

MOTION IN A STRAIGHT LINE

11th Standard CBSE

Date : 26-Nov-22

PhysicsReg.No. :

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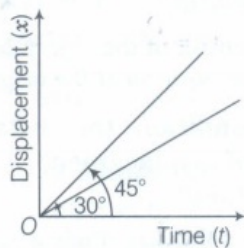
Exam Time : 01:00:00 Hrs

Total Marks : 50

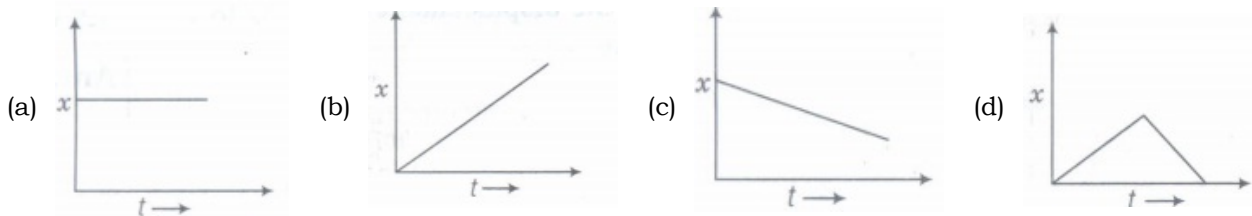
55 x 1 = 55

- 1) The displacement x of a particle varies with time according to the relation $x = \frac{a}{b}(1 - e^{-bt})$. Then
- (a) At $t = \frac{1}{b}$, the displacement of the particle is nearly $(2/3)(a/b)$.
- (b) The particle cannot reach a point at a distance x from its starting position if $x > a/b$.
- (c) The velocity and acceleration of the particle at $t = 0$ are a and $-ab$ respectively.
- (d) The particle will come back to its starting point as $t \rightarrow \infty$.
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- 2) The displacement of an object at any instant is given by $x = 30 + 20t^2$, where x is in metres and t in seconds. The acceleration of the object will be
- (a) 40 ms^{-2} (b) 50 ms^{-2} (c) 30 ms^{-2} (d) zero
-
- 3) Distance-time graph of a body at rest is
- (a) parallel to time-axis (b) parallel to distance-axis (c) inclined to time-axis
- (d) perpendicular to both axes.
-
- 4) The area under the velocity time graph between any two instants $t = t_1$ and $t = t_2$ gives the distance covered in a time $\delta t = t_2 - t_1$.
- (a) only if the particle moves with a uniform acceleration
- (b) only if the particle moves with a uniform velocity.
- (c) only if the particle moves with an acceleration increasing at a uniform rate.
- (d) in all cases irrespective of whether the motion is one of uniform velocity, or of uniform acceleration or of variable acceleration
-
- 5) Which of the following is not a vector quantity?
- (a) acceleration (b) velocity (c) speed (d) displacement
-
- 6) When the distance travelled by a body is directly proportional to the time, the body is said to have a
- (a) zero speed (b) uniform acceleration (c) zero velocity (d) uniform speed
-
- 7) In case of a moving body
- (a) displacement $>$ distance (b) displacement $<$ distance (c) displacement \geq distance
- (d) displacement \leq distance
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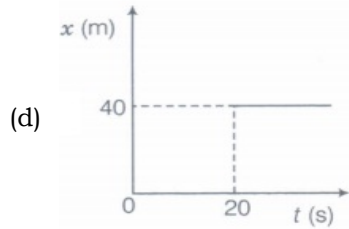
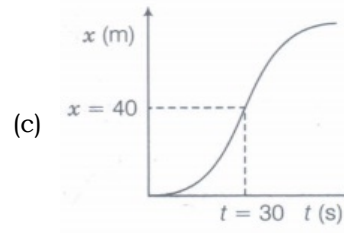
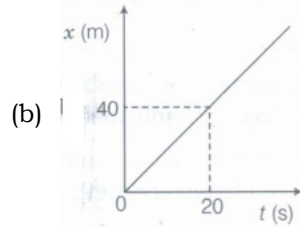
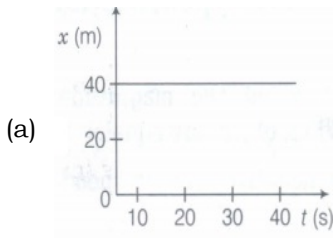
- 8) Identify one dimensional motion out of the following:
- (a) A honey bee dancing in air (b) A teacher writing on a blackboard
(c) A scooterist speeding on a level road (d) A kite flying in sky.
-
- 9) Which of the following statements is true for a car moving on the road?
- (a) With respect to the frame of reference attached to the ground, the car is at rest
(b) With respect to the frame of reference attached to the person sitting in the car, the car is at rest
(c) With respect to the frame of reference attached to the person outside the car, the car is at rest
(d) None of the above
-
- 10) The coordinates of object with respect to a frame of reference at $t = 0$ are $(-1, 0, 3)$. 1ft = 5 s, its coordinates are $(-1, 0, 4)$, then the object is in
- (a) motion along z-axis (b) motion along x-axis (c) motion along y-axis
(d) rest position between $t = 0$ and $t = 5$ s
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- 11) The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis, The ratio of their velocities is



