Gaining Apex Coaching Centre

(where toppers make ... ... toppers)

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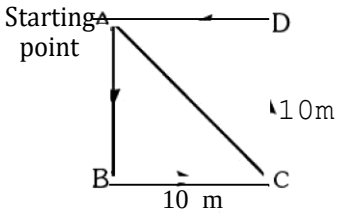
NCERT QUESTIONS WITH SOLUTIONS

1. An object has moved through a distance. Can it have zero displacement? It yes, mpport your answer with an example.

Ans. Yes, an object which has mood through a distance can have zero displacement.

Example : When a person. walking along a circum path, returns back to the starting point, after completing a circle, his displacement is zero. But he covers a distance 2rrr, where 'r' is the radius of circular path.

2. A farmer moves along the boundary of a square field of side 10 m in 40 s. What will be the magnitude of displacement of the farmer at the end of 2 minutes 20 seconds?



Ans. The perimeter of square field
ABCD = 4 x 10 m = 40 m.
time for moving around the 10 msquare field once = 40 s.
time Ior journey of farmer = 2 min and 20 s = 140 s.
Number of times the farmer movesarourid the square field = 4 = 3 2 times .
For going once around the square field, the displacement = 0
For going thrice around the square field, the displacement = 0
It is obvious from the figure. that it the farmer starts from point A, then he will cover 10 m along AB and then 10 m along BC.
Therefore, displacement of farmer from the point A to point C is

$$AC = AB^2 + BC = 10^2 + 10)^2 = 200 = 1 = 14.14 \text{ m}$$

3. Which of the following is true for displacement?
(a) It cannot be zero.
{b) Its magnitude is greater than the distance travelled by the object.
None of the statements (a) or (b) is true for displacement.

4. Distinguish between speed and velocity.

Ans Speed is rate of change of distance, while velocity is the rate of change of displacement. Speed is a scalar quantity, while velocity is a vector quantity. Speed is always positive, while velocity is positive, negative or zero.

5. Under what condition is the magnitude of average velocity of an object equal to its average speed?
When an object moves along a straight path without change in its direction, the average velocity of an object is equal to its average speed.

6. What does the odometer of an automobile measure?

Ana Odometer measures the distance travelled by the automobile.

7. What does the path of an object look like when it is in uniform motion?

Anæ In uniform motion, the object moss along a straight path i.e. the path of object is a straight line.

8. During an experiment a signal from a spaceship reached the ground station in five minutes. What was the distance of the space ship from the ground station? The signal travels at the **speed** of light that ÎS, Ñ X 10^8 QS.

Ans Let the distance between the spaceship and the ground station be 's'.
Then, s = v xt
where, v = speed of si9nal = 3 x 10' m/s
t = time taken = 5 min = 5 x 60 s = 300 s
s = 3 x 10' x 300 = 9 x 101O »

9. When will you say a body is in
(i) Uniform aoceleration?
(ii) Non uniform acceleration?

Ana (i) A body is in uniform acceleration when it moves in a straight line and equal changes of velocity take place in equal intervals of time.
(ig A body is said to be possessing non-uniform acceleration when unequal changes in velocity take place in equal intervals of time.

10. A bus decreases its speed from 80 km h*' to 60 km h* in 5 s. Find the acceleration of the bus.

Ans. Given t = 5 s
Initial speed of bus

u = 80 km h*' = 80 x $\frac{5}{}$ = 22.2ms—*

final **speed** of the bus

v = 60 km h* = 60 x $ = 16.6 msc^{s}

Now acceleration is given by the relation

a= $\frac{16\ 6 \quad 22\ 2}{}$ —$_{1}$.1 ms ^{2}

11. A train starting from a railway station and moving with uniform acceleration attains a speed of 40 kmh in 10 minutes. find its acceleration. Given t = 10 min = 10 x 60 = 600 s

Ans. Initial si›eed of train, u = 0 ms

Final speed of train

v = 40 km h*' = 40 x $ = 11.1 ms*'

Now acceleration is given by the relation

a = v 6 = 0.0185 ms*'

12. What is the nature of the distance-time graphs for uniform and non-uniform motion of an object?

Ans. The distance-time graph for uniform motion is a straight line not parallel to the time axis. The distance-time graph for non-uniform motion is not a straight line, it can be a curve or a zigzag line.

Ans.

13. What can you say about the motion of an object whose distance-time graph is a straight line parallel to the time axis?

14. 20

Ans.

15.

Ans.

16.

Ans.

17. A train is travelling at a speed of 90 krnh *. Brakes are appfied so as to produce a uniform acceleration of — 0.5 ms 2. Find how far the train will go before it is brought to rest.

Ana Given, initial speed of train,

u = 90 km h = 90 x 5/18 = 25 ms

Final speed, v = 0 ms 1,

Acceleration, a = — 0.5 , ms*2

Distance covered, s =? 2

Using the relation — u = 2as, we have

v' — u 0 — (25)'

, s 2a 2 x (0.5) =625m

18. A trolley, while going down an inclined plane, has an acceleration of 2 cms 2. What will be its velocity 3 s atter the start?

Am Given, initial velocity,, u = 0 final velocity, v =?

