Physicsaholics

DPP – 4 (Kinematics)

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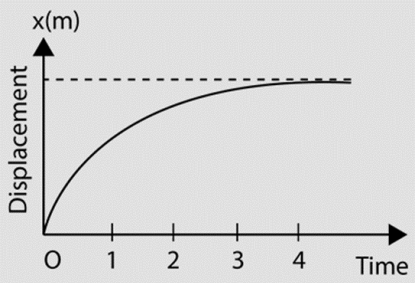
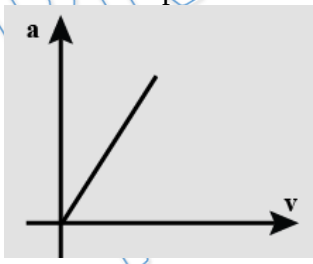
Written Solution on Website:- https://physicsaholics.com/note/notesDetalis/85

Q 1. The displacement of a particle as a function of time is shown in figure. The figure indicates that:



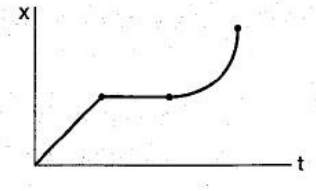
(a) the particle starts with a certain velocity but the motion is retarded and finally the particle stops.
(b) the velocity of the particle is constant throughout.
(c) the acceleration of the particle is constant throughout.
(d) the particle starts with constant velocity, the motion is accelerated and finally the particle moves with another constant velocity.

Q 2. The acceleration-velocity graph of a particle moving in a straight line is shown in figure. Then the slope of the velocity-displacement graph:

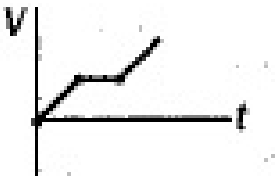


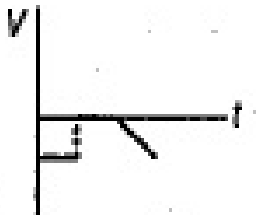
(a) Increases linearly
(b) Decreases linearly
(c) Is constant
(d) Increases parabolically

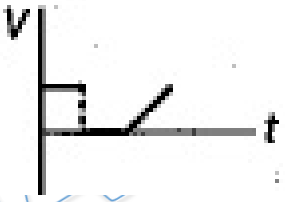
Q 3. A particle moving along the x-axis. Its position x as a function of time t recorded as shown in the figure . Identify which of the following graphs of velocity v as a function of time t is equivalent to the above graph?



(a) 

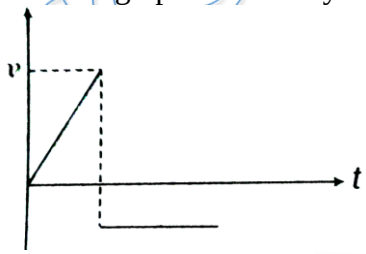
(b) 

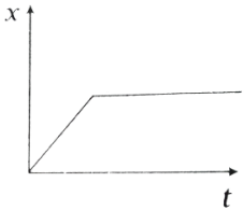
(c) 

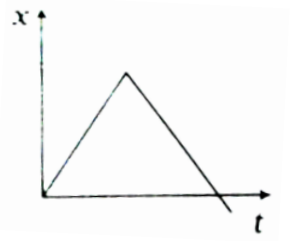
(d) 

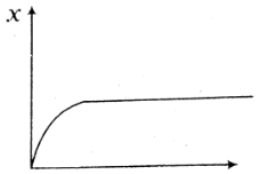
Q 4. The displacement-time graph of a freely falling body is:
(a) straight line passing through the origin
(b) straight line intersecting x and y axes
(c) parabola
(d) hyperbola

Q 5. 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:

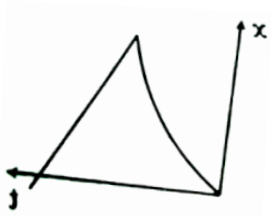


(a) 

(b) 

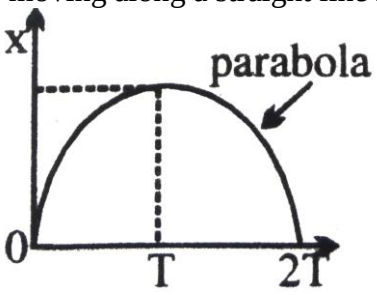


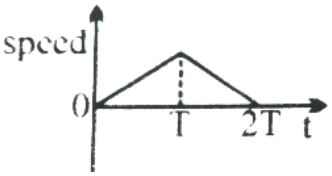
(c)



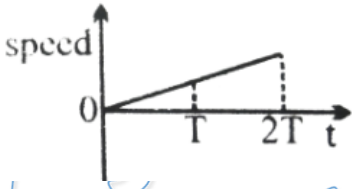
(d)

Q 6. The x-t graph of particle moving along a straight line is shown in figure:

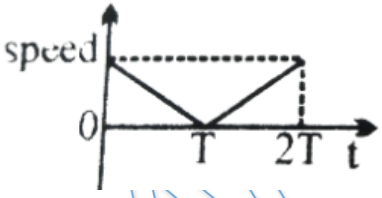




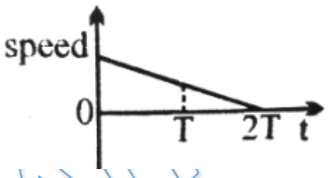
(a)



(b)