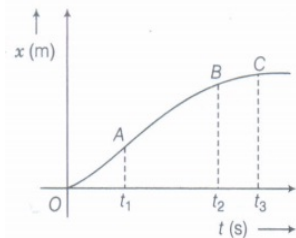
- (a) $1 : \sqrt{3}$ (b) 1:2 (c) 1:1 (d) $\sqrt{3} : 2$
-
- 12) The sign (+ ve or - vel) of the average velocity depends only upon
- (a) the sign of displacement (b) the initial position of the object (c) the final position of the object
(d) None of the above
-
- 13) The displacement of a car is given as - 240 m. Here negative sign indicates
- (a) direction of displacement (b) negative path length
(c) position of car is at point whose coordinate is -120 (d) no significance of negative sign
-
- 14) The x-t graph representing an object at rest is



- 15) For a stationary object at $x = 40$ m, the position-time graph is



- 16) A car starts from rest from origin 0 and continues to move till point C as shown in the graph. Select the correct statement about the motion of car as shown in the graph.



- (a) Part AB represents non-uniform motion. (b) At instant time $t = t_2$ brakes must have been applied.
 (c) At $t = t_3$ the car must have accelerated (d) All of the above

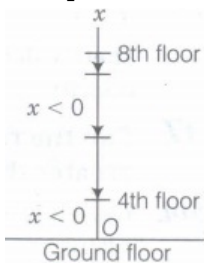
- 17) A vehicle travels half the distance L with speed v_1 and the other half with speed v_2 then its average speed is

(a) $\frac{v_1+v_2}{2}$ (b) $\frac{2v_1v_2}{v_1+v_2}$ (c) $\frac{2v_1v_2}{v_1+v_2}$ (d) $\frac{L(v_1+v_2)}{v_1v_2}$

- 18) The velocity of a particle moving along a straight line is described by equation $v = 12 - 3t^2$ where, x is in metre and t in sec. The retardation of the particle when its velocity becomes zero, is

(a) 24 ms^{-2} (b) zero (c) 6 ms^{-2} (d) 12 ms^{-2}

- 19) 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?

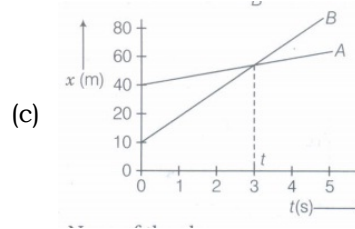
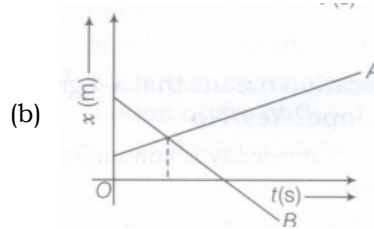
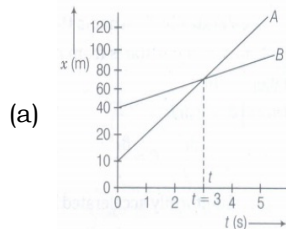


- (a) $x < 0, v < 0, a > 0$ (b) $x > 0, v < 0, a < 0$ (c) $x > 0, v < 0, a > 0$ (d) $x > 0, v > 0, a < 0$

- 20) The object is released from rest under gravity at $y = 0$. The equation of motion which correctly expresses the above situation is

