RADIANT 2026

Physics

Motion In One Dimension

Lecture - 07

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Topics *to be covered*

1. Equation of Motion
2. Numerical Practice

Recap *of previous lecture*

1. Acceleration-time graph

Question

A vector quantity possesses:

(A) Direction

(B) Magnitude

Velocity = 25 cm [toward N]

(C) Both (A) and (B)

(D) None of these

Question

A vector quantity possesses:

(A) Direction

(B) Magnitude

(C) Both (A) and (B)

(D) None of these

Ans. **(C)** Both (A) and (B)

Question

A vector quantity is

A Work

B Pressure

C Distance

D Velocity

Question

A vector quantity is

(A) Work

(B) Pressure

(C) Distance

(D) Velocity

Ans. **(D)** Velocity

Question

The speed of a car is 72 km h^{-1} Express it in ms^{-1}.

$$72\ \frac{km}{hr} \longrightarrow 72 \times \frac{5}{18}\ \frac{m}{s}$$

$$\longrightarrow 20\ m/s$$

Question

The speed of a car is 72 km h^{-1} Express it in ms^{-1}.

Solution.

As,

$$72 \text{ km h}^{-1} \frac{72\text{km}}{1\text{h}} = \frac{72\times1000\text{m}}{(60\times60)\text{s}}$$

$$\Rightarrow 72 \text{ km h}^{-1} = \frac{72\times10\text{m}}{(6\times6)\text{s}}$$

$$\Rightarrow 72 \text{ km h}^{-1} = \frac{20\times\text{m}}{\text{s}}$$

Hence, 72 km h^{-1} is equal to 20 ms^{-1}.

Question

Express 15 ms^{-1} in kmh^{-1}.

$15\frac{m}{s} \rightarrow 15 \times \frac{18}{5} = 54 km/h$

A → 45 km/h

B → 17 km/h

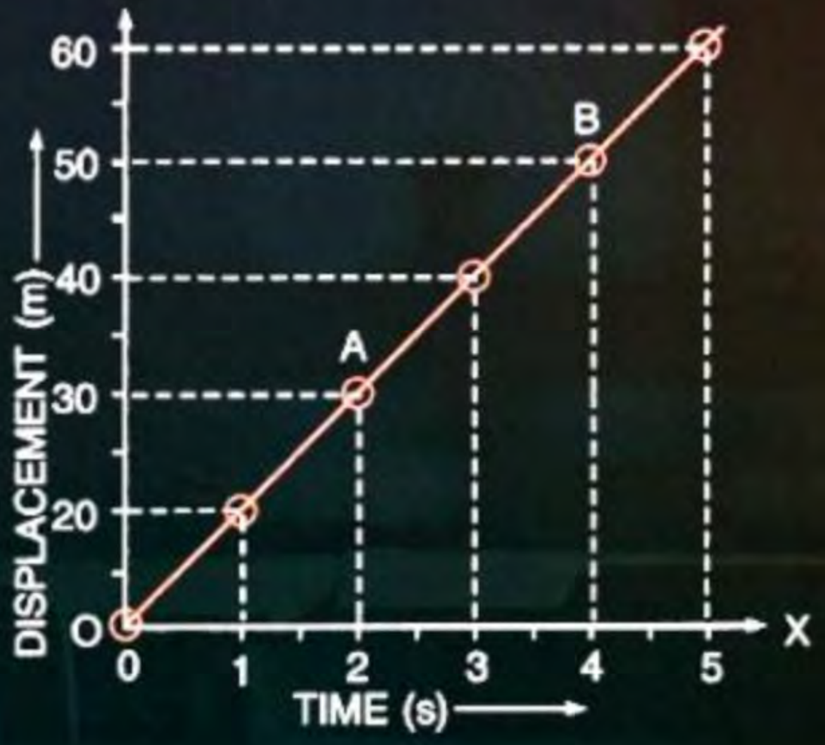
C → 54 km/h

D → 18 $\frac{Km}{h}$

Question

From the given displacement-time graph, answer the following questions:

(i) The kind of motion depicted in this graph is:



A uniform

B non-uniform

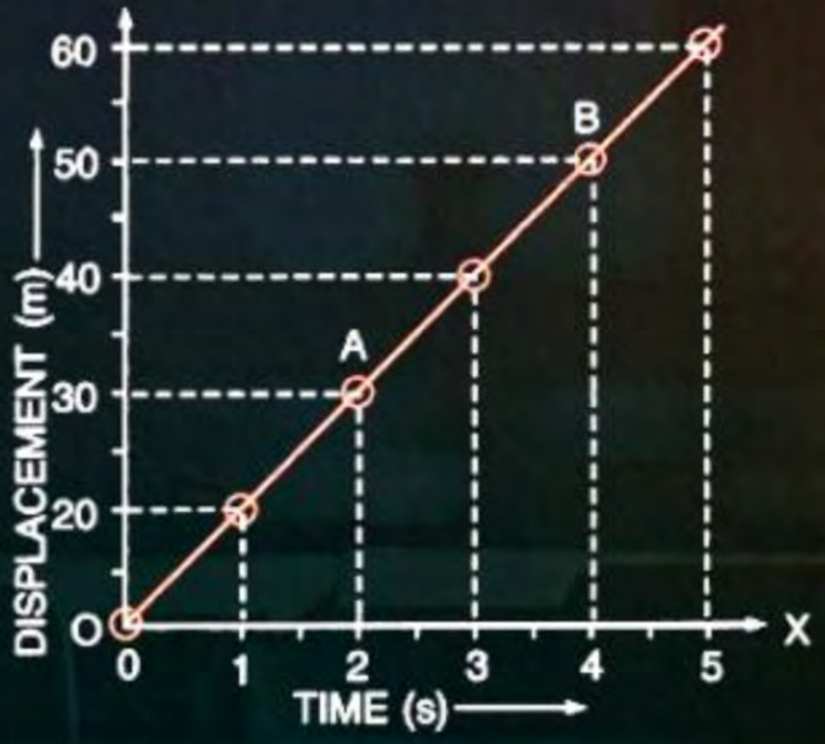
C retardation

D all of the above

Question

From the given displacement-time graph, answer the following questions:

(ii) The velocity between point A and C is:



(A) $20\ ms^{-1}$

(B) $5\ ms^{-1}$

(C) $10\ ms^{-1}$

(D) $15\ ms^{-1}$

Question

From the given displacement-time graph, answer the following questions:

(ii) The velocity between point A and C is:

(A) $20\ ms^{-1}$

(B) $5\ ms^{-1}$

(C) $10\ ms^{-1}$

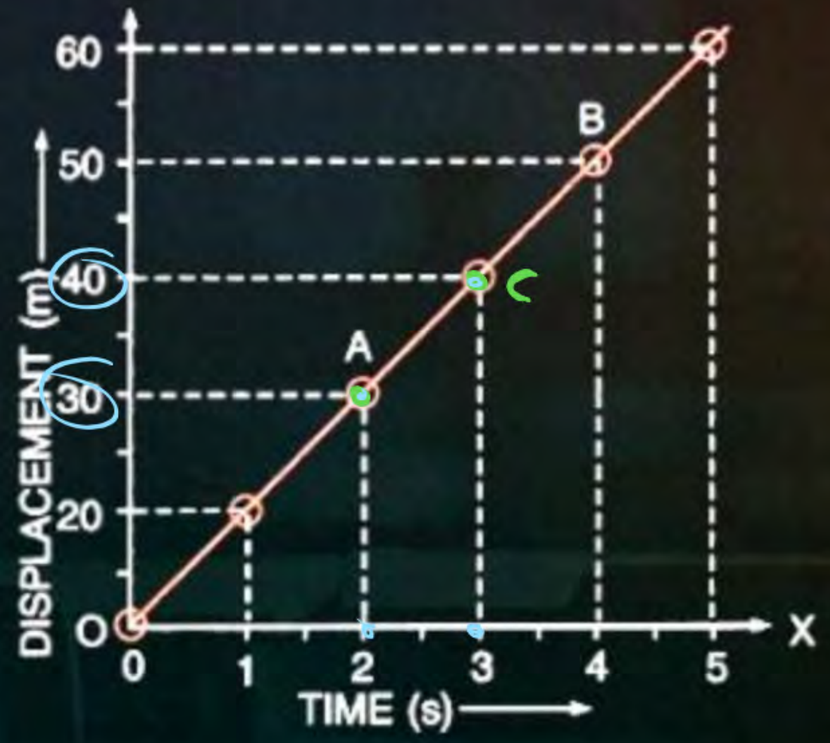
(D) $15\ ms^{-1}$

Velocity = slope

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

$$= \frac{40-30}{3-2} = \frac{10}{1}$$

$V = 10\ m/s$

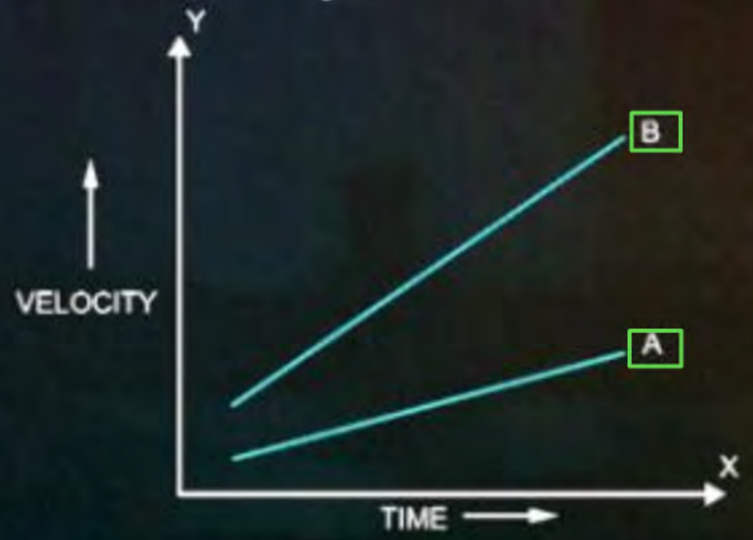


Ans. (C) $10\ ms^{-1}$

Question

Figure shows the velocity-time graph for two cars A and B moving in same direction. Which car has the greater acceleration? Give reason to your answer.

a ∝ slope



Question

Distance = 2πr
S = 0

Assertion (A): The displacement of a body can be zero even if the distance travelled by it is not zero.

Reason (R): Displacement is the shortest distance from the initial to the final position of body.

(A) both A and R are true and R is the correct explanation of A

(B) both A and R are true and R is not the correct explanation of A

(C) assertion is false but reason is true

(D) assertion is true but reason is false

Question

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Ans. **(A)** both A and R are true and R is the correct explanation of A

Question

Assertion (A): For a given time interval, average velocity and average speed can have different values.

Reason (R): Speed is a scalar quantity whereas velocity is a vector quantity.

A. both A and R are true and R is the correct explanation of A

B. both A and R are true and R is not the correct explanation of A

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Question

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Ans. **(A)** both A and R are true and R is the correct explanation of A

Question

Assertion (A): The slope of displacement-time graph gives the velocity.

Reason (R): Velocity is the product of displacement and time.

(A) both A and R are true and R is the correct explanation of A

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Question

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(B) both A and R are true and R is not the correct explanation of A

(C) assertion is false but reason is true

(D) assertion is true but reason is false

Ans. **(D)** assertion is true but reason is false

Question

Assertion (A): Acceleration of a moving body is always positive.

Reason (R): Acceleration is the rate of change of velocity with time.

(A) both A and R are true and R is the correct explanation of A

(B) both A and R are true and R is not the correct explanation of A

(C) assertion is false but reason is true

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Question

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(C) assertion is false but reason is true

(D) assertion is true but reason is false

Ans. **(C)** assertion is false but reason is true

Question

A body, initially at rest, starts moving with a constant acceleration 2 ms^{-2}. Calculate

(i) the velocity acquired and $v = ?$

(ii) and the distance travelled in 5 s.

given $u = 0$, $a = 2\ m/s$, $t = 5\ sec$, $s = ?$

$v = u + at$

$v = 0 + 2 \times 5$

$\boxed{v = 10\ m/s}$

$s = ut + \frac{1}{2}at^2$

$s = 0 \times 5 + \frac{1}{2} \times 2 \times 5 \times 5$

$s = 0 + 25$

$\boxed{s = 25\ m}$

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

$10 \times 10 = 0 + 2 \times 2 \times s$

$100 = 4s$

$s = 25$

$\boxed{s = 25\ m}$

Question

A bullet initially moving with a velocity 20 ms^{-1} strikes a target and comes to rest after penetrating a distance 10 cm in the target. Calculate the retardation caused by the target.