Time, t = 3 s

Acceleration, a = 2 cms*2

We know that, v = u + at or

v = 0 + 2 x 3 = 6 cms

The object is stationary. What can you say about the motion of an object? The object may be in uniform motion.

What is the quantity which is measured by the area occupied below the velocity-time graph?

Distance is the quantity which is measured by the area under velocity-time graph.

A bus starting from rest moves with a uniform acceleration of 0.1 ms*2 for 2 minutes. Find (a) the speed acquired. {b) the distance travelled. Given

Initial speed of bus, u = 0 ms Final speed of bus, v =?

a = 0.1 ms 2, t = 2 min = 120 s

s =?

(i) We know, v = u + at

or v = 0 + 0.1 x 120 = 12 ms

(ii) s = ut + at2

s - 0x120+ x0.1x(120)2=720m

Therefore, final speed acquired = 12 ms

Distance travelled = 720 m

The motion of an object if its speed-time graph is a

19. Therefore, final velocity = 6 cms*

Ans A racing car has uniform acceleration of 4 ms*^{2}. What distance will it cover in 10 s after start?
Given
Initial velocity, u = 0
Acceleration, a = 4
ms*^{2} Time, t = 10 s
Distanoe covered, s =?

We know. $s = ut + at^2$

$S=0x10+ 2 \quad X4X \quad 2$

20. - 0 + 200 - 200 m
Therefore, distance covered = 200 m.

Ana A stone is thrown in vertically upward direction with a velocity of 5 msc^s. If the acceleration of the stone during its motion is 10 ms ^{2} in the downward direction, what will be the height attained by the stone and how much fime will it take to reach there? Given, initial velocity, u = 5 ms
Final velocity, v= 0
Since, u is upward & a is downward. it is a retarded motion. .. a = —10 ms*^{2}
Height attained by stone, s =? Time taken to attain height, t =?

(i) Using the relation, v = u + at 0 = 5 + (— 10) t
or
t = 5/10 = 0.5 s

(ii) Using the relation. $v^2 — u^2 — 2as$, we have

$s= \quad v^2 — u^2 \_ (0/ — (5)^2 =1.25m$

$2a \quad 2x(10)$

2[. An athlete completes one round of a circular track of diameter 200 m in 40 s. What will be the distance covered and the displacement at the end of 2 minutes 20 s?

Given

Diameter of circular track, 2r =200 m

Circumference of circular track = 2 z r

$s=\S 2r)=\frac{22}{7}\times 200=\frac{4400}{7}$ m

Time for completing one round = 40 s.

Time for which the athlete ran = 2 min and 20 s = 140 s

Now distance covered by the atNete in 40 s is

$s=\frac{4400}{7}$ m . . Distance cowred in ls = $\frac{4400}{7\,.\,40}$

(i) Therefore, distance covered by athlete in 140 s

$\frac{4400}{7}\ \frac{140}{40}$ 2200 m

(ii) As the atNete returris to the initial point in 40 s, his displacement = 0

Now,

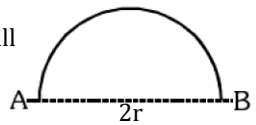
Number of rounds in 40 seconds = 1

Hence number of rounds in 140 s is = $\frac{140}{40}=3\frac{1}{2}$

For each complete round the displacement is zero.

Therefore for 3 complete rounds, the displacement wil1 be zero.

The final displacement will be due to hall the round (i.e. semicircle).



Thus, his displacement = diameter of circular track =2OOm

. Displacement after 140 s = 200 m

22. Joseph jogs from one end A to the other end B of a straight 300 m road in 2 minutes 50 seconds and then turns around and jogs 100 m back to point C in another 1 minute. What are Joseph's average speeds and velocities in jogging (a) from A to B and tb) from A to C?

Ans. The required figure is as shown

A C

100 m

300 m

(a) Distance covered — 300 m

Time taken = 2 min and 50 s = 170 s

Now average speed from A to B is given by

Now average velocity from A to B is given by

$\frac{\text{displacement}}{\text{fime}}\ \frac{300}{170}=L76$ „

{b) When Joseph tums around from B to C towards west, then

Distance covered = 300 + 100 = 400 m

Time taken = 170 + 60 = 230 s

Therefore, average speed from A to C is

$\frac{\text{distance covered}}{\text{time}}\ \frac{400}{230}=1.74\text{ms}'$

Now displacement from A to C = 200 m

Therefore, average velocity from A to C is

$\frac{\text{displacement}}{\text{lime}}\ \frac{200}{230}$ 0.869 ms ^{1}

2a. Abdul while driving to schcol ‹x›mputesthe awraqe sr eed for his trip to be 20 km h ^{1}. On his return trip along the same route, there is less traffic and the average speed is 40 km h*'. What is the average speed for Abdul's trip?

Ans. Let one way distance for his trip be S.

Let t be the time for his trip from home to school and t_2 be the time for his return trip.

