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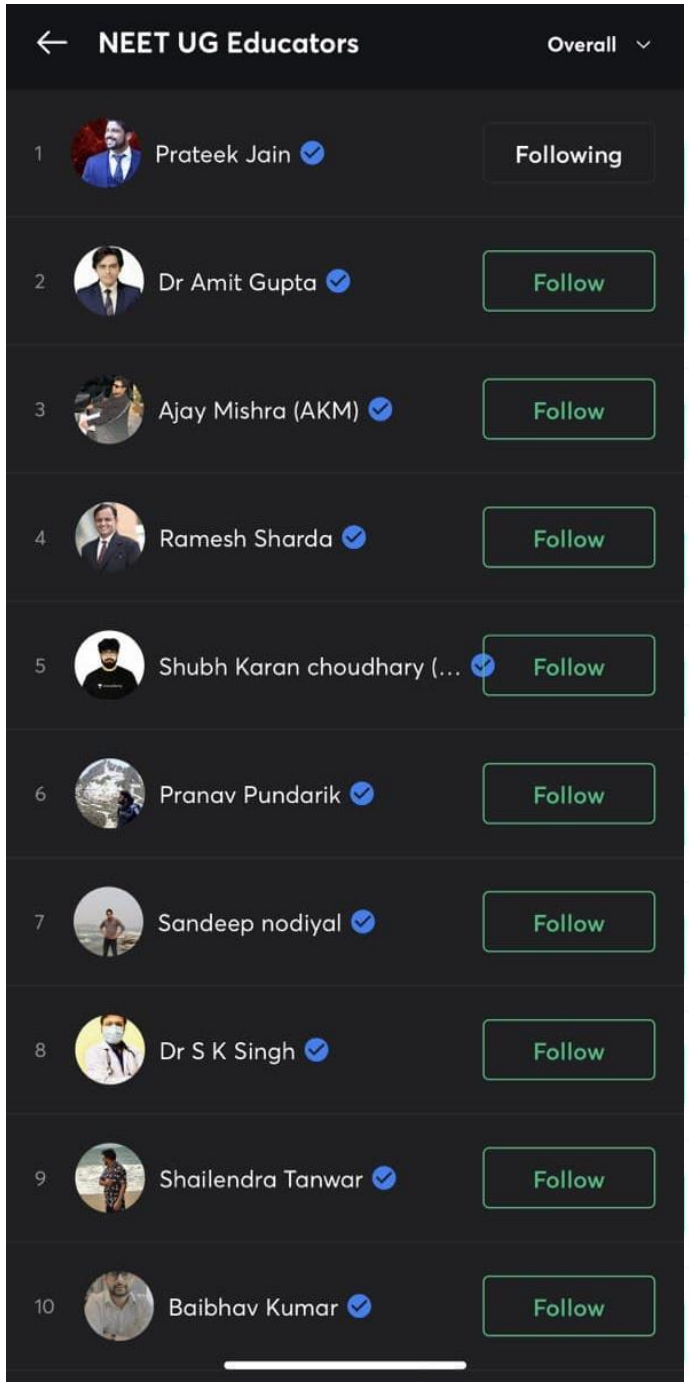