$u = 20 m/s$ $\quad s = 10 cm$ $\quad V = 0$ $\quad a = ?$

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

$$0 = 20 \times 20 + 2 \times a \times \frac{10}{100}$$

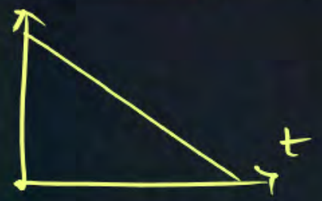
$$-20 \times 20 = 2 \times a \times \frac{1}{10}$$

$$\frac{-2000}{1} = a$$

$$a = -2000\ m/s^2$$

Question

For a uniformly retarded motion, the velocity-time graph is:



A) a curve

B) a straight line parallel to the time axis

C) a straight line perpendicular to the time axis.

D) a straight line inclined to the time axis.

Question

For a uniformly retarded motion, the velocity-time graph is:

(A) a curve

(B) a straight line parallel to the time axis

(C) a straight line perpendicular to the time axis.

(D) a straight line inclined to the time axis.

Ans. **(D)** a straight line inclined to the time axis

Question

The velocity-time graph of a body in motion is a straight line inclined to the time axis. The correct statement is:

(A) velocity is uniform

(B) acceleration is uniform

(C) both velocity and acceleration are uniform

(D) neither velocity nor acceleration is uniform.

Ans. **(B)** acceleration is uniform.

Question

Which of the following is true about motion along a straight line?

(A) It can only be uniform motion

(B) It can only be nonuniform motion

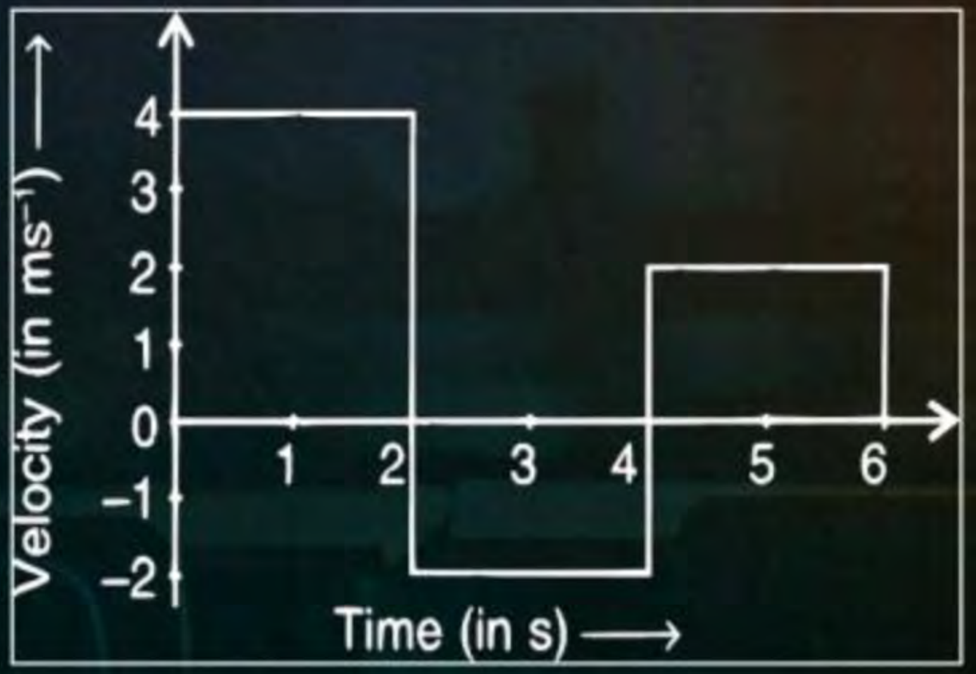
(C) It can be either uniform or nonuniform motion