Then tt h. and $t_2=\frac{S}{40}\ \frac{S}{h}$

Therefore, total time of trip is

$T=t+t_2=\frac{S}{20}\ \frac{S}{40}\ \frac{3S}{40}$ h

Total distance covered = 2S

Therefore, average speed of Abdul

$\frac{\text{total distance}}{\text{total time}}\ \frac{2S\times 40}{3S}=26.6$ kmh '

24. A motorboat starting from rest on a hke accelerates in a straight line at a constant rate of 3.0 ms*^{2} for 8.0 s. How far does the boat travel during this time?

Ana Given, initial velocity of boat, u = 0

Acceleration, a = 3.0 m s*^{2}

Time, t = 8 s

Distance covered, s =?

Using the relation $s=ut+\frac{1}{2}at^2$ we have,

$s = 0 \times 8 + \quad \times 3 \times 8^2 = 96$ m.

$$\frac{\text{distance covered}}{\text{time}} \quad \frac{340}{170} = 176\text{ms}^{-1}$$

$V_{av} =$

Ans.

$V_{av} =$

$V_{av} =$ – —— –

$$= \frac{S}{v_1} = \frac{S}{20}$$

V_{av}

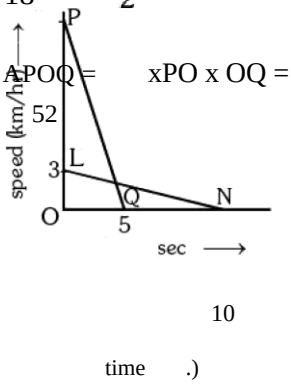
B

V_{av}

The driver of a car travelling at 52 km h*' applies the brakes and accelerates uniformly in the opposite direction. The car stops in 5 s. Another driver going at 3 kmh* , another car applies his brakes slowly and stops in 10 s. On the same graph paper, plot the speed versus time graphs for the two cars. Which of the two cars travelled farther after the brakes were applied?

Ans. The speed time graph of both the cars are shown belOW.

(i) Distance ‹x›vered bp car moving at 52 kmh (or 52 $\frac{5}{18}$ = 14.4 ms^{-1})



- area of APOQ = $\frac{1}{2}$ xPO x OQ = 2 x 14.4 x5 = 36 m

(ii) Distance covered bp car movin9 at 3 kmh*' (OI* X $\frac{5}{18}$ = 0.83 ms ') = $\frac{2}{2}$ = 4.

= area of AOLN = xLO xON = x0.83 x 10 = 15 m

. The car moving at 52 km h travels more distance on the application of brakes.

26. Figure below shows the distance-time graph of three objects A, B and C. Study the graph and answer the following questions :

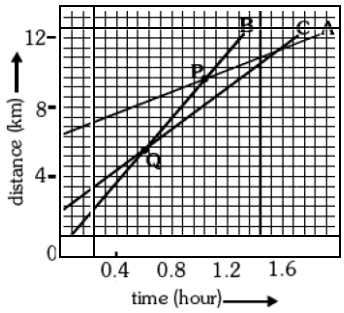
(a) Which of the three is trawlling the fastest?

{b) Are at three ear at the same point on the road?

(c) How far has C travelled when B pas.es A?

(d) How far has B traveled by the time it passes C?

Ans.



(a) Car B is travelling the fastest, because its slope is largest among the three.

tb) No, they are never at the same point because all the 9raphs of A. B and C do not intersect at one point.

(c) When car B passes car A at point P, the distance covered by car C = 8 — 2 = 6 km. (approx.)

(d) Car B and C pass each other at ¡x›int Q. The distance trawlled by B at that ¡x›int is neady

27. A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of 10 ms*^{2}, with what velocity wil it strike the ground? After what time will it strike the ground?

Ans. Given, initial velocity of ball, u = 0
final velocity of ball, v =?
Distance through which the ball falls, s = 20 m
Acceleration a = 10 ms ^{2}
Time of fall, t =?
We know

— u^2 = 2as

or – 0 = 2 x10 x 20 = 400 or v = 20 msc

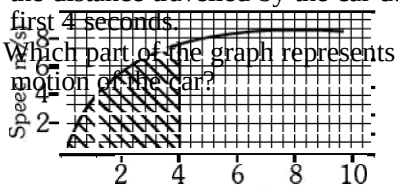
Now using v = u + at, we have

20 = 0 + 10 x t or t = 2 s

28. The speed-time graph for a car is shown in figure below.

(a) Shade the area on the graph that represents the distance travelled by the car during the first 4 seconds.

{b) Which part of the graph represents uniform motion of the car?



Ana (a) During first 4 seconds, car is moving with non-uniform acceleration. Area of shaded portion represents distance travelled.

{b) The straight fine portion of the graph represents uniform motion of the car.

29. State which of the following situations are possible and give an example for each of these.

(a) An object with a constant acceleration but with zero velocity.

{b) An ob]ect moving in a certain direction with acceleration in the perpendicular direction.

Am (a) A body with a constant acceleration but with zero velocity is possible. For example, when a body is just released, its initial wlocity u = 0, but acceleration q = 10 ms ^{2}.

tb) It is posible when a stone, tied to a string, is whirled in a circular path, the acceleration acting on it is always at right angle to the direction of motion of stone.

Ans.