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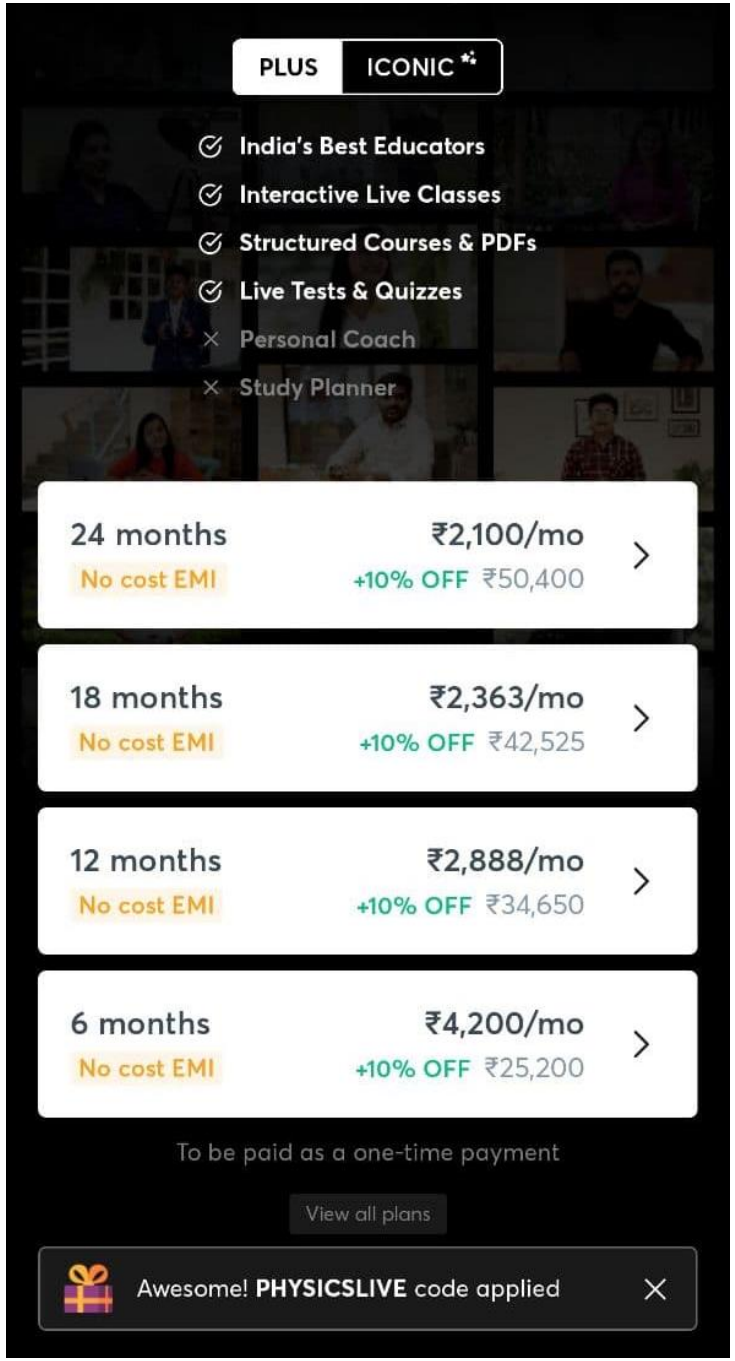

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Solution
NEET & AIIMS PYQs

Kinematics (1/3) 1D: (Distance, Displacement, Equation of kinematics)

By Physicsaholics Team

PYQs on Following Subtopic:

Distance & Displacement

A car travels 6 km towards north at an angle of 45° to the east and then travels distance of 4 km towards north at an angle 135° to east. How far is the point from the starting point? What angle does the straight line joining its initial and final position makes with the east? *[2008]* **AIIMS**

(a) $\sqrt{50}$ km and $\tan^{-1}(5)$

(b) 10 km and $\tan^{-1}(\sqrt{5})$

(c) $\sqrt{52}$ km and $\tan^{-1}(5)$

(d) $\sqrt{52}$ km and $\tan^{-1}(\sqrt{5})$

Ans. c

PYQs on Following Subtopic:

Displacement, Velocity
& Acceleration Relation

A bus travelling the first one-third distance at a speed of 10 km/h, the next one-third at 20 km/h and the last one-third at 60 km/h. The average speed of the bus is

[CBSE AIPMT 1991]

(a) 9 km/h (b) 16 km/h (c) 18 km/h (d) 48 km/h

Ans. c

A car moves a distance of 200 m. It covers the first-half of the distance at speed 40 km/h and the second-half of distance at speed v km/h . The average speed is 48 km/h. Find the value of v.

[CBSE AIPMT 1991]

(a) 56 km/h (b) 60 km/h (c) 50 km/h (d) 48 km/h

Ans. b

If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is [NEET 2016]

(a) $3A + 7B$

(b) $\frac{3}{2}A + \frac{7}{3}B$

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

(d) $\frac{3}{2}A + 4B$

Ans. b

Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $X_P(t) = at + bt^2$ and $X_Q(t) = ft - t^2$. At what time do the cars have the same velocity? *[NEET 2016]*

(a) $\frac{a-f}{1+b}$ (b) $\frac{a+f}{2(b-1)}$ (c) $\frac{a+f}{2(1+b)}$ (d) $\frac{f-a}{2(1+b)}$

Ans. d

A car moves from X to Y with a uniform speed v_u and returns to X with a uniform speed v_d. The average speed for this round trip is *[CBSE AIPMT 2007]*

(a) $\frac{2 v_d v_u}{v_d + v_u}$ (b) $\sqrt{v_u v_d}$ (c) $\frac{v_d v_u}{v_d + v_u}$ (d) $\frac{v_u + v_d}{2}$

Ans. a

The position x of a particle w.r.t. time t along x-axis is given by $x = 9t^2 - t^3$, where x is in metre and t in sec. What will be the position of this particle when it achieves maximum speed along the + x direction?