(a) $v = -9.8 t \text{ ms}^{-1}$ (b) $v = (9.8 - 9.8 t) \text{ m/s}$ (c) $v^2 = -19.6 y^2 \text{ m}^2 \text{ s}^2$ (d) $v^2 = (v_0^2 + 29.6y) \text{ m}^2/\text{s}^2$

- 21) The average velocities of the objects A and B are v_A and v_B respectively. The velocities are related such that $v_A > v_B$. The position-time graph for this situation can be represented as



(d) None of the above

- 22) A person is moving with a velocity of 10 ms^{-1} towards North. A car moving with a velocity of 20 ms^{-1} towards South crosses the person. The velocity of car relative to the person is

(a) -30 ms^{-1} (b) $+30 \text{ ms}^{-1}$ (c) 10 ms^{-1} (d) -10 ms^{-1}

- 23) The slope of the straight line connecting the points corresponding to (v_2, t_2) and (v_1, t_1) on a plot of velocity versus time gives

(a) average velocity (b) average acceleration (c) instantaneous velocity (d) None of these

- 24) The kinematic equations of rectilinear motion for constant acceleration for a general situation, where the position coordinate at $t = 0$ is non-zero, say X_0 is

(a) $v = V_0 + at$ (b) $x = x_0 + v_0t + \frac{1}{2}at^2$ (c) $v^2 = v_0^2 + 2a(x - x_0)$ (d) All of the above

- 25) A car is moving with a velocity of 30 ms^{-1} . On applying the brakes, the velocity decreases to 15 ms^{-1} in 2 s. The acceleration of the car is

(a) $+7.5 \text{ ms}^{-2}$ (b) -7.7 ms^{-2} (c) -7.5 ms^{-2} (d) $+15 \text{ ms}^{-2}$

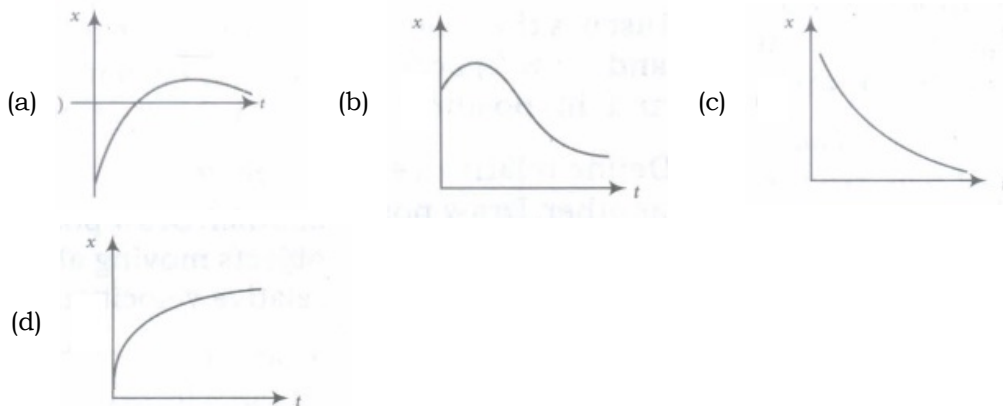
- 26) An object starts from rest and moves with uniform acceleration α . The final velocity of the particle in terms of the distance x covered by it is given as

(a) $\sqrt{2ax}$ (b) $2ax$ (c) $\sqrt{\frac{ax}{2}}$ (d) \sqrt{ax}

- 27) Two particles A and B are moving in a straight line with the same speed. Which of the following statement(s) is/are correct for the relative motion of the two particles?

- (a) The relative velocity v_{AB} or v_{BA} is zero. Only if they are moving in the same direction
 (b) If the particles are moving in opposite direction, the magnitude of v_{BA} or v_{AB} is twice, then the magnitude of velocity of A or that of B
 (c) The relative velocity v_{AB} or v_{BA} is always zero (d) Both (a) and (b)

- 28) Among the four graph 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?