(D) It can have multiple directions

Ans. **(C)** It can be either uniform or nonuniform motion

Question

The velocity-time graph given below shows an object moving in a straight line. The displacement and the distance travelled by the object in 6 s will respectively be:



(A) 8 m, 16 m

(B) 16 m, 8 m

(C) 16 m, 16 m

(D) 8 m, 8 m

Ans. **(A)** 8 m, 16 m

Question

What can you say about the nature of motion of a body if its displacement-time graph is-

(a) a straight line parallel to time axis?

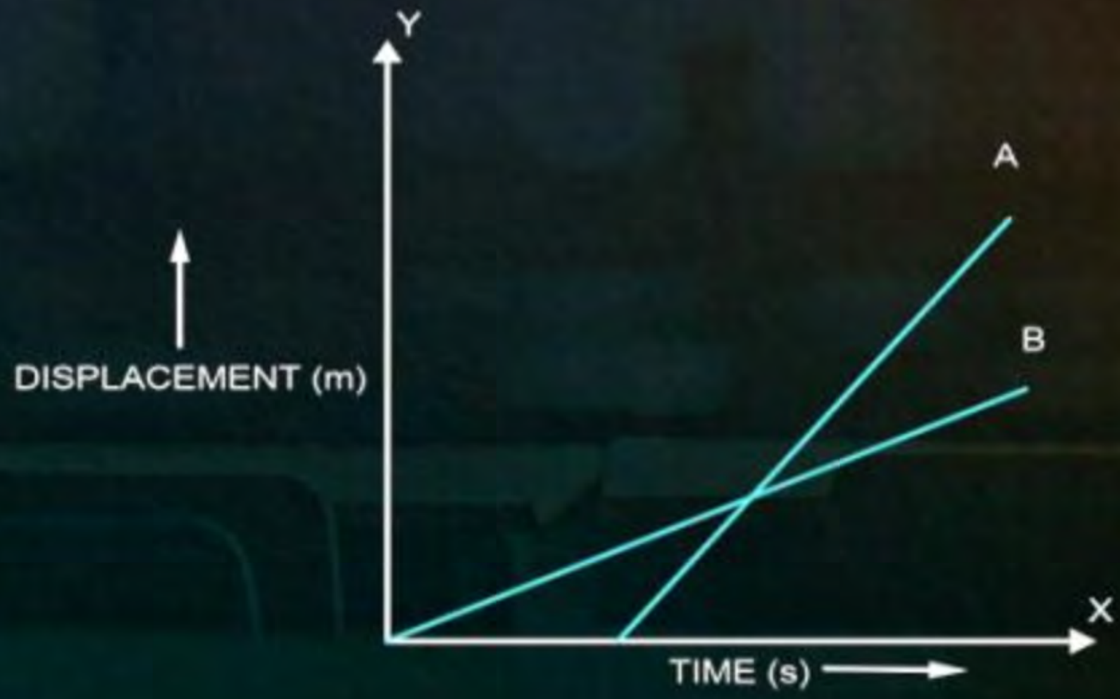
(b) a straight line inclined to the time axis with an acute angle?

(c) a straight line inclined to the time axis with an obtuse angle?

(d) a curve

Question

The figure shows displacement-time graph of two vehicles A and B moving along a straight road. Which vehicle is moving faster? Give reason



