/t_2 will be

- $\frac{a_1 + a_2}{a_1}$
- $\frac{a_1}{a_2}$
- $\frac{a_2}{a_1}$

$\frac{a_1 + a_2}{a_2}$

Correct: +4 · Incorrect: -1

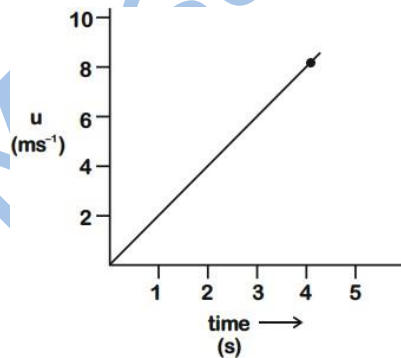
8 The velocity (v) and time (t) graph of a body in a straight line motion is shown in the figure. The point S at 4.333 seconds. The total distance covered by the body in 6 s is



- 37/3 m
- 12m
- 11m
- 49/7 m

Correct: +4 · Incorrect: -1

9 The speed versus time graph for a particle is shown in the figure. The distance travelled (in m) by the particle during the time interval $t = 0$ to $t = 5$ s will be ____



- 18
- 19
- 20
- 21

Correct: +4 · Incorrect: -1

10 The distance x covered by a particle in one dimensional motion varies with t as $x^2 = at^2 + 2bt + c$. If the acceleration of the particle depends on x as x^n , where n is an integer, the value of n is ____

- 0
- 1
- 2
- 3

Correct: +4 · Incorrect: -1

11 A bullet of mass 20g has an initial speed of 1ms^{-1} just before it starts penetrating a mud wall of thickness 20cm. If the wall offers a mean resistance of $2.5 \times 10^{-2}\text{N}$, the speed of the bullet after emerging from the other side of the wall is close to

- 0.1ms^{-1}
- 0.7ms^{-1}

ms^{-1}

ms^{-1}

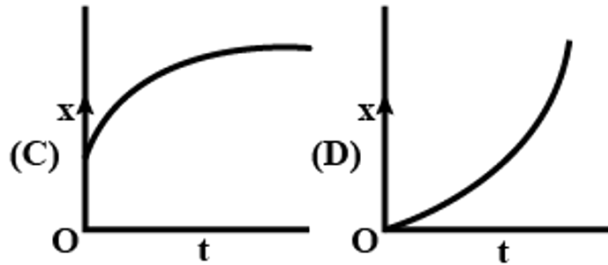
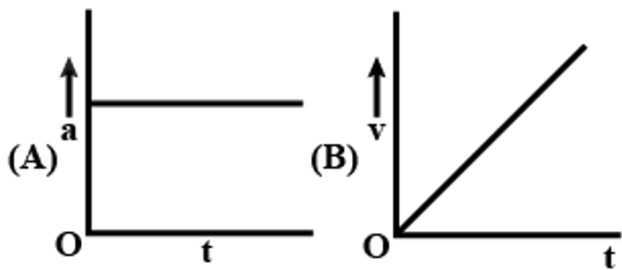
Correct: +4 · Incorrect: -1

12 The position of a particle as a function of time t , is given by $x(t) = at + bt^2 - ct^3$ where a , b and c are constants. When the particle attains zero acceleration, then its velocity will be

- $a + \frac{b^2}{4c}$
- $a + \frac{b^2}{3c}$
- $a + \frac{b^2}{c}$
- $a + \frac{b^2}{2c}$

Correct: +4 · Incorrect: -1

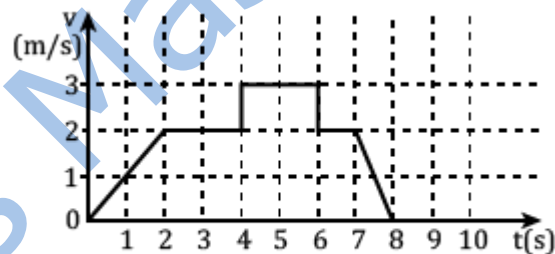
13 A particle starts from origin O from rest and moves with a uniform acceleration along the positive x axis. Identify all figures that correctly represents the motion qualitatively (a = acceleration, v = velocity, x = displacement, t = time)



- B, C
- A
- A, B, C
- A, B, D

Correct: +4 · Incorrect: -1

14 A particle starts from the origin at time $t = 0$ and moves along the positive x axis. The graph of velocity with respect to time is shown in figure. What is the position of the particle at time $t = 5\text{s}$?