29) If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it in 1s is

- (a) $3A+7B$ (b) $\frac{3}{2}A + \frac{7}{3}B$ (c) $\frac{A}{2} + \frac{B}{3}$ (d) $\frac{3}{2}A + 4B$

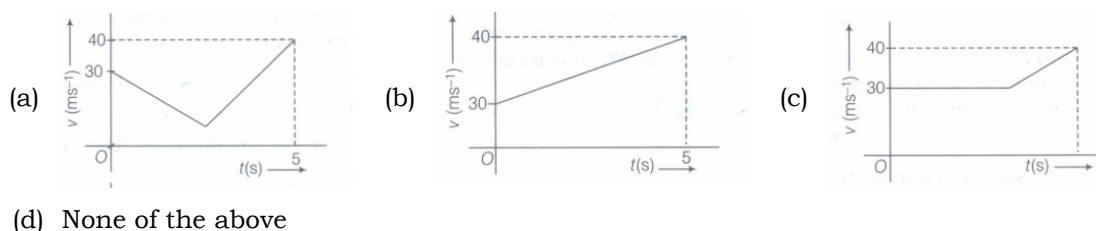
30) At a metro station, a girl walks up a stationary escalator in time t_1 . If she remains stationary on the escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be

- (a) $(t_1 + t_2)/2$ (b) $t_1 t_2 / (t_2 - t_1)$ (c) $t_1 t_2 / (t_2 + t_1)$ (d) $t_1 = t_2$

31) In one dimensional motion, instantaneous speed v satisfies $0 \leq v$

- (a) The displacement in time T must always take non-negative values
 (b) The displacement x in time T satisfies $-vT \leq x \leq vT$
 (c) The acceleration is always a non-negative number (d) The motion has no turning points

32) An object is moving with an initial velocity of 30 ms^{-1} with uniform acceleration. The velocity of the object increases to 40 ms^{-1} in next 5 s. The v-t graph which best represents this situation is



33) The relative velocity v_{BA} or v_{AB} is zero for two particles moving along x-axis uniformly. The position-time graph for this situation will be

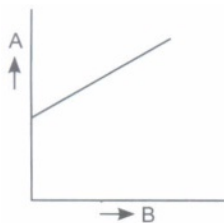
- (a) straight lines parallel but inclined to time axis
 (b) straight lines parallel and also parallel to time axis
 (c) straight lines intersecting each other at some point (d) curves and not straight lines

34) A stone is dropped into a well in which the level of water is at a distance h below the top of the well. If v is the velocity of sound, the time T after which the splash is heard is given by

- (a) $T = \frac{2h}{v}$ (b) $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$ (c) $T = \sqrt{\frac{2h}{v}} + \frac{h}{g}$ (d) $T = \sqrt{\frac{h}{2g}} + \frac{2h}{v}$

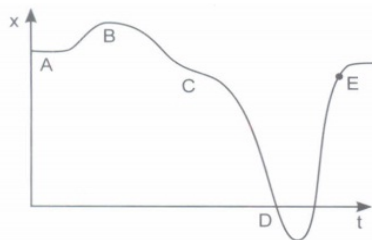
- 35) The distance travelled by a body is directly proportional to the square of the time taken. Its acceleration
- (a) increases (b) decreases (c) becomes zero (d) remains constant
-
- 36) Wind is blowing west to east along two parallel tracks. Two trains moving with same speed in opposite directions have the steam track of one double then other. The speed of each train is
- (a) equal to that of wind (b) double that of wind (c) three times that of wind (d) half that of wind.
-
- 37) A particle moving with a uniform acceleration travels 24 metre and 64 metre in first two consecutive intervals of 4 seconds each. Its initial velocity is
- (a) 1 m/s (b) 2 m/s (c) 5 m/s (d) 10 m/s
-
- 38) A ball is thrown up, it reaches a maximum height and then comes down. If t_1 ($t_2 > t_1$) are the times that the ball takes to be at a particular height then the time taken by the ball to reach the highest point is
- (a) $(t_1 + t_2)$ (b) $(t_1 - t_2)$ (c) $(t_2 - t_1)/2$ (d) $(t_2 + t_1)/2$
-
- 39) A stone is dropped from a certain height and at the same time another stone is thrown horizontally from the same height which one will reach the ground earlier.
- (a) first stone (b) second stone (c) simultaneously (d) not sure
-
- 40) A particle is forced to move on a straight line path. It returns to the starting point after 10 seconds. The total distance covered by the particle during this time is 20 m. Which of the following statements is false regarding the motion of the particles?
- (a) The average velocity of the particle is zero. (b) The displacement of the particle is zero.
(c) The average speed of the particle is 2.0 ms^{-1} . (d) The displacement of the particle is 20 m
-
- 41) Select the correct statements for a particle going on a straight line:
- (a) If the position and velocity are in opposite directions, the particle is moving towards the origin.
(b) If the acceleration and velocity are in opposite directions, the particle is slowing down.
(c) If the velocity is zero for a time interval, the acceleration is zero at any moment within that time interval.
(d) If the velocity is zero at any instant, then the acceleration must also be zero at that instant.
-
- 42) Acceleration of a particle which is at rest at $x = 0$ is $\vec{a} = (4 - 2x)\hat{i}$. Select the correct alternative(s).
- (a) Maximum speed of the particle is 4 units (b) Particle further comes to rest at $x = 4$.
(c) Particle oscillates about $x = 2$ (d) Particle will continuously accelerate along the x-axis
-
- 43) The displacement of a particle is given by $x = (t - 2)^2$ where x is in metres and t in seconds. The distance covered by the particle in first 4 seconds is
- (a) 4 m (b) 8 m (c) 12 m (d) 16 m
-