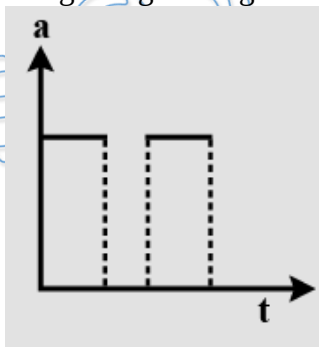


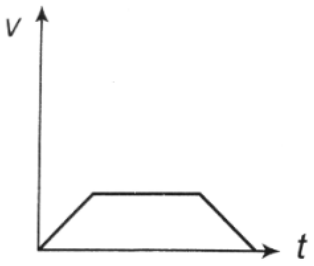
(c)



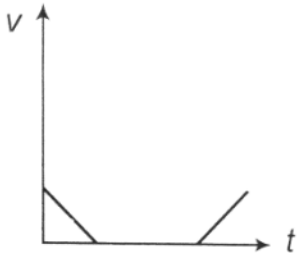
(d)

Q 7. The x-t graph of particle moving along a straight line is shown in figure:

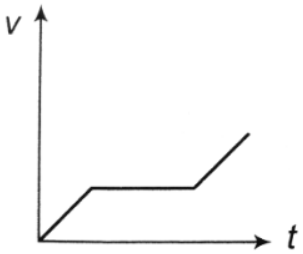




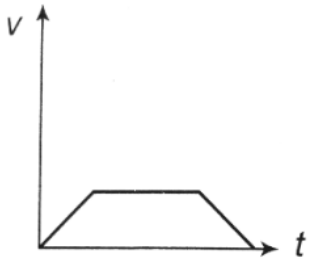
(a)



(b)

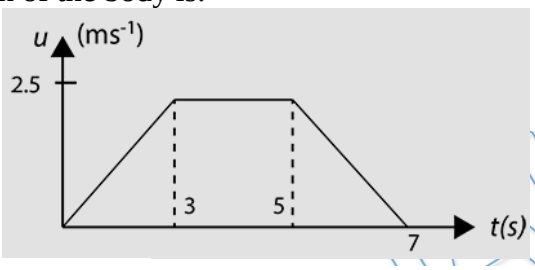


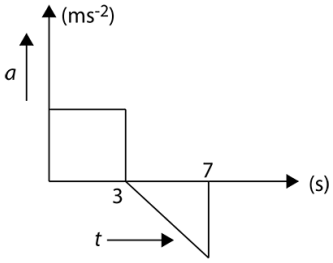
(c)



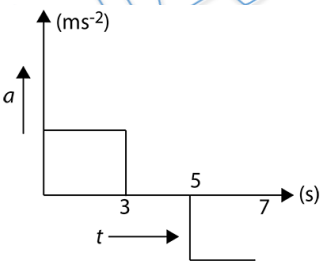
(d)

Q 8. Velocity (u)-time (t) graph of a body is as shown in the figure. acceleration (a)-time (t) graph of the motion of the body is:

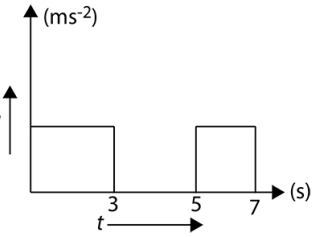




(a)



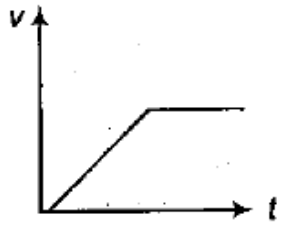
(b)



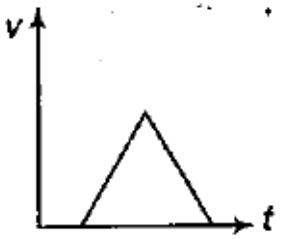
(c)

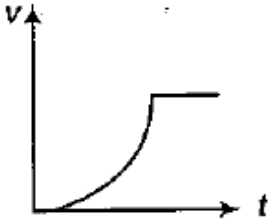
(d) none of these

Q 9. The acceleration-time graph of a body is shown. The most probable velocity-time graph of the body is :

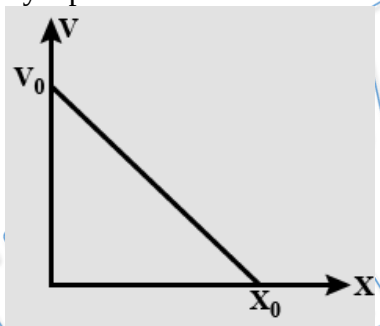
(a) 

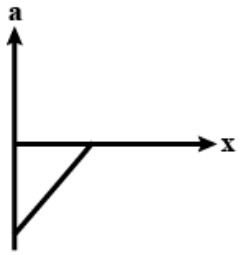
(b) 

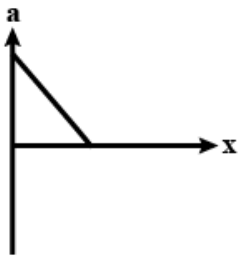
(c) 

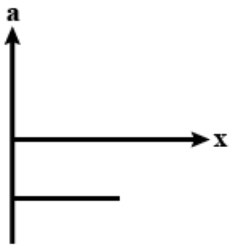
(d) 

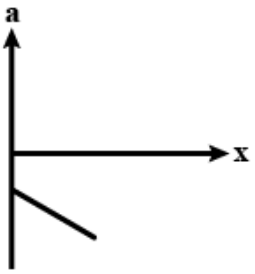
Q 10. The given graph shows the variation of velocity With displacement. Which one of the graph given below correctly represents the variation of acceleration With displacement?