- 10m
- 6m
- 3m
- 9m

Correct: +4 · Incorrect: -1

15 In a car race on a straight road, car A takes a time t less than car B at the finish and passes finishing point with a speed ' v ' more than of car B. Both the cars start from rest and travel with constant acceleration a_1 and a_2 respectively. Then ' v ' is equal to

$\frac{2a_1 a_2 t}{a_1 + a_2}$

$\sqrt{2a_1 a_2 t}$

$\sqrt{a_1 a_2 t}$

$\frac{a_1 + a_2}{2} t$

Correct: +4 · Incorrect: -1

16 An automobile travelling at 40km/h can be stopped at a distance of 40m, by applying brakes. IF the same automobile is travelling at 80km/h, the minimum stopping distance in metres, is (assume no skidding)

75m

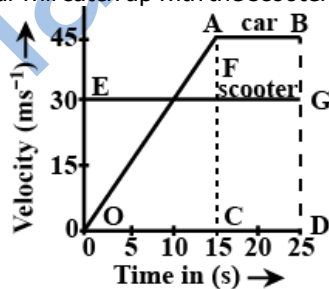
160m

100m

150m

Correct: +4 · Incorrect: -1

17 The velocity time graphs of a car and a scooter are shown in the figure. (i) the difference between the distance travelled by the car and the scooter is 15m and (ii) the time at which the car will catch up with the scooter are respectively



337.5m and 25s

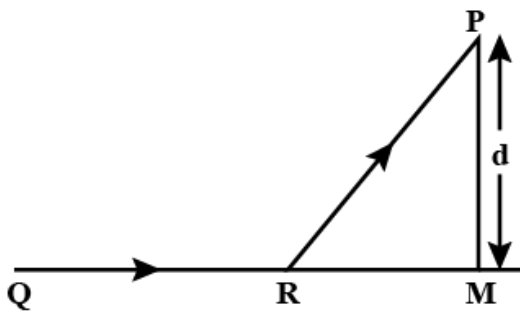
225.5m and 10s

112.5m and 22.5s

112.5m and 15s

Correct: +4 · Incorrect: -1

18 A man in a car at location Q on a straight highway is moving with speed v . He decides to reach a point P in a field at a distance d from highway (point M) as shown in figure. Speed of the car in the field is half to that on the highway. What should be the distance RM so that the time taken to reach P is minimum?



- $\frac{d}{\sqrt{3}}$
- $\frac{d}{2}$
- $\frac{d}{\sqrt{2}}$
- d

Correct: +4 · Incorrect: -1

19 An object moving a speed of 6.25m, is decelerated at a rate given by $dv/dt = 2.5\sqrt{v}$ where v is the instantaneous speed. The time taken by the object, to come to rest, would be

- 2s
- 4s
- 8s
- 1s

Correct: +4 · Incorrect: -1

20 The relation between time t and distance x at $t = ax^2 + bx$ where a and b are constants. The acceleration is

- $2bv^3$
- $-2abv^2$
- $2av^2$
- $-2av^3$

Correct: +4 · Incorrect: -1

21 If a body loses half of its velocity on penetrating 3cm in a wooden block, then how much will it penetrate more before coming to rest?

- 1cm
- 2cm
- 3cm
- 4cm

Correct: +4 · Incorrect: -1

22 A boy reaches the airport and finds that the escalator is not working. He walks up the stationary escalator in time t_1 . If he remains stationary on a moving escalator then the escalator takes him up in time t_2 . The time taken by him to walk up on the moving escalator will be

- $\frac{t_1 t_2}{t_2 - t_1}$
- $\frac{t_1 + t_2}{2}$
- $\frac{t_1 t_2}{t_2 + t_1}$
- $t_2 - t_1$

Correct: +4 · Incorrect: -1

23 Train A and B are running parallel tracks in the opposite direction with speeds of 36 km/hr and 72km/hr respectively. A person is walking in train A in the direction opposite to its motion with a speed of 1.8km/hr. Speed (in ms^{-1}) of this person as observed from train B will be close to (take the distance between the tracks as negligible)

- 29.5 ms^{-1}
- 28.5 ms^{-1}
- 31.5 ms^{-1}
- 30.5 ms^{-1}

Correct: +4 · Incorrect: -1

24 A passenger train of length 60m travels at a speed of 80km/hr. Another freight train of length 120m travels at a speed of 30km/h/ The ratio of times taken by the passenger train to completely cross the freight train when (i) they are moving in same direction and (ii) in the opposite directions is

- 11/5

- 5/2
- 3/2
- 25/11

Correct: +4 · Incorrect: -1

25 A person standing on an open ground hears the sound of a jet plane, coming from north at an angle of 60° with ground level. But he finds the aeroplane right vertically above his position. If v is the speed of sound, speed of the plane is

- $\frac{\sqrt{3}}{2}v$
- $\frac{2v}{\sqrt{3}}$
- v
- $\frac{v}{2}$

Correct: +4 · Incorrect: -1

26 A person climbs up a stalled escalator in 60s. If standing on the same but escalator running with constant velocity he takes 40s. How much time is taken by the person to walk up the moving escalator?