30. An artificial satellite is moving in a circular orbit of radius 42250 km. Calculate **its speed if it** takes 5.7 km.

v =

24 hours to revolve around the earth.
Distance covered by the satellite in 24 hours. S=2z

$=2_X \frac{22}{}$ x42250 - 265571.43 km

Therefore speed of satellite

distance travelled 265571.45 =

3.07 kms ,time taken 24 x 60 x 60

SOLVED EXAMPLES

1. In a long distance race, the athletes were expected to take four rounds of the track such that the line of finish was same as the line of start. Suppose the length of the track was 200 m.

(i) What is the total distance to be covered by the atNetes?

(if What is the displacement of the atNetes when they touch the finish line?

(iii) Is the motion of the athletes uniform or non-uniform?

(iv) b the displacement of an atNete arid the distance moved by him at the end of the race equal?

Sol. (i) Total distance covered = 4 x 200 m = 800 m

(ig As the athletes finish at the starting line,

Displacement = final position-initial position

' A“A — 0

(iii) Motion is non-uniform as the direction of motion of the atNete is changing while running on the track.

(iv) Displacement and distance moved are not equal.

2. On a 120 km track, a train travels the first 30 km with a uniform speed of 30 kms. How fast must the train travel the next 90 km so as to average 60 for the entire trip?

Sol. Total distance d = 120 km

Average speed $V_{a.}$ = 60

Total time = t =?

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time taken}}$$

$$\frac{d}{t} \quad \text{or } p\,t = \frac{d}{V}$$

Putting the values.

$$\frac{120\ \text{km}}{} \quad '' \quad 60\text{km h} = 2\ \text{h} \ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Distance travelled in first part of trip, dj = 30 km

Speed in first part of the trip, v = 30 k

Time taken in first part of trip, t =?

Distance to be covered in second part of the trip

d_2 = 90 km

Required speed in second part, v_2 =?

$$\text{Speed} \quad \frac{\text{distance}}{\text{time}} \text{ or } v \quad d, \quad \frac{90\text{km}}{2 \text{ " } t, \text{ " } 1\text{h}} = \mathbf{90km/h}$$

3. Nisha swims in a 90 m long ¡x›ol. She covers 180 m in one minute bp swimming from one end to the other and back along the same straight path. Find the average speed and average velocity of Nisha.

Total distance = 180 m

Total displacement = 0

Time taken, t = l min. = 60 s

$$\text{Average speed } (V_e) = \frac{\textbf{total distance}}{\textbf{total time taken}}$$

$$V_{av} — \frac{180\ \text{m}}{60\text{s}}$$

$$\text{Average velocity } (V,) = \frac{\text{total displacement}}{\text{total time taken}}$$

0

$$' V_{av} \quad 60\text{s} \quad 0$$

4. A bus going from Kota to Jaipur passed the 100 km, 160 km and 220 km points at 10.30 am, 11.30 am and 1.30 pm. Find the average speed of the bus duñnq each of the following intervals :

(a) 10.30 am to 11.30 am,

(b) 11.30 am to 1.30 pm and

(c) 10.30 am to 1.30 pm.

Sol. (a) The distance covered between 10.30 am and 11.30 am is 160 km — 100 km = 60 km. The time interval is 1 hour. The average speed during this interval is —

$$V_1 \quad \frac{60\ \text{km}}{\text{lh}} = 60\ \text{km/h}$$

tb) The distance covered between 11.30 am and 1.30 pm is 220 km — 160 km. = 60 km. The time interval is 2 hours. The average speed during this interval is —

$$V_2 — \frac{60\text{km}}{2\text{h}} \quad 30\ \mathbf{km/h}$$

Putting the values.

' A_1 $\frac{30\text{Lm}}{30\text{km h}}$ h

Time taken to complete second part of the trip

t_2 - t — t_i - 2 — 1 - 1 h

(c) The distance covered between 10.30 am and 1.30 pm is 220 km — 100 km = 120 km. The time interval is 3 hours. The average speed during this interval is —

v_3 — $\frac{120\text{km}}{3\text{ h}}$ = 40 kmph

Sol.

= 3 m/s

V_{av} =

5. The average speed of a bicycle, an athlete and a car are *18* kmph, 7 mrs and 2 km/min. respectively. Which of the three is the fastest and

which is the slowest?

Sol. $18\ km/h = \frac{18km}{1h} \cdot \frac{18000\,m}{8600s} = 5 \quad s$

$2\ k \quad min = \frac{2km}{1} \cdot \frac{2000m}{60s} = 33.3 \quad s$

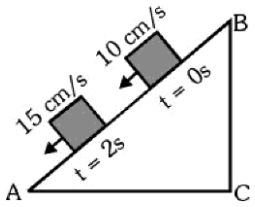
Thus, the average speeds of the bicycle, the athlete and the car are 5 mrs, 7 mrs and 33.3 s respectively. So the car is the fastest, and the bicyde is the slowest.

6. An object is sfidinq down on an inclined plane. The velocity changes at a constant rate from 10 emus to 15 cm/s in 2 seconds. What is its acceleration?

Sol. The situation is shown in figure. Let us take BA as the positive direction. The velocity at t = 0 is u = +10 *anfo* and that at t = 2s is v = +15 emus.