(a) 

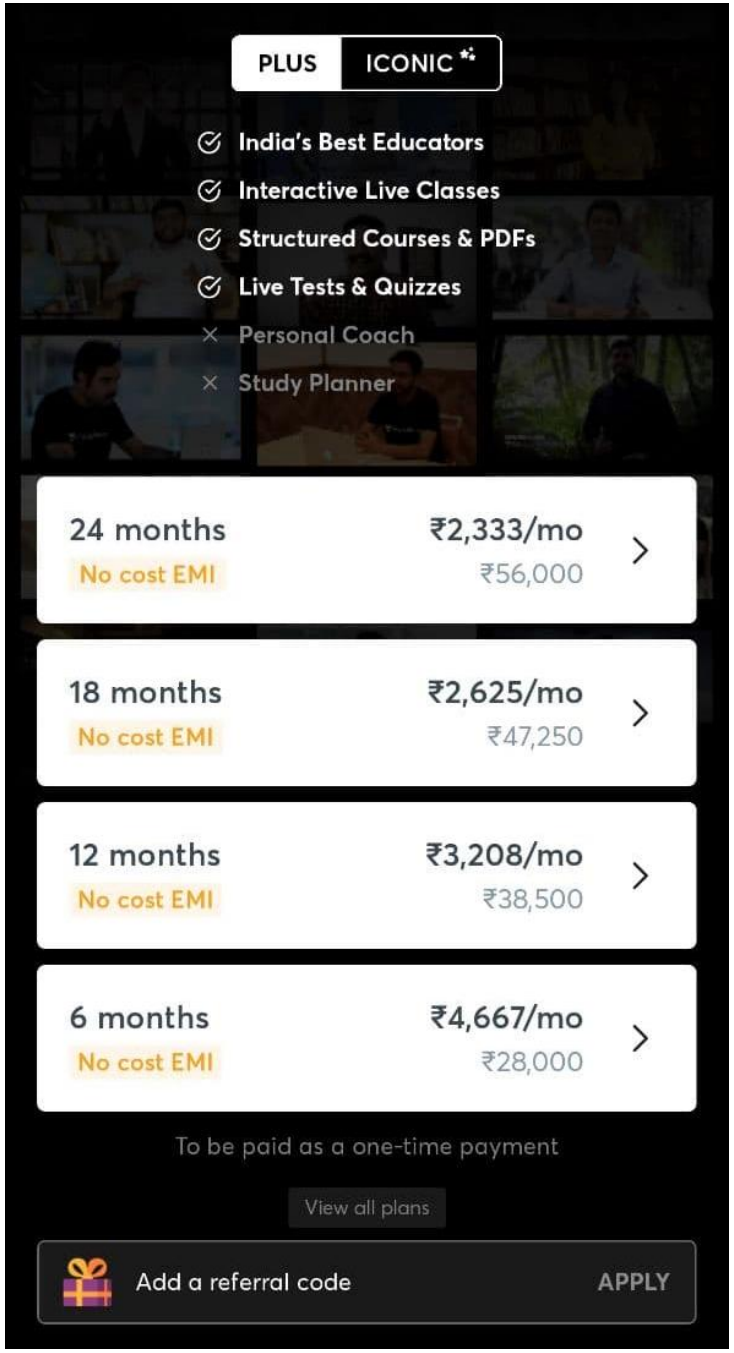
(b) 

(c) 

(d) 

Answer Key

Q.1) a	**Q.2) c**	**Q.3) d**	**Q.4) c**	**Q.5) d**
Q.6) c	**Q.7) c**	**Q.8) b**	**Q.9) d**	**Q.10) a**