- 44) The variation of quantity A with quantity B, plotted in Fig. describes the motion of a particle in a straight line. Choose the correct statement(s).



- (a) Quantity B may represent time (b) Quantity A is velocity if motion is uniform
 (c) Quantity A is displacement if motion is uniform
 (d) Quantity A is velocity if motion is uniformly accelerated

- 45) A graph of x versus t is shown in Fig. Choose correct alternatives from below.



- (a) The particle was released from rest at $t = 0$. (b) At B, the acceleration $a > 0$.
 (c) At C, the velocity and the acceleration vanish. (d) The speed at D exceeds that at E.

- 46) For the one-dimensional motion, described by $x = t - \sin t$

- (a) $x(t) < 0$ for all $t > 0$. (b) $v(t) > 0$ for all $t > 0$ (c) $a(t) > 0$ for all $t > 0$. (d) $v(t)$ lies between 0 and 2.

- 47) A man throws ball into the air one after the other. Throwing one when other is at the highest point. How high the balls rise if he throws, twice a second?

- (a) 2.45 m (b) 1.225 m (c) 19.6 m (d) 4.9 m

- 48) A balloon is going upwards with velocity 12 m/sec. It releases a packet when it is at a height 65 m from the ground. How much time the packet will take to reach the ground? ($g = 10 \text{ m/s}^2$)

- (a) 5 sec (b) 6 sec (c) 7 sec (d) 8 sec

- 49) The position of a particle moving in the X- Y plane at any time t is given by; $x = (3t^2 - 6t)$ meters; $y = (t^2 - 2t)$ meters, Select the correct statement.

- (a) acceleration is zero at $t = 0$ (b) velocity is zero at $t = 0$ (c) velocity is zero at $t = 1$ second
 (d) velocity and acceleration of the particle are never zero.

- 50) A stone is thrown with an initial speed of 4.9 m/s from a bridge in vertically upward direction. It falls down in water after 2 seconds. The height of the bridge is

- (a) 4.9 m (b) 9.8 m (c) 19.8 m (d) 24.7 m

- 51) A balloon starts rising from the ground with an acceleration of 1.25 m/s^2 . After 8 seconds, a stone is released from the balloon. The stone will (use $g = 10 \text{ m/s}^2$).

- (a) cover a distance of 40 m (b) have displacement of 50 m (c) reach the ground in 4 second
(d) begin to move downward after being released.

- 52) The displacement of a particle is represented by the following equation $s = 2(t^3 + 7t^2 + 5t + 8)$ where s is in metres and t in seconds. The acceleration of the particle at $t = 1$ s is
(a) 18 m/s^2 (b) 32 m/s^2 (c) zero (d) 14 m/s^2

- 53) An object while moving may not have
(a) variable speed but constant velocity, (b) variable velocity but constant speed
(c) non-zero acceleration but constant speed (d) zero acceleration but constant velocity

- 54) A particle moves along a straight line as $s = u(t - 2) + a(t - 2)^2$
(a) the acceleration of the particle is 'a'. (b) the initial velocity of the particle is 'v'
(c) at $t = 2$ s, the particle is at rest. (d) the acceleration of the particle is '2a'.