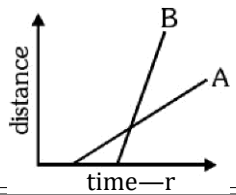
Thus, $a = \frac{v - u}{t} \quad \frac{15cm/s - 10\ cm/s}{2\ sec}$

$\frac{5\ cm/sec}{2sec} = 2.5\ cm/s^2$



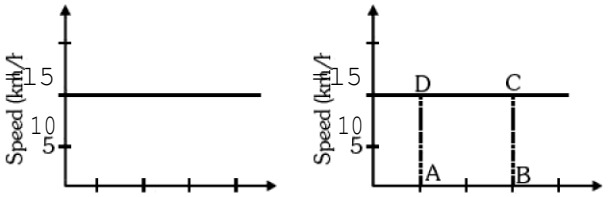
The acceleration is positive, which means it is in the direction BA.

7. Figure shows distance-time graph of two objects A and B. Which object is movin9 with greater speed when both are moving?



Sol. The fine for object B makes a larger angle with the

8. Figure represents the speed-time graph lora partide. Find the distance covered by the particle betwen t = 10 min. and t = 30 min.



0 10 20 30 40
time (min) —+
(a)

10 20 30 40
time (min) —+
(b)

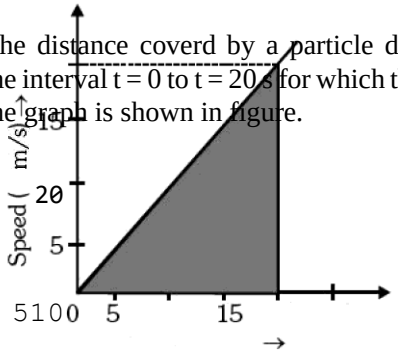
Sol. We draw perpendicular lines from the 10-minute point and the 30-minute point to the line of graph (see fig. {b)). The distance covered is equal to the area of the rectangle ABCD. Its value is

ABCD = (30 min.—10 min.) x(10 kms)

$= \frac{20}{60} in. \times 10 km/h$

h x 10 = km.

9. Find the distance coverd by a particle during the time interval t = 0 to t = 20 s for which the speed-time graph is shown in figure.



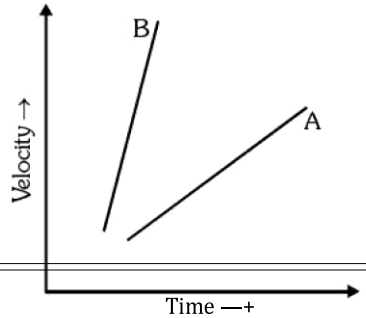
10 20 25
time (in sec.)

Sol. The distance covered in the time interval 0 to 20 s. is equal to the area of the shaded triangle. It is

$\frac{1}{2} \times base \times height = \frac{1}{2} \times (20\ s) \times (20 \quad s) = 200\ m.$

10. Figure shows the velocity—time 9raphs for two objects. A and B, moving along the same direction. Which object has greater acceleration?

Sol.



The slope of the velocity—time graph of B is greater than that for A. Thus, the acceleration of B is greater than that of A.

object A. Thus, the speed of B is greater than that of A.

time-axis. Its slope is larger than the slope of the line for object

EXERCISE # 1

Multiple choice questions

1. An object is said to be at rest if its ..... does not change with time.

(1) Posifion (2) Size

(3) Colour (4) Material

2. Which of these is an example of oscillatory motion?

(1) Motion of an electric fan

(2) Motion of a spinning top

(3) Motion of pendulum of a wall clock

(4) Motion of a stone dropped from a roof

3. Which of the following is not a vector quantity?

(1) Retardation

(2) Acceleration due to gravity

(3) Average speed

(4) Displacement

4. In which of the following cases of motion, the distance moved and the magnitude of displacement are equal?

(1) If the car is moving on straight road

(2) If the car is moving in circular path

(3) The pendulum is moving to and fro

(4) The earth is revolving around the sun

5. The numerical ratio of displacement to distance for a moving object is

(1) Always less than 1

(2) Always equal to 1

(3) Always more than 1

(4) Equal or less than 1

6. A particle is movin9 in a circular path of radius r. The displacement after hall a cirde would be

(1) Zao (2) zr

(3) 2r (4) 2xr

7. The rate of change of displacement with time is

(1) speed (2) acceleration

(3) retardation (4) velocity

8. A body goes from A to B with a velocity of 20 s and comes back from B to A with a wlocity of 30 s. The awraqe velocity of the body during the whole journey is

(1) zero (2) 25ms

(3) 24 m/s **(4) noneothee**

9. The CGS unit of aoceleration is

(1) cm/s (2) cm/min

(3) c s^2 (4) c min^2

10. A body is thrown vertic ally upward with velocity (u) .The greatest height h to which it will

(1) u/g (2) u'/2g

(3) u'/g (4) u/2g

I1. If the displacement of an object is proportional to square of time, then the object moves with