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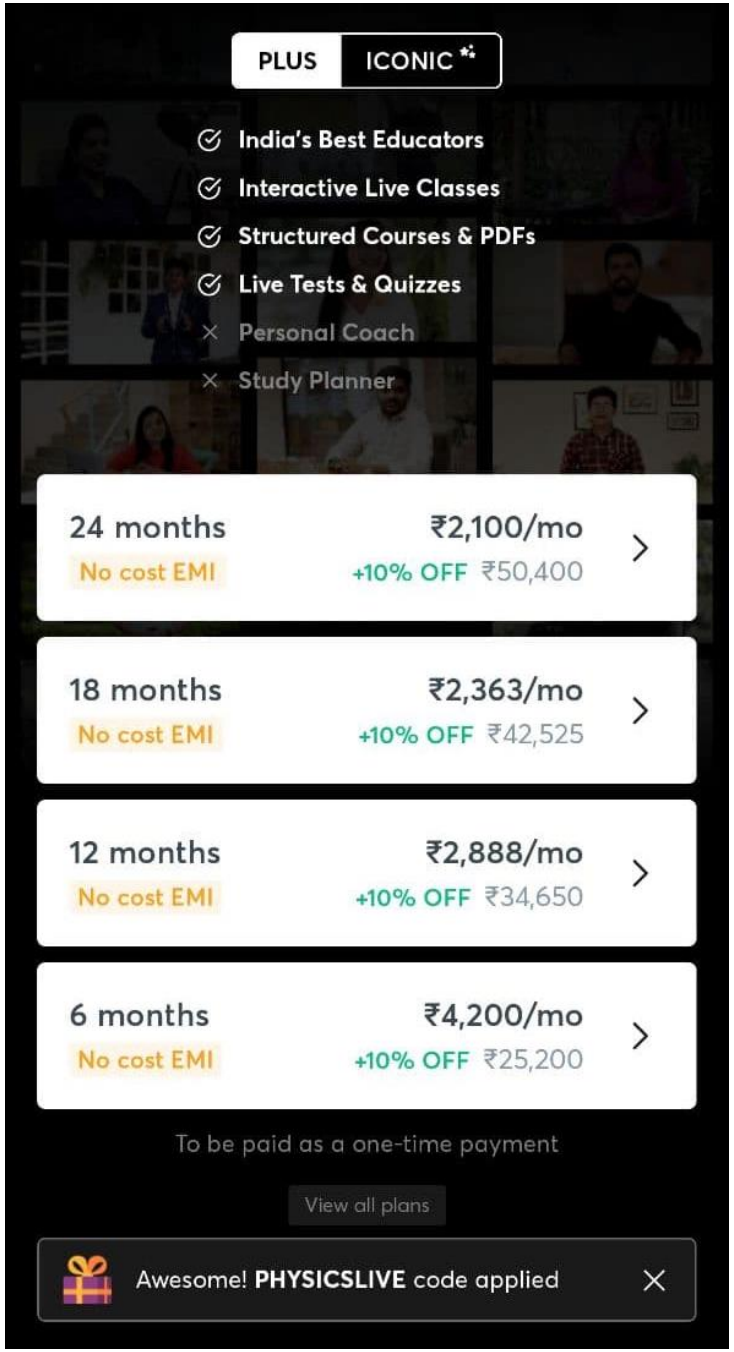
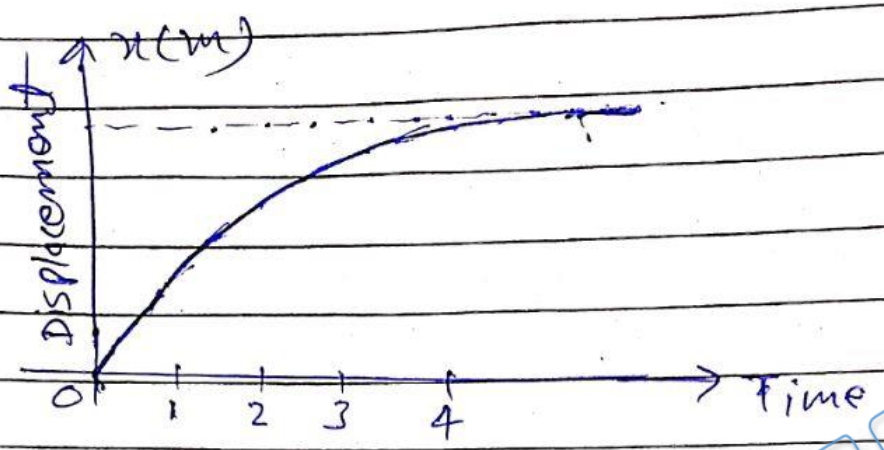


Written Solution

DPP-4 Position, Velocity and Acceleration Graph

By Physicsaholics Team

SOLUTION : 1



initially at origin, slope of x-t curve is not zero

$$\frac{dx}{dt} = v \neq 0$$

∴ initially is starts with some velocity.

But as time increases $\Rightarrow \frac{dx}{dt}$ decreases

$\Rightarrow \frac{dx}{dt} = v \Rightarrow$ decreases

speed decreasing.

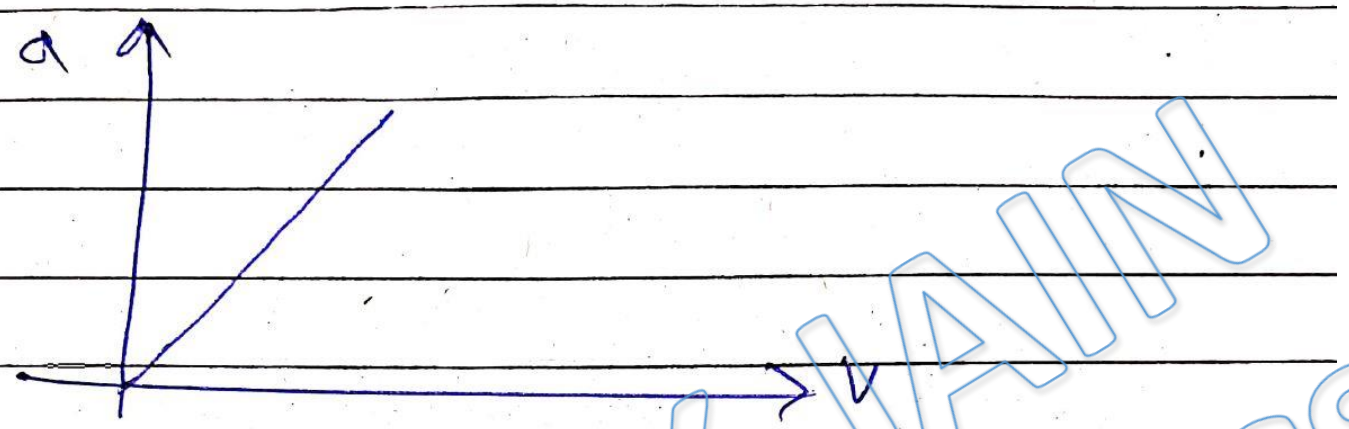
and after some time slope become constant and zero

finally $\frac{dx}{dt} = v = 0$

∴ some retardation is present as velocity is decreasing.

