

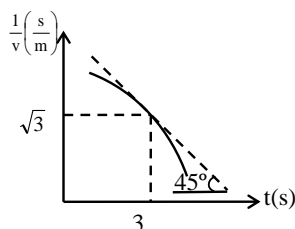
CLASS XI-PHYSICS
MOTION IN ONE DIMENSION

ASSIGNMENT-1

NUMERICAL QUESTIONS:

Q.1 A particle is moving on a straight line with constant retardation of 1m/s^2 . what is the average speed of the particle on the last two meters before it stops (in m/s.)

Q.2 The diagram shows variation of $\frac{1}{v}$ with respect to time (where v is in m/s).



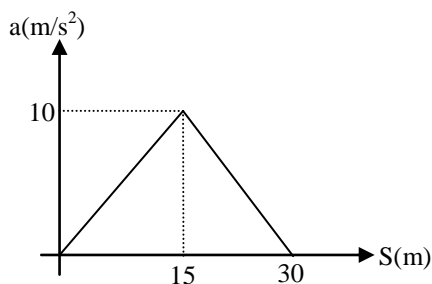
what is the instantaneous acceleration of body at $t = 3$ sec. (in $\frac{\text{m}}{\text{s}^2}$).

Q.3 An insect moves with a constant velocity v from one corner of a room to other corner which is opposite of the first corner along the largest diagonal of room. If the insect can not fly and dimensions of room is $a \times a \times a$, then the minimum time in which the insect can move is $\frac{a}{v}$ times the square root of a number n, then n is equal to ?

Q.4 On a horizontal ground, rabbit is at origin and a cat is at position (46m, 28m). When the rabbit starts running with velocity $(7.5 \hat{i} + 10 \hat{j})$ m/s cat also starts running. If cat can run with maximum speed of 5 m/s. What is the minimum time in which cat can catch the rabbit ? (in seconds)

Q.5 A ball is thrown upwards from the foot of a tower. The ball crosses the top of the tower twice after an interval of 4 second and the ball reaches ground after 8seconds then the height of tower in meters is.

Q.6 The particle moves with rectilinear motion given the acceleration-displacement (a-S) curve is shown in figure, determine the velocity after the particle has traveled 30 m. If the initial velocity is 10 m/s.



Q.7 A swimmer jumps from a bridge over a canal and swims 1 km up stream. After that first km, he passes a floating cork. He continues swimming for half an hour and then turns around and swims back to the bridge. The swimmer and the cork reach the bridge at the same time. The swimmer has been swimming at a constant speed. How fast does the water in the canal flow in km/hr.

Q.8 A ball is thrown upwards from the foot of a tower. The ball crosses the top of tower twice after an interval of 4 seconds and the ball reaches ground after 8 seconds, then the height of tower in meters is : ($g = 10 \text{ m/s}^2$)

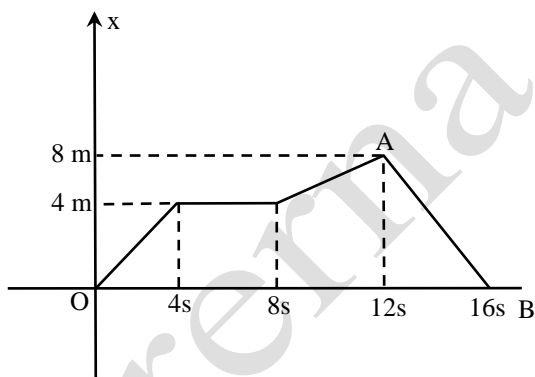
Q.9 An insect moves with a constant velocity v from one corner of a room to other corner which is opposite of the first corner along the largest diagonal of room. If the insect can not fly and dimensions of room is $a \times a \times a$, then the minimum time in which the insect can move is $\frac{a}{v}$ times the square root of a number n , then n is equal to ?

Q.10 A particle is moving on a straight line with constant retardation of 1 m/s^2 . what is the average speed of the particle on the last two meters before it stops(in m/s.)