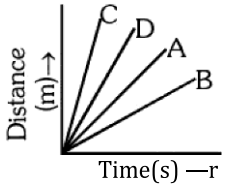
(1) Uniform velocity

(2) Uniform acceleration

(3) Increasing acceleration

(4) Decreasing acceleration

Four cars A, B, C and D are moving on a levelled road. Their distance versus time graphs are shown in figure. Choose the correct statement



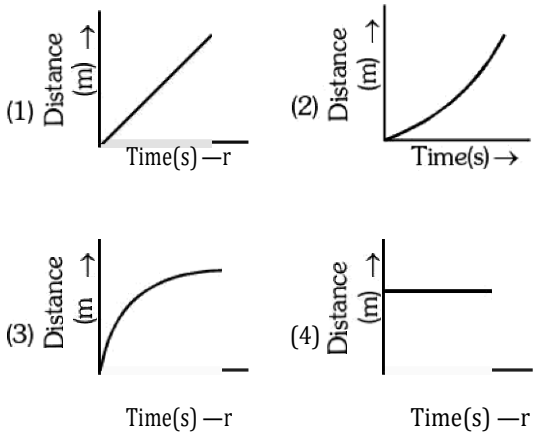
(1) Car A is faster than car D

(2) Car B is the slowest

(3) Car D is faster than car C

(4) Car C is the slowest

13. Which of the following figures represents uniform motion of a moving object correctly?



14. Slope of a velocity time graph gives

(1) The distance

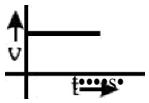
(2) The displacement

(3) The acceleration

(4) The speed

15. From the given v — t graph, it can be inferred that the object is

(1) inunilonmmotion



(2) at rest

(3) in non-uniform motion

(4) moving with uniform acceleration

True or false

1. Kinematin deab with the motion of objects without taking into account the cause of their motion.
2. A body is said to be at rest if it does not change its position with resi›ect to the reference ¡x›int.
3. Motion along a curved line is called rectilinear motion.
4. A quantity which can be represented completely bp magnitude only is called a vector quantity.
5. A motion is said to be uniform it a body undergoes equal displacements inequal intervals of time.
6. Velocity and speed are measured in different units.
7. In uniform motion, the average velocity and the instantaneous velocity are unequal.
8. Acceleration is defined as the rate of change of wlocity.
9. A motion is said to be uniform if s t^2. uniform
10. The graph between velocity and time for acoeleration is a curved line.

Match the column

1.

Column-I	Column-11
(A) Distance	(p) displacement
(B) Scalar	(q) velocity
(C) Vector	(r) speed
{D) Shortest path between two points of motion	(s) act ual path travelled

2.

Golumn-I	Column-11
(A) A body fading freely	(p) displacement
{B) Distance with direction	(q) velocity
(C) Si›eed with direction	(r) acceleration
D) Rate of change of velocity	(s) u n i I o r ml y accelerated motion

3.

Column-I	Column-11
(A) A body covers equal displacements in equal intervals of time	(p) speed
(B) Slope of distancmtime Qraph	(q) distance
(C) Area under velocity-time Qraph	(r) circular motion
(D) S r eed is constant but object is accelerated	(s) uniform motior