- 37s
- 27s
- 24s
- 45s

Correct: +4 · Incorrect: -1

27 Water drops are falling from a nozzle of a shower onto the floor, from a height of 9.8m. The drops fall at a regular interval of time. When the first drop strikes the floor, at that instant, the third drop begins to fall. Locate the position of second drop from the floor when the first drop strikes the floor.

- 4.18m
- 2.94m
- 2.45m

7.35m

Correct: +4 · Incorrect: -1

28 Water droplets are coming from an open tap at a particular rate. The spacing between a droplet observed at 4th second after its fall to the next droplet is 34.3m. At what rate the droplets are coming from the tap? (take $g = 9.8\text{m/s}^2$)

3drops/ 2 seconds

2drops/ seconds

1drop/ seconds

1drops/ 7 seconds

Correct: +4 · Incorrect: -1

29 A balloon was moving upwards with a uniform velocity of 10m/s. An object of knite mass is dropped from the balloon when it was at a height of 75m from the ground level. The height of the balloon from the ground when object strike the ground was around: (take the value of g as 10m/s^2)

300m

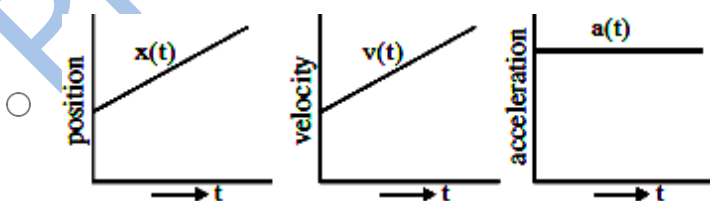
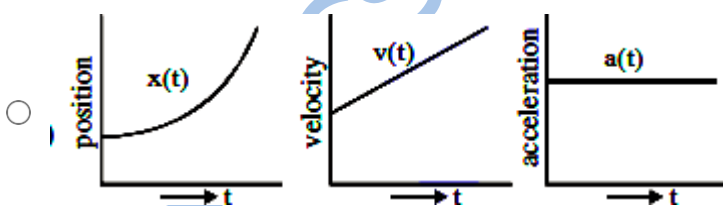
200m

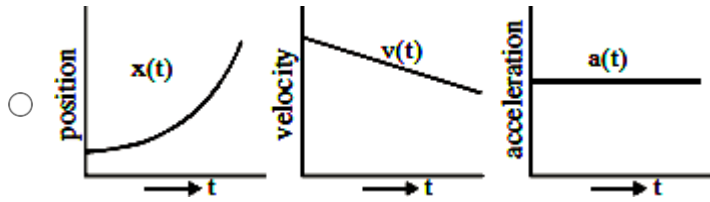
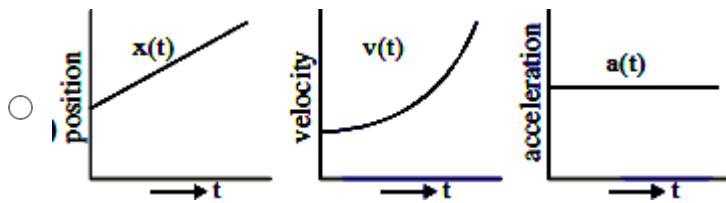
125m

250m

Correct: +4 · Incorrect: -1

30 The position, velocity and acceleration of a particle moving with a constant acceleration can be represented by





Correct: +4 · Incorrect: -1

31 A stone is dropped from the top of building. When it crosses a point 5m below the top, another stone starts to fall from a point 25m below the top. Both stones reach the bottom of building simultaneously. The height of the building is