ANS : a

SOLUTION : 2



$a = cv$ [a-v curve = line]

$v\frac{dv}{dx} = cv$

$\int dv = c\int dx$

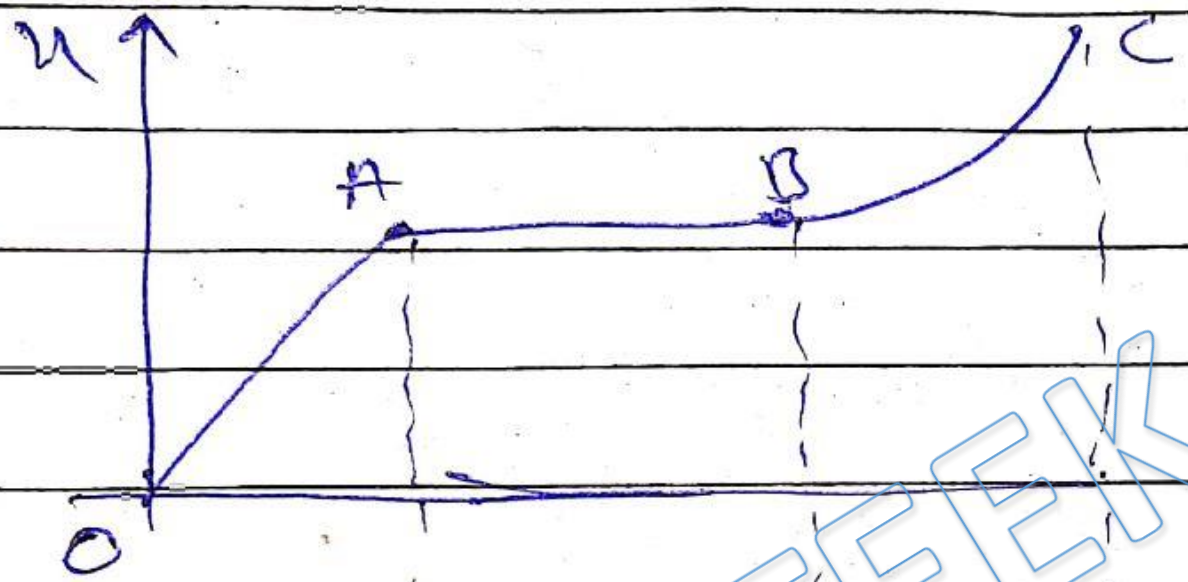
$\boxed{v = cx + c}$

Straight line

Slope - c = constant.

ANS : c

SOLUTION : 3



OA → Straigh line

V = constant

a = 0

AB → u = constant

V = 0

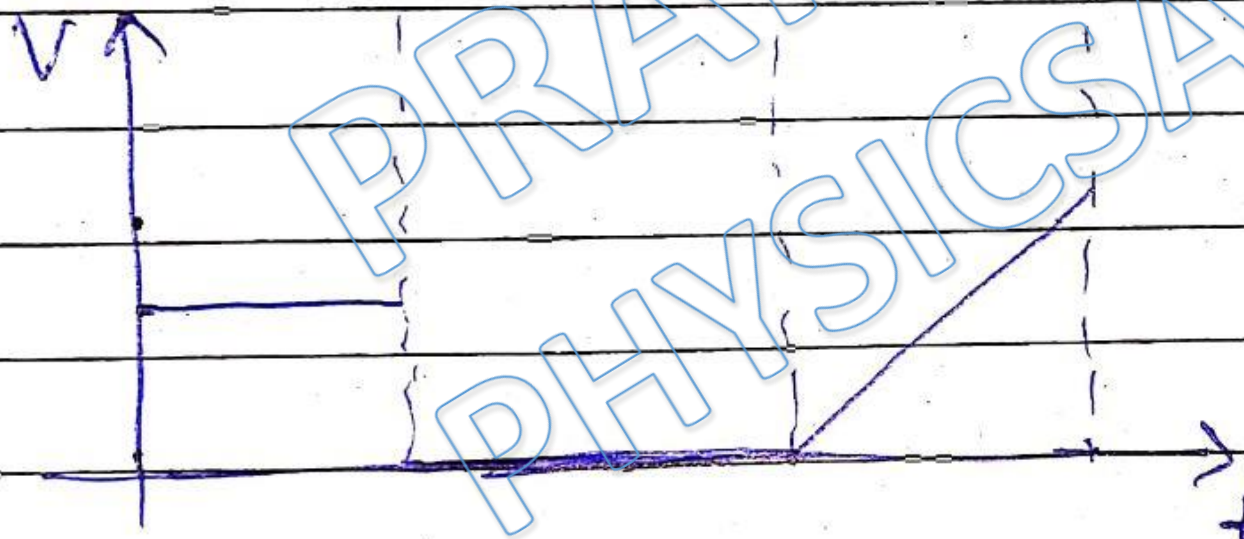
a = 0

BC → Parabola

$V = \frac{du}{dt} = +ve$

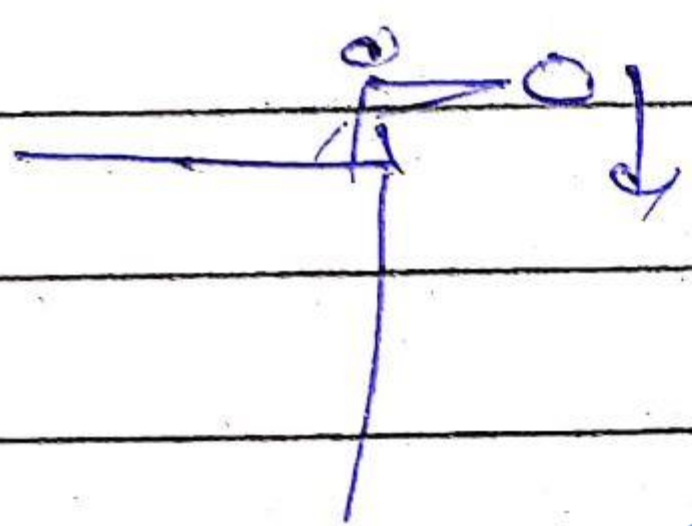
V → Increasing

a = constant.