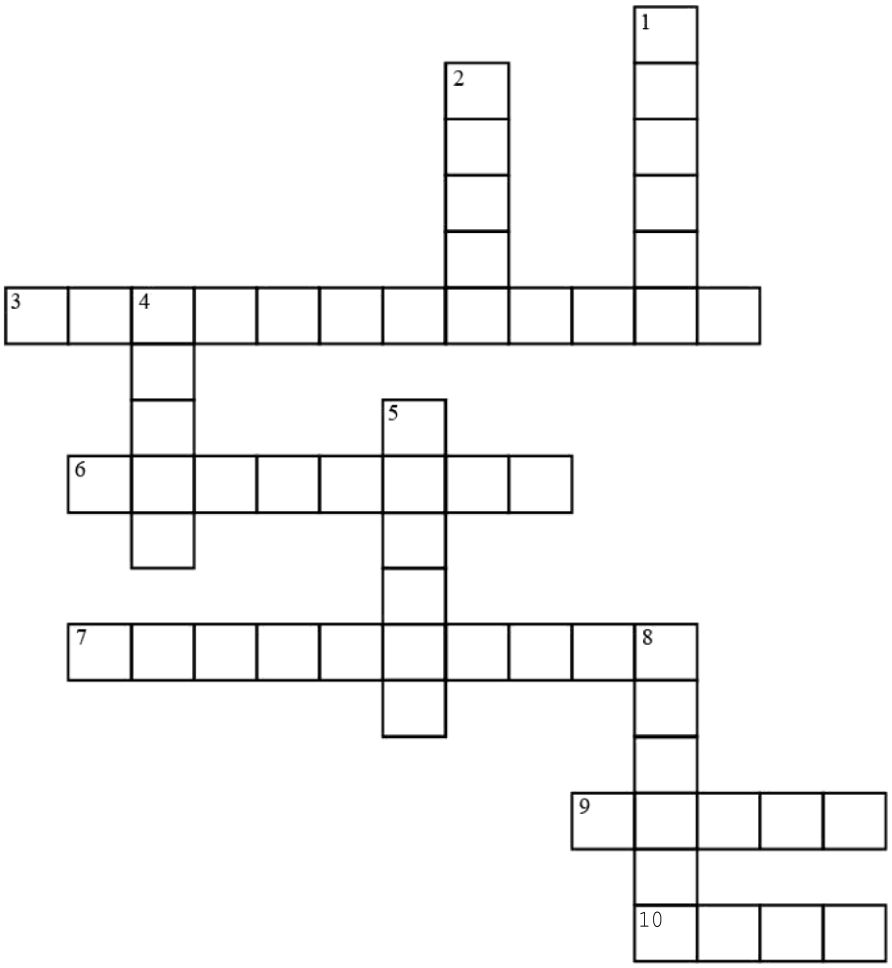
Fill in the blanks

1. A body is said to be at rest il it does not chan9e its . with respect to the surroundings.
2. A body is said to be in ..... it it changes its position with respect to the surroundings.
3. A point object is one whose size is ..... as compared to the distance it moves.

The reference point from which the distance of a body is measured is called .....

5. A quantity which can be completely represented by magnitude alone is called .....
6. A quantity which can be completely represented by magnitude and direction is called .....
7. Distance is the .....path followed bp a body between two ¡x›ints.
8. Displacement is the ..... distance between Mo points.
9. Speed is the ratio of the.....traveled to the time taken.
10. Area under a v-t graph represent a physical quantity which has a unit. ....

Crossword puzzle



Across

3. Shortest distance taken from initial point to final point.
6. Rate of change of displacement.
7. Science of describing the motion of objects using equations, diagrams, 9raphs etc.
9. Acceleration is given bp the ..... Of a velocity—time graph.
10. No chan9e in the position of a body with resi›ect to surroundings.

Down

i. Change in the position of a body with respect to surroundings.
2. . ..... covered per unit time in circular motion is called 'angular velocity'.
a. Rate of chan9e of distance.
5. Motion exhibited bra body movin9 in a straight line.
8. Quantity defined by its magnitude only.

EXERCISE # 1 ANSWER KEY

Mu ltiple ch o ice questions

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	3	3	1	4	3	4	1	3	2	2	2	1	3	1

True or fs lee

1. True Z. True 3. False 4. False S. True 6. False 7. False 8. True 9. False 10. False

Match th e col u m n

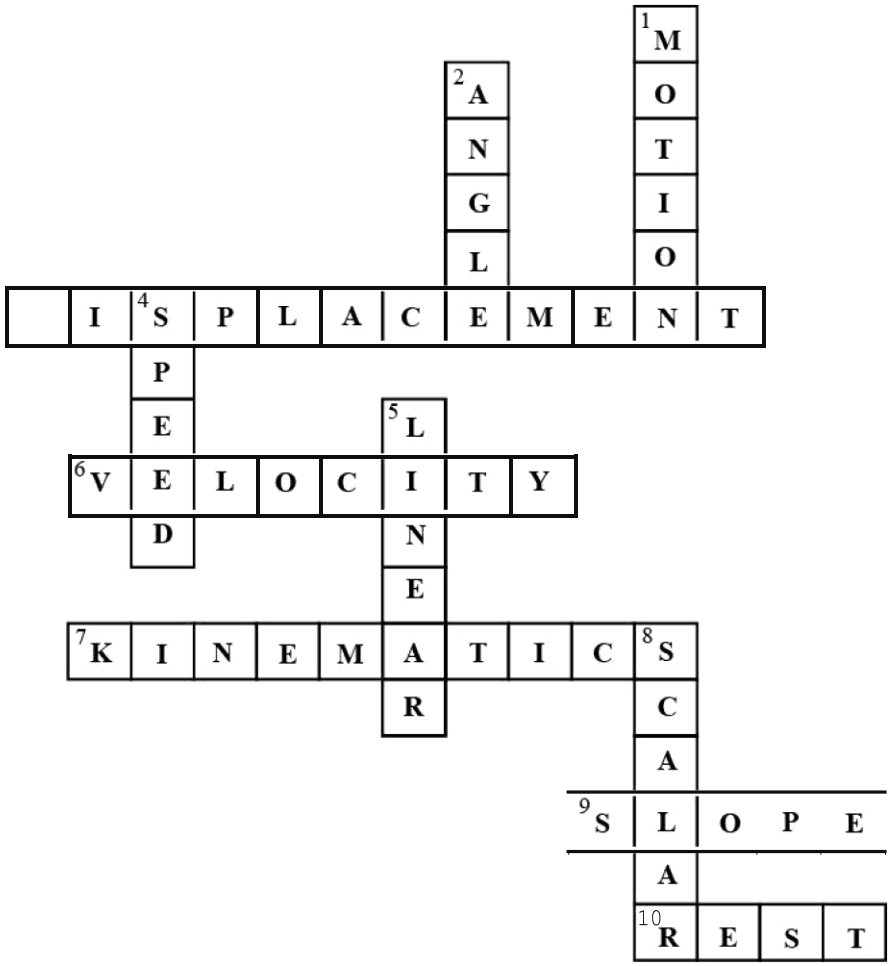
1. (A —› s), (B —› r), tC —› q), (D —› p) 2. tA —› s). (B —› p). (C —r q), (D —r r)