- 35m
- 45m
- 25m
- 50m

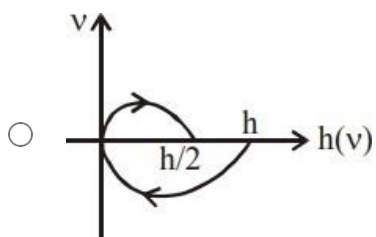
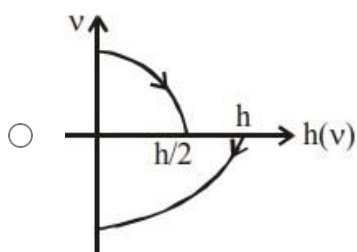
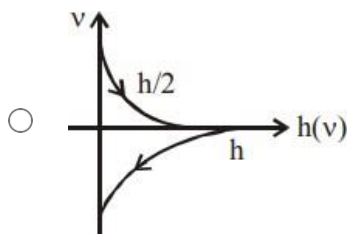
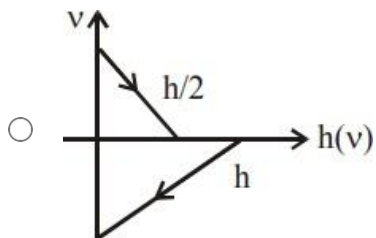
Correct: +4 · Incorrect: -1

32 A helicopter from rest on the ground vertically upwards with a constant acceleration g . A food packet is dropped from the helicopter when it is at a height h . The time taken by the packet to reach the ground is close to [g is the acceleration due to gravity]

- $t = \frac{2}{3} \sqrt{\left(\frac{h}{g}\right)}$
- $t = 1.8 \sqrt{\frac{h}{g}}$
- $t = \sqrt{\frac{2h}{3g}}$
- $t = 3.4 \sqrt{\left(\frac{h}{g}\right)}$

Correct: +4 · Incorrect: -1

33 A tennis ball is released from a height h and after freely falling on a wooden floor it rebounds and reach height $h/2$. The velocity versus height of the ball during its motion may be represented graphically by (graphs are drawn schematically and on not to scale)



Correct: +4 · Incorrect: -1

34 A ball is dropped from the top of a 100m high tower on a planet. In the last $\frac{1}{2}$ s before hitting the ground, it covers a distance of 19m. Acceleration due to gravity (in ms^{-2}) near the surface on that planet is ____

- 6
- 7
- 8
- 9

Correct: +4 · Incorrect: -1

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

- $2gH = n^2u^2$
- $gH = (n-2)^2u^2d$
- $2gH = nu^2(n-2)$
- $gH = (n-2)u^2$

Correct: +4 · Incorrect: -1

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TEST

JEE Mains PYQS Motion in Straight Line (Physics Master Academy)

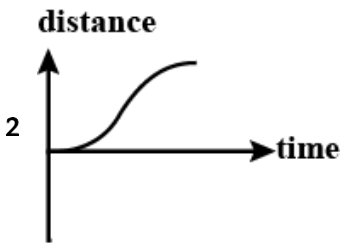
ANSWERS

SECTIONS

1. Section A - 35 Questions

Section 1 : Section A - 35 Questions

1 $\frac{b^2 \tau}{2}$



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

4 1

5 12

6 $3/2 \alpha + 7/3 \alpha$

7 $\frac{a_2}{a_1}$

8 $37/3$ m

9 20

10 3

11 0.7 ms^{-1}

12 $a + \frac{b^2}{3c}$

13 A, B, D

14 9m

15 $\sqrt{a_1 a_2} t$

16 160m

17 112.5m and 22.5s

18 $\frac{d}{\sqrt{3}}$

19 2s

20 $-2av^3$

21 1cm

22 $\frac{t_1 t_2}{t_2 + t_1}$

23 29.5 ms^{-1}

24 11/5

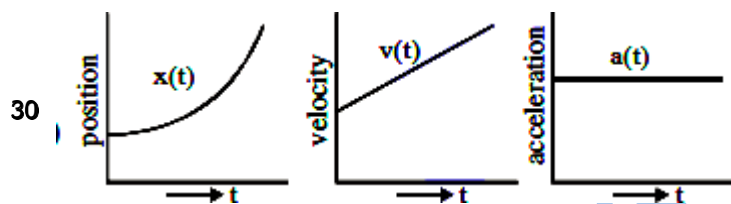
25 $\frac{v}{2}$

26 24s

27 7.35m

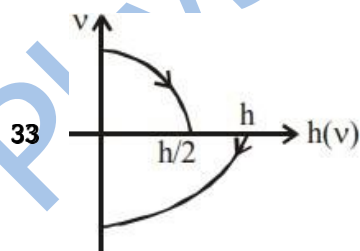
28 1drop/ seconds

29 125m



31 45m

32 $t = 3.4 \sqrt{\left(\frac{h}{g}\right)}$



34 8

35 $2gH = nu^2(n-2)$

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