[CBSE AIPMT 2007]

(a) 32 m (b) 54 m (c) 81 m (d) 24 m

Ans. b

A particle moves along a straight line OX. At a time t (in second), the distance x (in metre) of the particle from O is given by

$$x = 40 + 12t - t^3$$

How long would the particle travel before coming to rest? *[CBSE AIPMT 2006]*

(a) 24 m (b) 40 m (c) 56 m (d) 16 m

Ans. ~~c~~ d

The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$, where a, b, α and β are positive constants. The velocity of the particle will *[CBSE AIPMT 2005]*

(a) decrease with time
(b) be independent of α and β
(c) drop to zero when $\alpha = \beta$
(d) increase with time

Ans. d

A particle moves along a straight line such that its displacement at any time t is given by $s = (t^3 - 6t^2 + 3t + 4)$ m

The velocity when the acceleration is zero, is

[CBSE AIPMT 1994]

(a) $3\,ms^{-1}$

(b) $-12\,ms^{-1}$

(c) $42\,ms^{-1}$

(d) $-9\,ms^{-1}$

Ans. d

A car covers the first-half of the distance between two places at 40 km/h and other half at 60 km/h. The average speed of the car is *[CBSE AIPMT 1990]*

(a) 40 km/h (b) 48 km/h (c) 50 km/h (d) 60 km/h

Ans. b

A particle is moving such that its position co-ordinates (x, y) are (2m, 3m) at time $t = 0$, (6m, 7m) at time $t = 2$ s and (13m, 14m) at time $t = 5$ s.

Average velocity vector (v_{av}) from $t = 0$ to $t = 5$ s is

[CBSE AIPMT 2014]

(a) $\frac{1}{5}(13\hat{i} + 14\hat{j})$

(b) $\frac{7}{3}(\hat{i} + \hat{j})$

(c) $2(\hat{i} + \hat{j})$

(d) $\frac{11}{5}(\hat{i} + \hat{j})$

Ans. d

The position vector of a particle is $\mathbf{r} = (a\cos\omega t)\,\hat{\mathbf{i}} + (a\sin\omega t)\,\hat{\mathbf{j}}$. The velocity of the particle is [CBSE AIPMT 1995]

(a) directed towards the origin
(b) directed away from the origin
(c) parallel to the position vector
(d) perpendicular to the position vector

Ans. d

A bus is moving on a straight road towards North with a uniform speed of 50 km/h.

If the speed remains unchanged after turning through 90°, the increase in the velocity of bus in the turning process is

[CBSE AIPMT 1989]

(a) 70.7 km/h along South-West direction
(b) zero
(c) 50 km/h along West
(d) 70.7 km/h along North-West direction

Ans. a

wrong

Assertion : For a given time interval, average velocity is single valued while average speed can have many values.

Reason : Velocity is a vector quantity and speed is a scalar quantity.

AIIMS *(2018)*

Ans. ~~b~~

A is wrong

R is correct

The coordinates of a moving particle at any time t are given by $x = a\,t^2$ and $y = b\,t^2$. The speed of the particle is

AIIMS ***[2012]***

(a) $2\,t\,(a+b)$

(b) $2t\sqrt{(a^2+b^2)}$

(c) $2t\sqrt{(a^2-b^2)}$

(d) $\sqrt{(a^2+b^2)}$

Ans. b

If man were standing unsymmetrically between parallel cliffs, claps his hands and starts hearing a series of echoes at intervals of 1 s. If speed of sound in air is 340 m s^{-1}, the distance between two cliffs would be

(a) 340 m (b) 510 m

(c) 170 m (d) 680 m

AIIMS *(2011)*

Ans. b

The relation between time t and distance x is $t = ax^2 + bx$ where a and b are constants. The acceleration is **[2005]**

(a) $2bv^3$ (b) $-2abv^2$ (c) $2av^2$ (d) $-2av^3$

AIIMS

Ans. d

A particle moving along x-axis has acceleration f, at time t, given by $f = f_0\left(1 - \frac{t}{T}\right)$, where f_0 and T are constants. The particle at $t = 0$ has zero velocity. In the time interval between $t = 0$ and the instant when $f = 0$, the particle's velocity (v_x) is [CBSE AIPMT 2007]

(a) $f_0 T$ (b) $\frac{1}{2} f_0 T^2$ (c) $f_0 T^2$ (d) $\frac{1}{2} f_0 T$

Ans. d

A particle moves along a straight line such that its displacement at any time t is given by $s = 3t^3 + 7t^2 + 14t + 5$. The acceleration of the particle at $t = 1$ s is *[CBSE AIPMT 2000]*