ANS : d

SOLUTION : 4



$u = 0$

$a = g$

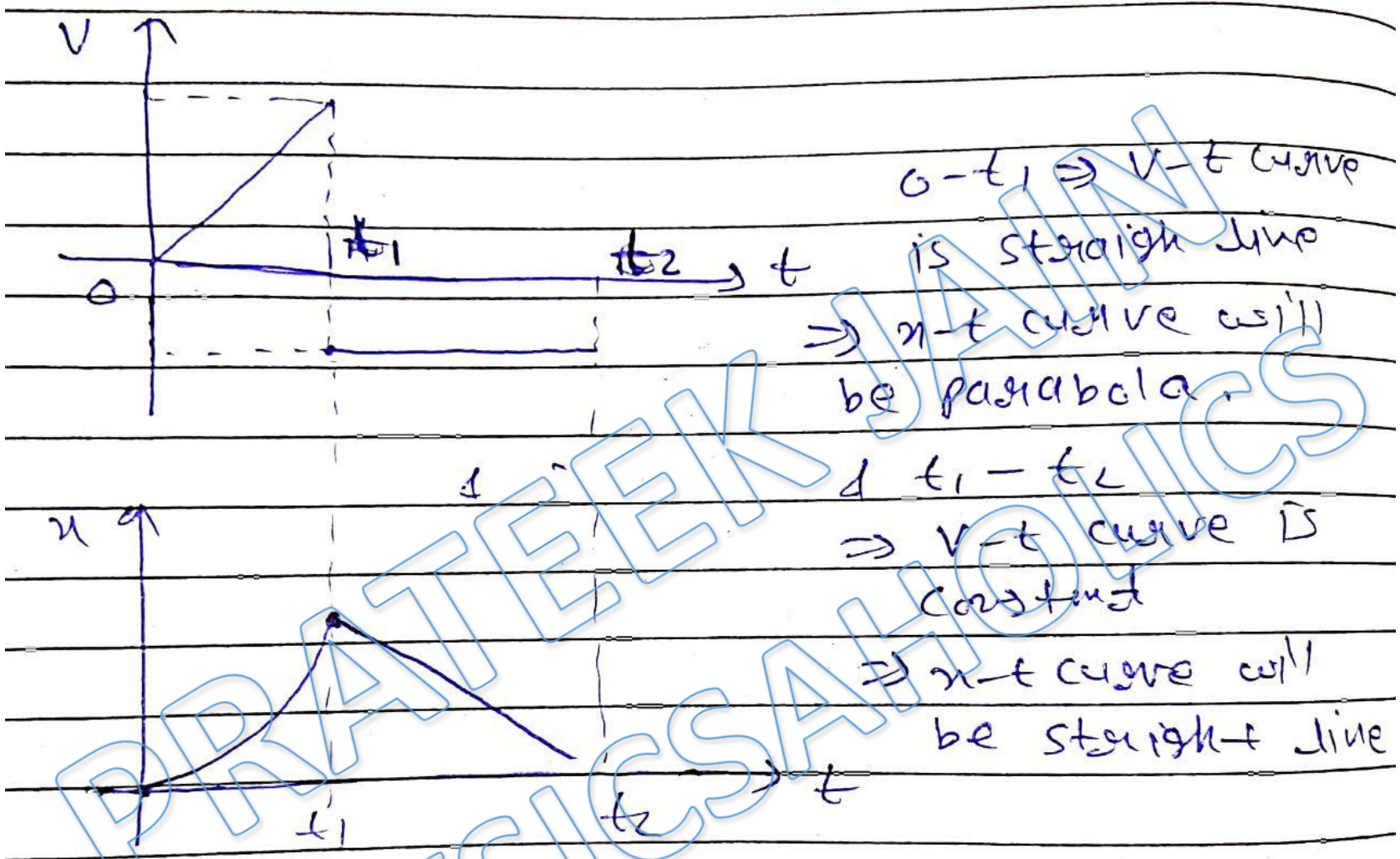
a = constant

→ v-t curve → Straight line

→ x-t curve → Parabola

ANS : c

SOLUTION : 5



$0 - t_1 \Rightarrow$ V-t curve is straight line

$\Rightarrow$ x-t curve will be parabola.

$t_1 - t_2$

$\Rightarrow$ V-t curve is constant

$\Rightarrow$ x-t curve will be straight line

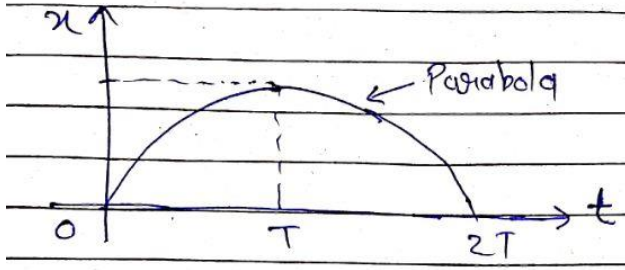
in (t_1, t_2) interval

$v =$ -ve but constant

$\frac{dx}{dt} =$ -ve constant

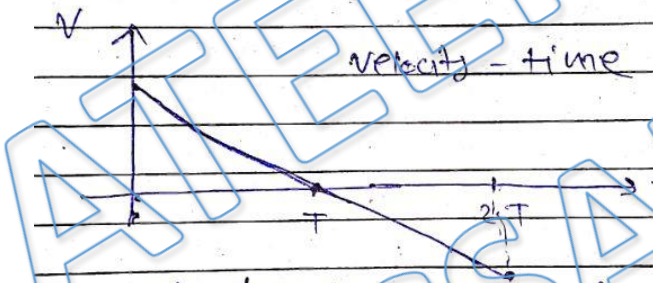
ANS : d

SOLUTION : 6



0 - T ⇒ slope of x - t curve is decreasing ⇒ V = decreasing. positive and

T - 2T ⇒ slope of x - t curve is negative and increasing.