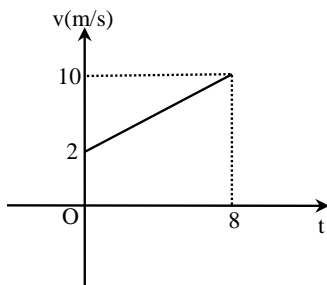
Q.11 A point moves with uniform acceleration and its initial speed and final speed are 2 m/s and 8 m/s respectively then, the space average of velocity over the distance moved is. (in m/s)

Q.12 A body moves with constant acceleration covers 16 m and 24 m in successive intervals of 4 sec and 2 sec . Then its acceleration in m/s^2 is.

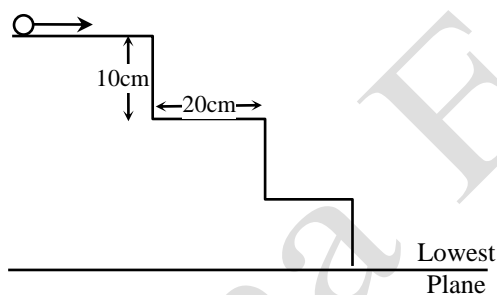
Q.13 Figure shows the graph of the x-co-ordinate of a particle going along the x-axis as function of time. Find the instantaneous speed of particle at $t = 12.5 \text{ s}$ (in m/s)



Q.14 Figure shows the graph of velocity versus time for a particle going along x axis. Initially at $t = 0$, particle is at $x = 3\text{m}$. Find position of particle at $t = 2\text{s}$. (in m)

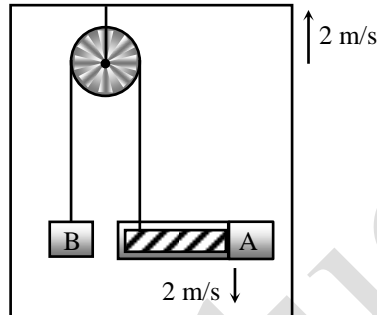


- Q.15** An athlete takes 2s to reach his maximum speed of 36 km/h. What is the magnitude of his average acceleration ? (in m/s)
- Q.16** A car travelling at 60 km/h overtakes another car travelling at 42 km/h. Assuming each car to be 5.0 m long. Find the time taken during the overtake. (in sec)
- Q.17** A police jeep is chasing a culprit going on a motor bike. The motor bike crosses a turning at a speed of 72 km/h. The jeep follows it at a speed of 90 km/h crossing the turning ten seconds later than the bike. Assuming that they travel at constant speeds, how far from the turning will the jeep catch up with the bike ? (in km)
- Q.18** A bullet going with speed 16 m/s enters a concrete wall and penetrates a distance of 0.4 m before coming to rest. Then the time taken during the retardation is
..... $\times 10^{-2}$ s. (in sec)
- Q.19** A boy standing on a long railroad car throws a ball straight upwards. The car is moving on the horizontal road with an acceleration of 1m/s^2 and projection velocity in the vertical direction is 9.8m/s . How far behind the boy will the ball fall on the car ? (in m)
- Q.20** A staircase contains three steps each 10 cm high and 20 cm wide. What should be the minimum horizontal velocity of a ball rolling off the uppermost plane so as to hit directly the lowest plane. (in m/s)

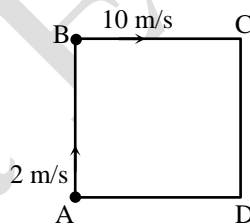


- Q.21** A man is running with a speed 8 m/s constant in magnitude and direction passes under a lantern hanging at a height 10 m above the ground. Find the velocity which the edge of the shadow of the man's head moves over the ground with if his height is 2 m.
- Q.22** Find the average velocity of a particle released from rest from a height of 125 m over a time interval till it strikes the ground. $g = 10\text{ m/s}^2$.
- Q.23** Two particles A and B start moving simultaneously along the line joining them in the same direction with acceleration of 1 m/s^2 and 2 m/s^2 and speed 3 m/s and 1 m/s respectively. Initially A is 10 m behind B. What is the minimum distance between them ?