Question

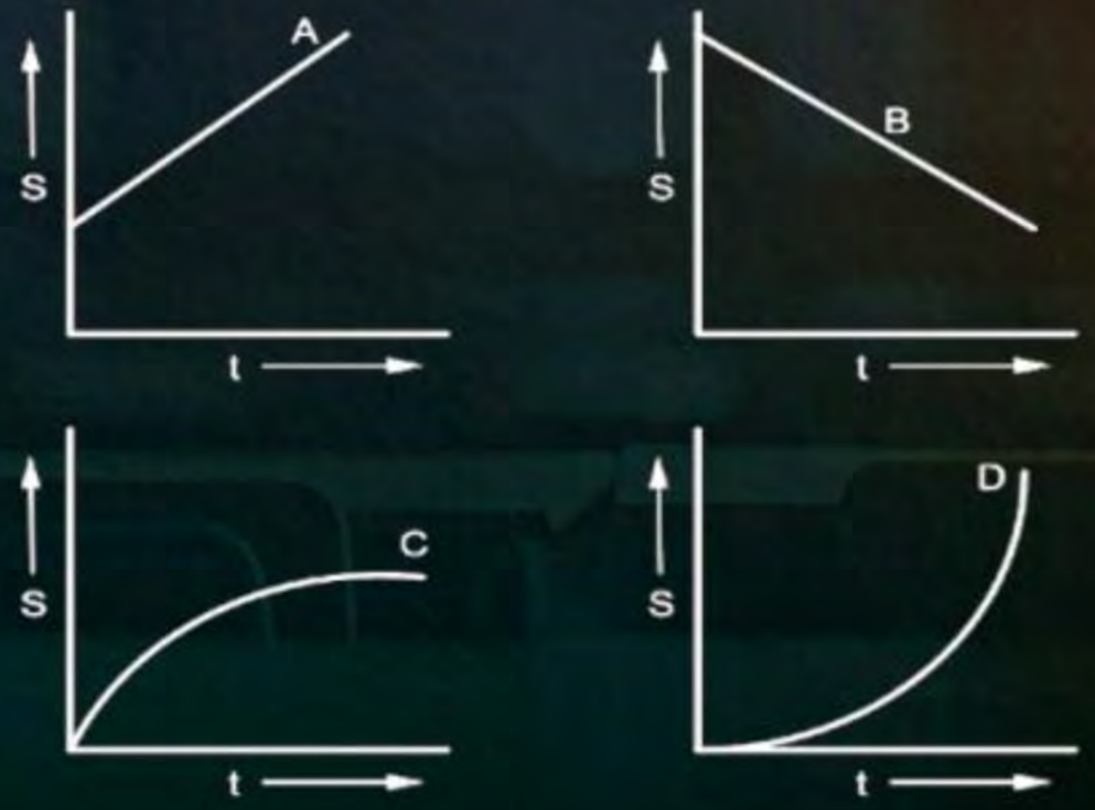
Draw the velocity-time graph a body moving with-

(a) uniform velocity

(b) uniform acceleration.

Question

The figure given below shows the displacement-time graph for four bodies A, B, C and D. In each case state what information do you get about the acceleration (zero, positive or negative).



Question

The correct equation of motion is-

A $v = u + at$

B $s = ut + 1/2\ at^2$

C $v^2 = u^2 + 2aS$

D All of these

Question

The correct equation of motion is-

(A) $v = u + at$

(B) $s = ut + 1/2\ at^2$

(C) $v^2 = u^2 + 2aS$

(D) All of these

Ans. **(D)** All of these

Question

When a body starts from rest, the of motion takes the form:

$u = 0$

A $v = u$

$V = u + at$

B $v = at$

C $v = 1/2\ at^2$

D $s = ut + 1/2\ at^2$

Question

When a body starts from rest, the of motion takes the form:

(A) $v = u$

(B) $v = at$

(C) $v = 1/2\ at^2$

(D) $s = ut + 1/2\ at^2$

Ans. **(B)** $v = at$

Question

A car acquires a velocity of 54 ms^{-1} in 20 s starting from rest, then its acceleration is:

$u = 0 \quad V = 54 m/s \quad t = 20$

(A) 5.4 ms^{-2}

(B) 2.7 ms^{-2}

(C) 7.2 ms^{-2}

(D) 2.0 ms^{-2}

$$a = \frac{v-u}{t}$$

$$= \frac{54-0}{20}$$

$$= \frac{54}{20}$$

$$= \frac{27}{10}$$

$$= 2.7 m/s^2$$

Question

A car acquires a velocity of 54 ms^{-1} in 20 s starting from rest, then its acceleration is:

(A) 5.4 ms^{-2}

(B) 2.7 ms^{-2}

(C) 7.2 ms^{-2}

(D) 2.0 ms^{-2}

Ans. **(B)** 2.7 ms^{-2}

Question

A particle starts to move in a straight line from a point with a velocity $10\ ms^{-1}$ and acceleration $-2.0\ ms^{-2}$. Its position at $t = 5$ s will be:

$u = 10\ m/s^2 \quad a = -2\ m/s^2 \quad t = 5\ ?$

(A) 5 m

(B) 10 m

(C) 20 m

(D) 25 m

$$S = ut + \frac{1}{2}at^2$$

$$S = 10 \times 5 - \frac{1}{2} \times 2 \times 5 \times 5$$

$$= 50 - 25$$

$$S = 25\ m$$

Question

A particle starts to move in a straight line from a point with a velocity $10\ ms^{-1}$ and acceleration $-2.0\ ms^{-2}$. Its position at $t = 5$ s will be:

(A) 5 m

(B) 10 m

(C) 20 m

(D) 25 m

Ans. **(D)** 25 m

Question

A body initially at rest, starts moving with a constant acceleration of 0.5 ms^{-2} and travels a distance 25 m, then its final velocity is:

(A) 5 ms^{-1}

(B) 20 ms^{-1}

(C) 15 ms^{-1}

(D) -15 ms^{-1}

$u = 0$

$a = 0.5\ m/s^2$

$s = 25\ m$

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

$v^2 = 0 + 2 \times 0.5 \times 25$

$= 2 \times \frac{0.5}{10_2} \times 25$

$v^2 = 25$

$v = 5\ m/s$

Question

A body initially at rest, starts moving with a constant acceleration of 0.5 ms^{-2} and travels a distance 25 m, then its final velocity is:

(A) 5 ms^{-1}

(B) 20 ms^{-1}

(C) 15 ms^{-1}

(D) $-15\ ms^{-1}$

Ans. **(A)** 5 ms^{-1}

Question

A body starts from rest with a uniform acceleration of 8 ms^{-2}, then the distance covered by the body in 2 s is:

(A) 4 m

(B) 16 m

(C) 20 m

(D) 32 m

Question

A body starts from rest with a uniform acceleration of 8 ms^{-2}, then the distance covered by the body in 2 s is:

(A) 4 m

(B) 16 m

(C) 20 m

(D) 32 m

HW

Ans. **(B)** 16 m

Question

A car starting from rest accelerates uniformly to acquire a speed 20 km h^1 in 30 min. The distance travelled by car in this time interval will be

(A) 600 km

(B) 5 km

(C) 6 km

(D) 10 km

HW

Question

A car starting from rest accelerates uniformly to acquire a speed 20 km h^1 in 30 min. The distance travelled by car in this time interval will be

(A) 600 km

(B) 5 km

(C) 6 km

(D) 10 km

Ans. **(B)** 5 km

Question

A body starts from rest with a uniform acceleration of 2 ms^{-2}. Find the distance covered by the body in 2 s.

Question

A train travels with a speed of 60 km h^{-1} from station A to station B and then comes back with a speed 80 km h^{-1} from station B to station A. Find-

(i) the average speed, and

(ii) the average velocity of train.

HW

Question

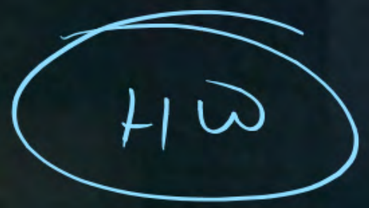
A car travels a distance 100 m with a constant acceleration and average velocity of 20 ms^{-1}. The final velocity acquired by the car is 25 ms^{-1}. Find:

(i) the initial velocity and

(ii) acceleration of car.

Question

A body moves from rest with a uniform acceleration and travels 270 m in 3 s. Find the velocity of the body at 10 s after the start.



Question

A space craft flying in a straight course with a velocity of 75 km s-1 fires its rocket motors for 6.0 s. At the end of this time, its speed is 120 km s-1 in the same direction. Find

(i) the space craft's average acceleration while the motors were firing.

(ii) the distance travelled by the space craft in the first 10 s after the rocket motors were started, the motors having been in action for only 6.0 s.

HW


Thank You