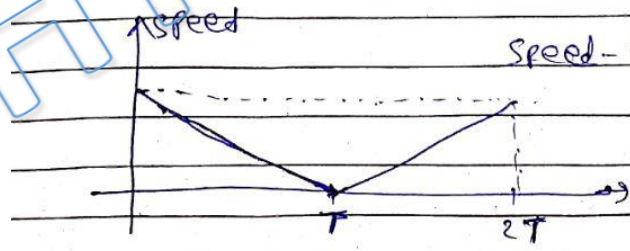


velocity - time graph.

at t = T, slope of x - t curve is = zero

∴ $V_{at\ t=T}$ = zero

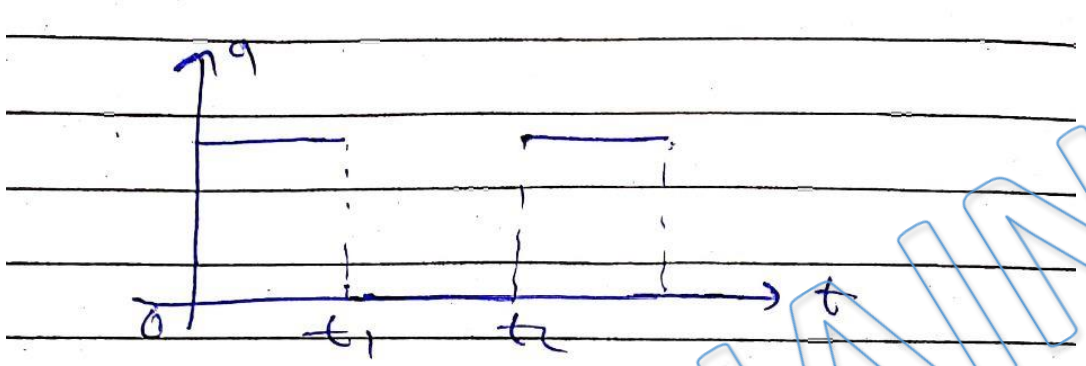
speed = always +ve.



speed - time graph.

ANS : c

SOLUTION : 7



$0 - t_1 \Rightarrow$ a = constant (+ve)

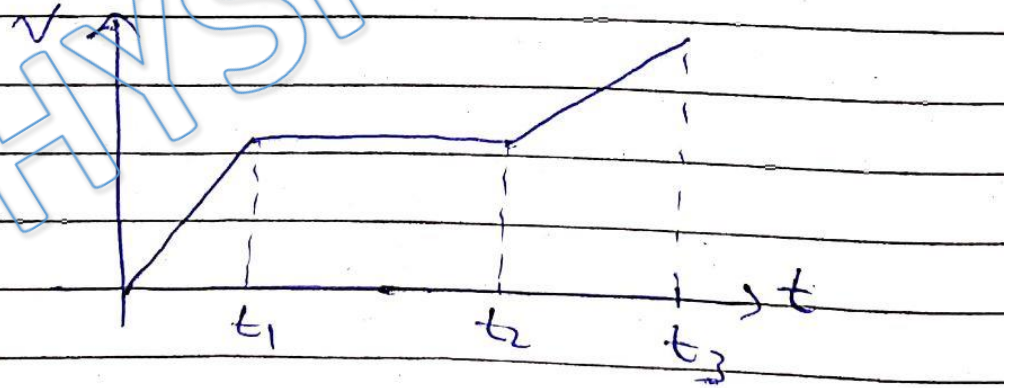
V - increases

$t_1 - t_2 \Rightarrow$ a = zero

V = constant

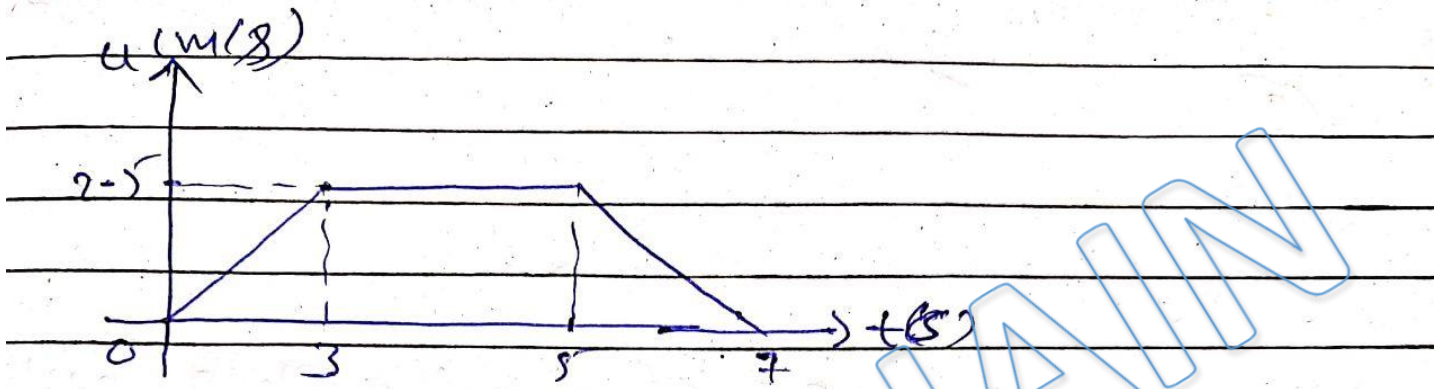
$t_2 - t_3 \Rightarrow$ a = constant (+ve)