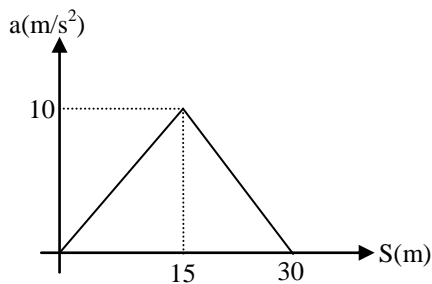
- Q.24** A ball is thrown upwards from the foot of a tower. The ball crosses the top of the tower twice after an interval of 4 second and the ball reaches ground after 8seconds then the height of tower in meters is.
- Q.25** On a horizontal ground, rabbit is at origin and a cat is at position $(46\text{m}, 28\text{m})$. When the rabbit starts running with velocity $(7.5\hat{i} + 10\hat{j})$ m/s cat also starts running. If cat can run with maximum speed of 5 m/s. What is the minimum time in which cat can catch the rabbit ? (in seconds)
- Q.26** In the figure shown, the velocity of lift is 2m/s while string is winding on the motor shaft with velocity 2m/s and block A is moving downwards with a velocity of 2m/s, the velocity of block B in m/s is-



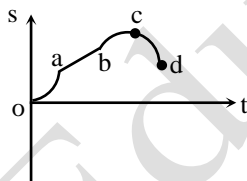
- Q.27** Two men P & Q are standing at corners A & B of square ABCD of side 8 m. They start moving along the tank with constant speed 2m/s and 10 m/s respectively. The time when they will meet for the first time, in second is -



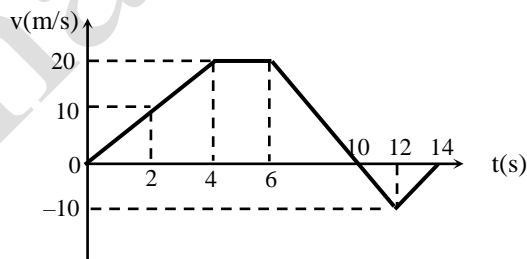
- Q.28** A particle starting from rest undergoes acceleration given by $a = |t - 2|$ m/s² where t is time in sec. Velocity of particle after 4 sec is -
- Q.29** A ball is thrown upward from the edge of a cliff with an initial velocity of 6 m/s How fast is it moving 1/2 s later? ($g = 10 \text{ m/s}^2$)
- Q.30** A baseball is moving at 25m/s when it is struck by a bat and moves off in the opposite direction at 35 m/s. If the impact lasted 0.010 s, find the baseball's acceleration during the impact. (in km/s²)
- Q.31** A car goes from 20 to 30 km/h in 1.5 second. At the same acceleration, how long will it take the car to go from 30 to 36.7 km/h? (in sec)
- Q.32** The particle moves with rectilinear motion given the acceleration-displacement (a-S) curve is shown in figure. If the initial velocity is 10 m/s then velocity of particle after particle has travelled 30 m divided by 5 is equal to.



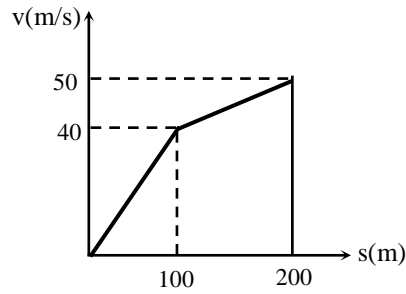
- Q.33** An insect moves with a constant velocity v from one corner of a room to other corner which is opposite of the first corner along the largest diagonal of room. If the insect can not fly and dimensions of room is $a \times a \times a$, then the minimum time in which the insect can move is $\frac{a}{v}$ times the square root of a number n , then n is equal to ?
- Q.34** The speed of a motor launch with respect to the water is $v = 5$ m/s, the speed of stream $u = 3$ m/s. When the launch began travelled 3.6 km up stream, turned about and caught up with the float. How long is it before the launch reaches the float again ? (Find answer in hour).
- Q.35** Displacement-time graph of a particle moving in a straight line is as shown in figure.



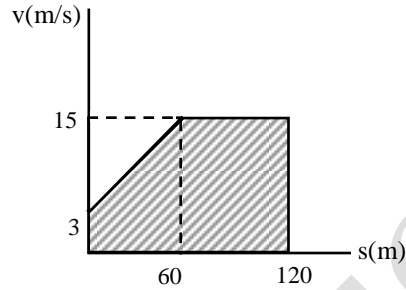
- (a) Find the sign of velocity in regions oa , ab , bc and cd
- (b) Find the sign of acceleration in the above region
- Q.36** Velocity-time graph of a particle moving in a straight line is shown in figure. In the time interval from $t = 0$ to $t = 14$ s, find:



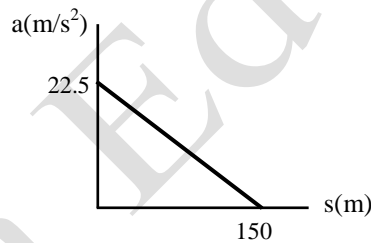
- (a) average velocity and
- (b) average speed of the particle
- Q.37** The v - s graph for an airplane travelling on a straight runway is shown. Determine the acceleration of the plane at $s = 50$ m and $s = 150$ m. Draw the a - s graph.