- 55) 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) $\frac{2v_1 v_2}{v_1+v_2}$ (d) $\frac{L(v_1+v_2)}{v_1 v_2}$

55 x 1 = 55

- 1) (a) At $t = \frac{1}{b}$, the displacement of the particle is nearly $(\frac{2}{3})(a/b)$.

- 2) (c) 30 ms^{-2}

- 3) (a) parallel to time-axis

- 4) (d)

in all cases irrespective of whether the motion is one of uniform velocity, or of uniform acceleration or of variable acceleration

- 5) (c) speed

- 6) (d) uniform speed

- 7) (d) displacement \leq distance

- 8) (c) A scooterist speeding on a level road

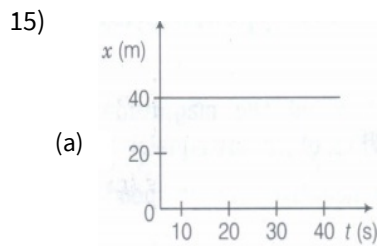
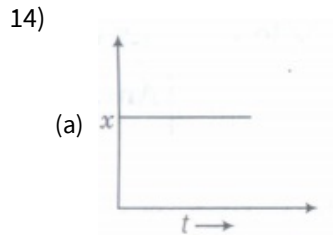
- 9) (b) With respect to the frame of reference attached to the person sitting in the car, the car is at rest

10) (a) motion along z-axis

11) (a) $1 : \sqrt{3}$

12) (a) the sign of displacement

13) (a) direction of displacement



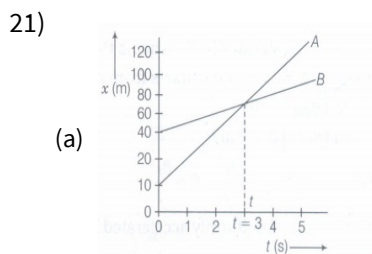
16) (b) At instant time $t = t_2$ brakes must have been applied.

17) (c) $\frac{2v_1 v_2}{v_1 + v_2}$

18) (d) 12 ms^{-2}

19) (a) $x < 0, v < 0, a > 0$

20) (a) $v = -9.8 t \text{ ms}^{-1}$



22) (a) -30 ms^{-1}

23) (b) average acceleration

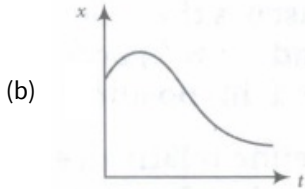
24) (d) All of the above

25) (c) -7.5 ms^{-2}

26) (a) $\sqrt{2ax}$

27) (d) Both (a) and (b)

28)

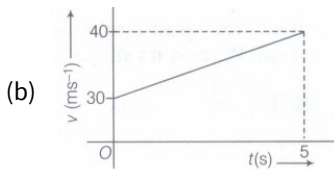


29) (c) $\frac{A}{2} + \frac{B}{3}$

30) (c) $t_1 t_2 / (t_2 + t_1)$

31) (b) The displacement x in time T satisfies $\frac{x}{v_0} = T$

32)



33) (a) straight lines parallel but inclined to time axis

34) (b) $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$

35) (d) remains constant

36) (c) three times that of wind

37) (a) 1 m/s

38) (d) $(t_2 + t_1)/2$

39) (c) simultaneously

40) (d) The displacement of the particle is 20 m

41) (a) If the position and velocity are in opposite directions, the particle is moving towards the origin.

42) (b) Particle further comes to rest at $x = 4$.

- 43) (b) 8 m
-
- 44) (a) Quantity B may represent time
-
- 45) (a) The particle was released from rest at $t = 0$.
-
- 46) (d) $v(t)$ lies between 0 and 2.
-
- 47) (b) 1.225 m
-
- 48) (a) 5 sec
-
- 49) (c) velocity is zero at $t = 1$ second
-
- 50) (b) 9.8 m
-
- 51) (c) reach the ground in 4 second
-
- 52) (b) 32 m/s^2
-
- 53) (a) variable speed but constant velocity,
-
- 54) (d) the acceleration of the particle is '2a'.
-
- 55) (c) $\frac{2v_1 v_2}{v_1 + v_2}$
-