V = increases



ANS : c

SOLUTION : 8

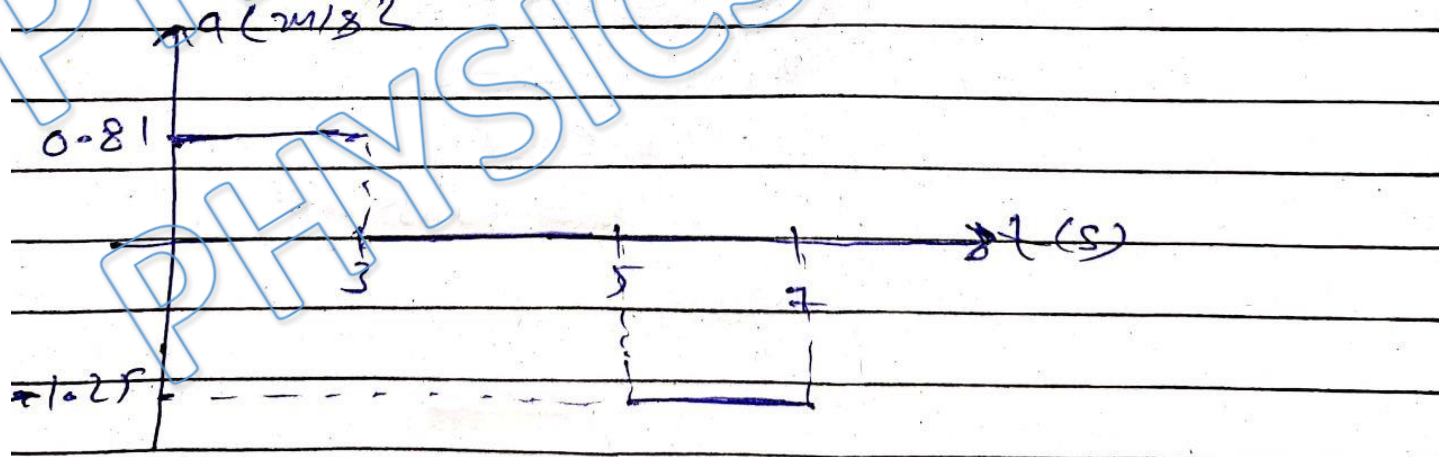


$0-3$; $a = \frac{2.5}{3} = 0.81\ m/s^2$

$3-5$; $u = 2.5\ m/s$ = constant

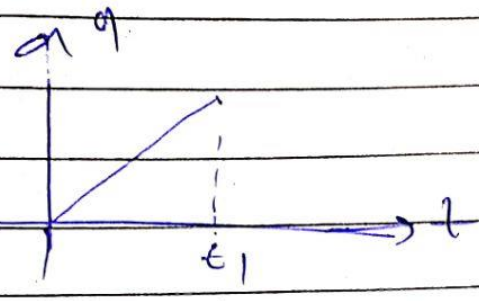
$\therefore a$ = zero

$5-7$; $a = \frac{0-2.5}{7-5} = \frac{-2.5}{2} = -1.25\ m/s^2$



ANS : b

SOLUTION : 9



$a = kt$ k - Slope (constant)

$\frac{dv}{dt} = kt$

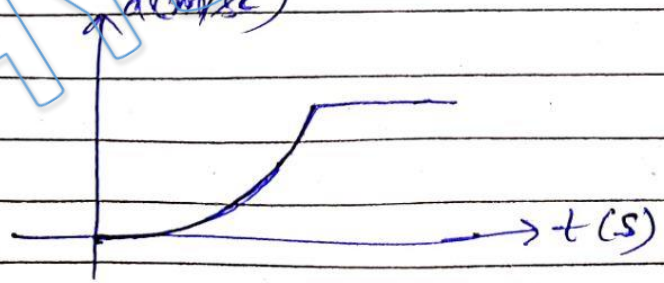
$v = \frac{1}{2}kt^2 + c$

$\therefore$ v-t graph is upward parabola for $t = 0$ to $t = t_1$

and after $t = t_1$

$a = 0$

$\therefore v$ = constant



ANS : d

SOLUTION : 10

$V = -mx + u$

where; $m = \tan\theta = -\frac{V_0}{x_0}$

& $u = V_0$

$V = -mx + V_0$

differentiate w.r.t. t

$\frac{dV}{dt} = -m\frac{dx}{dt} + 0$

$\frac{dV}{dt} = -m(v)$

$= -m(-mx + V_0)$

$= m^2x \ominus mV_0$

$\frac{dV}{dt} = m^2x - mV_0$

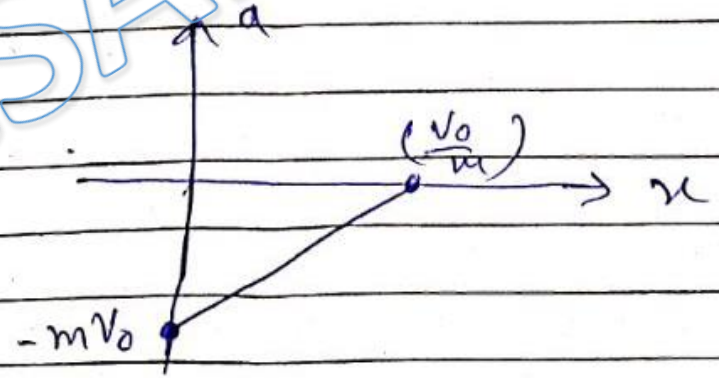
m & m^2 = Constants

$a = m^2x - mV_0$

at, $x = 0$

$a = -mV_0$

& for $a = 0$; $m^2x - mV_0 = 0 \Rightarrow x = \frac{V_0}{m}$



ANS : a

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