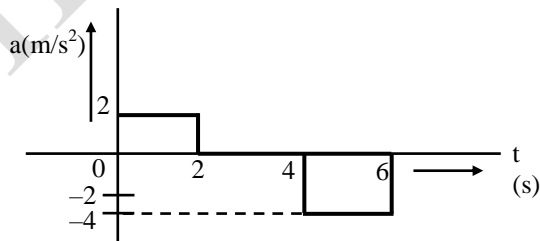
- Q.38** The v-s graph describing the motion of motorcycle is shown in figure. Construct the a-s graph of the motion and determine the time needed for the motorcycle to reach the position $s = 120$ m. $\pi = 1.6$



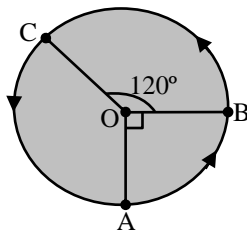
- Q.39** The jet plane starts from rest at $s = 0$ and is subjected to the acceleration shown. Determine the speed of the plane when it has travelled 60 m.



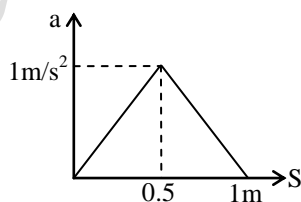
- Q.40** The acceleration versus time graph of a particle moving along a straight line is shown in the figure. Draw the respective velocity-time graph. Given $v = 0$ at $t = 0$



- Q.41** Figure shows a particle starting from point A, travelling upto B with a speed s , then upto point C with a speed $2s$ and finally upto A with a speed of $3s$. Determine its average speed. (Give answer in cm/s)



- Q.42** A particle moving in a straight line covers half the distance with speed of 3 m/s. The other half of the distance is covered in two equal time intervals with a speeds of 4.5 m/s and 7.5 m/s, respectively. Find the average speed of the particle during this motion.
- Q.43** The sum of magnitude of two forces is 25N and magnitude of resultant of these two forces is 5N. Resultant force is perpendicular to smaller force. Find the smaller force.
- Q.44** The position x of a particle varies with time t according to the relation $x = t^3 + 3t^2 + 2t$. Find velocity and acceleration as a function of time.
- Q.45** The displacement of a particle along x -axis is given by $x = 3 + 8t + 7t^2$. Obtain its velocity and acceleration at $t = 2s$.
- Q.46** 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 $u = 2 ms^{-1}$ at $t = 0$, then find the velocity at the end of 2s.
- Q.47** The acceleration of a particle is given by $a = t^3 - 3t^2 + 5$, where a is in ms^{-2} and t in sec. At $t = 1s$, the displacement and velocity are 8.30 m and $6.25 ms^{-1}$, respectively. Calculate the displacement and velocity at $t = 2$ sec.
- Q.48** A particle starts moving along x -axis from $t = 0$, its position varying with time as $x = 2t^3 - 3t^2 + 1$.
- (a) At which time instants is its velocity zero ?
- (b) What is the velocity when it pass through origin ?
- Q.49** A body initially at rest moving along x -axis in such a way so that its acceleration Vs displacement plot is as shown in figure. What will be the maximum velocity of particle in m/sec.



- Q.50** At the moment $t = 0$, a particle leaves the origin and moves in the positive direction of the x -axis. Its velocity varies _____ with _____ time _____ as $v = v_0 \left(1 - \frac{t}{5}\right)$ where v_0 is the initial velocity whose modulus is $v_0 = 10$ cm/sec. The particle will be at the distance of 10 cm from the origin at three different instants. Find out the approximate time interval between 2nd and 3rd event.
- Q.51** A particle is thrown upward from ground. It experiences a constant resistive force which can produce retardation of $6 m/sec^2$. What will be the ratio of time of descent to time of ascent ($g = 10 m/sec^2$)

Prerna Education

