

Dear student following is a Moderate level [0 0 ● 0 0] test paper. Score of 15 Marks in 10 Minutes would be a satisfactory performance. Questions 1-8 (+3, -1). (All Questions have Single Options correct)

Q.1 If displacement of a particle is zero, distance covered by it
 (A) may be zero or may not be zero
 (B) must be zero
 (C) must not be zero
 (D) all are true

Q.2 A person travels along a straight road for the first half time with a velocity v_1 and the second half time with a velocity v_2 . Then the mean velocity v is given by

(A) $v = \frac{v_1 + v_2}{2}$ (B) $\frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$

(C) $v = \sqrt{v_1 v_2}$ (D) $v = \sqrt{\left(\frac{v_2}{v_1}\right)}$

Q.3 A car having an initial speed of 16 meters per second is uniformly brought to rest in 4.0 second. How far does the car travel during this 4.0 second interval.
 (A) 32 m (B) 82 m (C) 96 m (D) 40 m

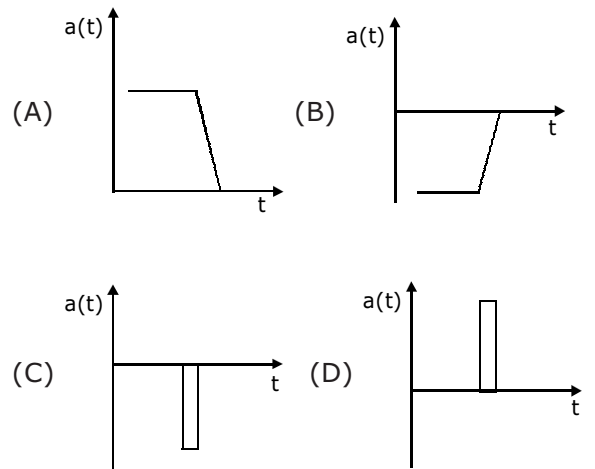
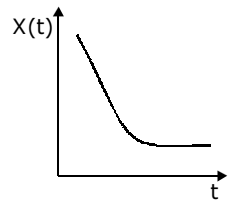
Q.4 An object starting from rest, accelerates at a rate of 3.0 meters per second for 6.0 seconds. The velocity of the object at the end of this time is
 (A) 0.50 m/s (B) 2.0 m/s
 (C) 3.0 m/s (D) 18 m/s

Q.5 A car moving at a speed of 8.0 meters per second enters a highway and accelerates at 3.0 meters per second². How fast will the car be moving after it has accelerated for 56 meters.
 (A) 24 m/s (B) 20 m/s
 (C) 18 m/s (D) 4.0 m/s

Q.6 A police man in a jeep is chasing a terrorist on a straight road with a constant speed v . The terrorist is riding a motor cycle and when the jeep is at a distance 50 m away, the terrorist starts with a constant acceleration 1 m/s². The terrorist will be caught if.
 (A) $v \geq 10 \text{ ms}^{-1}$ (B) $v \geq \sqrt{10} \text{ ms}^{-1}$
 (C) $v \geq 1 \text{ ms}^{-1}$ (D) $v \geq \sqrt{3} \text{ ms}^{-1}$

Q.7 A point moves in x-y plane according to the law $x = 3 \cos 4t$ and $y = 3(1 - \sin 4t)$. The distance travelled by the particle in 2 sec is (where x and y are in meters)
 (A) 48 m (B) 24 m
 (C) $48\sqrt{2}$ m (D) $24\sqrt{2}$ m

Q.8 Given the position (x) Vs. time (t) plot select the corresponding acceleration (a) vs. time plot for an object moving in one dimension.



PHYSICS IIT JEE (09 / 06 / 2007) (ONE-D MOTION) ANSWER KEY

Name : Roll No. :

	A	B	C	D		A	B	C	D		A	B	C	D
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					

ANSWER KEY

Que.	1	2	3	4	5	6	7	8
Ans.	A	A	A	D	B	A	B	D

SOLUTIONS

Sol.1 (A)

When displacement is zero, particle may be at rest, therefore, distance travelled = 0.
Again, when displacement is zero, final position coincides with the initial position, distance travelled is not zero.

Sol.2 (A)

Average velocity

$$= \frac{\text{net displacement}}{\text{time taken}} = \frac{v_1 \times t + v_2 \times t}{(t + t)}$$

$$= \frac{v_1 + v_2}{2}$$

Sol.3 (A)

Initial speed $u = 16 \text{ m/s}$

Final speed $v = 0$

Time 4 second

$$v = u + at \quad \dots(i)$$

put the value

$$0 = 16 + a(4)$$

$$a = -\frac{16}{4} = -4 \text{ m/s}^2$$

$$v^2 = u^2 + 2as \quad \dots(ii)$$

put the value

$$0 = (16)^2 + 2(-4)s$$

$$s = \frac{(16)^2}{8} = 32 \text{ m.}$$

Sol.4 (D)

Initial velocity $u = 0$

$$a = 3 \text{ m/s}^2, t = 6 \text{ sec.}$$

Final velocity

$$v = u + at$$

$$v = 0 + 3 \times 6 = 18 \text{ m/s.}$$

Sol.5 (B)

$$u = 8 \text{ m/s}$$

$$a = 3 \text{ m/s}^2$$

$$s = 56 \text{ meters}$$

$$v^2 = u^2 + 2as$$

$$v^2 = (8)^2 + 2 \times 3 \times 56$$

$$= 64 + 6 \times 56 = 64 + 336$$

$$v^2 = 400$$

$$v = 20 \text{ m/s.}$$

Sol.6 (A)

Let police man will catch the motorcycle after t sec. So it will cover distance vt .

Similarly distance travelled by the terrorist

$$\text{will be } \frac{1}{2}at^2 \quad [a = 1 \text{ m/s}^2]$$

For given condition

$$vt = 50 + \frac{1}{2}at^2 = 50 + \frac{t^2}{2}$$

$$v = \frac{50}{t} + \frac{t}{2}$$

Find the minimum value of v

$$\frac{dv}{dt} = 0,$$

so we get $t = 10 \text{ sec}$, then $v = 10 \text{ m/s}$

$$v \geq 10 \text{ m/s.}$$

Sol.7 (B)

$$x = 3 \cos 4t \quad \dots(i)$$

$$y = 3(1 - \sin 4t) \quad \dots(ii)$$

$v_x =$ Velocity in x -direction

$$v_x = \frac{dx}{dt} = 3(-4) \sin 4t$$

$$= -12 \sin 4t \quad \dots(iii)$$

$v_y =$ Velocity in the y -direction

$$v_y = \frac{dy}{dt} = 3(-4) \cos 4t$$

$$= -12 \cos 4t \quad \dots(iv)$$

$$v = \sqrt{v_x^2 + v_y^2}$$

$$v = \sqrt{(-12 \sin 4t)^2 + (-12 \cos 4t)^2}$$

$$= 12 \sqrt{\sin^2 4t + \cos^2 4t}$$

$$= 12 \times 1 = 12 \text{ m/s}$$

Distance travels in 2 seconds

$$= 2 \times v = 2 \times 12 = 24 \text{ m.}$$

Sol.8 (D)

The object initially had negative slope (velocity) and then came to rest. So a positive acceleration must have acted for a short time.

The correct plot is D.