(a) 18 m/s^2 (b) 32 m/s^2 (c) 29 m/s^2 (d) 24 m/s^2

Ans. b

The position x of a particle varies with time t, as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equals to

[CBSE AIPMT 1997]

(a) zero

(b) $\frac{a}{3b}$

(c) $\frac{2a}{3b}$

(d) $\frac{a}{b}$

Ans. b

The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in metres and t in seconds. The acceleration of the particle at $t = 2\,s$ is *[NEET 2017]*

(a) 0 (b) 5 m/s^2 (c) –4 m/s^2 (d) –8 m/s^2

Ans. c

The position(x) of a particle at any time(t) is given by

AIIMS ***[2009]***

$$x(t) = 4t^3 - 3t^2 + 2$$

The acceleration and velocity of the particle at any time t = 2 sec are respectively

(a) $16\ ms^{-2}$ and $22\ ms^{-1}$

(b) $42\ ms^{-2}$ and $36\ ms^{-1}$

(c) $48\ ms^{-2}$ and $36\ ms^{-1}$

(d) $12\ ms^{-2}$ and $25\ ms^{-1}$

Ans. b

Assertion : A body can have acceleration even if its velocity is zero at a given instant of time.

Reason : A body is numerically at rest when it reverses its direction. **AIIMS** ***[1998]***

Ans. a (Vague)

Assertion : Retardation is directly opposite to the velocity.

Reason : Retardation is equal to the time rate of decrease of speed.

AIIMS ***[2002]***

Vague language

Ans. a

PYQs on Following Subtopic:

Equation of Kinematics
for constant acceleration

An automobile travelling with a speed of 60 km/h, can brake to stop within a distance of 20m. If the car is going twice as fast i.e., 120 km/h, the stopping distance will be **[2004]**

AIIMS

(a) 60m (b) 40m (c) 20m (d) 80m

Ans. d

A car, moving with a speed of 50 km/hr, can be stopped by brakes after at least 6 m. If the same car is moving at a speed of 100 km/hr, the minimum stopping distance is **[2003]**

(a) 12 m (b) 18 m (c) 24 m (d) 6 m

AIIMS

a

Ans. c

A car moving with a speed of 40 km/h can be stopped after 2 m by applying brakes. If the same car is moving with a speed of 80 km/h, what is the minimum stopping distance? *[CBSE AIPMT 1998]*

(a) 8 m (b) 2 m (c) 4 m (d) 6 m

Ans. a

If a car at rest, accelerates uniformly to a speed of 144 km/h in 20s, it covers a distance of *[CBSE AIPMT 1997]*

(a) 2880 m
(b) 1440 m
(c) 400 m
(d) 20 m

Ans. c

If a car at rest accelerated uniformly to a speed of 144 km/hour in 20 second it covers a distance :

(a) 400 m (b) 1440 m ***[1997]***

(c) 2880 m (d) 25 m **AIIMS**

a

Ans. a

A body starts from rest, what is the ratio of the distance travelled by the body during the 4th and 3rd s? *[CBSE AIPMT 1993]*

(a) $\frac{7}{5}$

(b) $\frac{5}{7}$

(c) $\frac{7}{3}$

(d) $\frac{3}{7}$

Ans. a

A car is moving along a straight road with a uniform acceleration. It passes through two points P and Q separated by a distance with velocity 30 km/h and 40 km/h respectively. The velocity of the car midway between P and Q is *[CBSE AIPMT 1988]*

(a) 33.3 km/h

(b) $20\sqrt{2}$ km/h

(c) $25\sqrt{2}$ km/h

(d) 0.35 km/h

Ans. c

A particle has initial velocity $(3\hat{i} + 4\hat{j})$ and has acceleration $(0.4\,\hat{i} + 0.3\,\hat{j})$. Its speed after 10 s is *[CBSE AIPMT 2010]*

(a) 7 unit
(b) $7\sqrt{2}$ unit
(c) 8.5 unit
(d) 10 unit

Ans. b

A body starts from rest with an acceleration a_1. After two seconds another body B starts from rest with an acceleration a_2. If they travel equal distances in fifth second after the starts of A, the ratio $a_1 : a_2$ will be equal to : ***[2001]***

AIIMS

(a) 9 : 5 (b) 5 : 7

(c) 5 : 9 (d) 7 : 9

Ans. c

A particle starts its motion from rest under the action of a constant force. If the distance covered in first 10 s is s_1 and that covered in the first 20 s is s_2, then *[CBSE AIPMT 2009]*

(a) $s_2 = 2\, s_1$

(b) $s_2 = 3\, s_1$

(c) $s_2 = 4\, s_1$

(d) $s_2 = s_1$

Ans. c

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