3. (A —› s), (B —› p), (C —› q). (D —r r)

Fill in the b I an ks

1. Position 2. Motion 3. Small 4. Origin 5. Scalar 6. Vector
7. Actual 8. Shortest 9. Distance 10. Metre

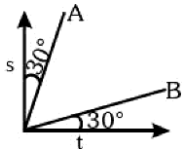
Crossword puzzle



EXERCISE # 2

Very short answer type questions

1. Give an example of a motion in which distance is covered but there is no displacement.
2. Is displacement independent of path? Explain.
3. Give one type of motion where distance and displacement are same.
4. A man walks 12 steps in Northern direction and turns left to walks 5 steps, then returns to the initial point by the shortest path. find (i) distance travelled (ii) displacement. Given, each step is 0.3 m.
5. A car traveb 1 km and returns to the same point in a different path. What is its average velocity?
6. What is the ratio of CGS to SI unit of acoeleration ?
7. Two cars A and B have their s-t graph as shown. Which one has greater velocity?



g. What is the value of acceleration, if v-t graph is a straight line parallel to the time axis?

9. Name a physical quantity that (i) varies (ii) remains same, in a uniform circular motion.
10. In a circular path of radius 1 m, a iron of 2 kg moves with a constant speed of 10 mrs. Find the angular speed.

Short answer type questions

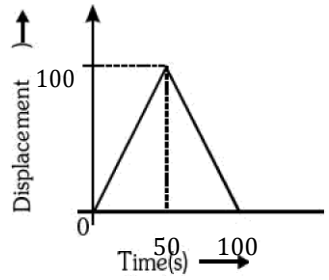
1. When are two vectors said to be equal? Give two examples each of scalar and vector quantities.
2. The displacement of a moving object in a given interval of time is zero. Would the distance travelled by the object abo be zero? Justify your answer.
3. A motorcydist drives from A to B with a uniform speed of 30 km h^{*1} and returns with a speed of 20 km h^{*1}. Find his average speed.
4. Give two examples each of uniform and non-uniform acceleration.
5. How will the equations of motion for an ob]ect moving with a uniform velocity change?
6. A car starts from rest and moves along the x-axis with constant acceleration 5 m s^{*2} for 8 seconds. If it then continues with constant velocity, what distance will the car cover in 12 seconds since it started from rest?
7. An object is dropped from rest at a height of 150 m and simultaneously another ob]ect is dropped from rest at a height 100 m. What is the difference in their heights atter 2 s i1 both the objects drop with same acceleration? How does the difference in heights vary with time?
8. An object starting from rest travels 20 m in first 2 s and 160 m in next 4 s. What will be the velocity after 7 s from the start?
9. An electron moving with a velocity of 5 $x10^{1'}$ ^{1} enters into a uniform electric field and acquires a uniform acceleration of $10' m s'$ in the direction of its initial motion.
   () Calcuhte the time in which the electron would acquire a velocity double of its initial wlocity.
   {ii) How much distance the electron would ‹x›ver in this time?
10. Obtain a relation for the distance travelled bp an object moving with a uniform acceleration in the interval between t=4 and t=5 seconds.
11. Two stones are thrown vertically upwards simultaneously with their initial velocities u_s and u, respectively. Prove that the heights reached by them would be in the ratio of u,' : u,' (Assume upward acmlerationis -q and downward aooeleiationto be +q).

12. Usin9 following data, draw displacement-time graph for a movin9 object.

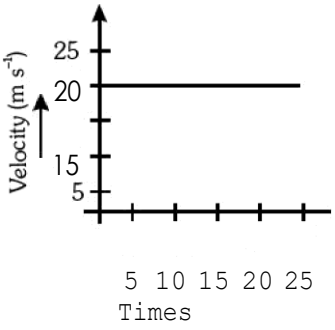
Displacement (m)	0	2	4	4	4	6	4	2	0
Time (s)	0	2	4	6	8	10	12	14	16

Use the graph to find average velocity for first 4 s, for next 4 s and for last 6 s.

13. A girl walks along a straight path to drop a letter in the letterbox and comes back to her initial position. Her displacement-time graph is shown in figure. Plot a velocity-time graph for the same.



14. The velocity-time graph given shows the motion of a cyclist. Find (i) its acceleration (ii) its velocity and (iii) the distance ‹x›vered by the cydist in 15 se‹x›nds.



15. Draw velocity versus time graph of a stone thrown wrticaly upwards and then coming dmvn ards alter attaining the maximum height.

Long answer type questions

1. With the help of examples explain that motion is a relative term.
2. Distinguish between
   (i) scalar and vector quantities
   (ii) distance and displacement
   (iii) speed and velocity
3. Can the speed of a particle be negative? Can the velocity of a particle be negative? Give reasons in sup¡x›rt of your answer.

,q, Derive — $u^2 = 2as$.

s. What is velocity-time graph? How can you derive $v = u + at$ and $s = ut + at^2$ fr om this?

Numerical problems

1. The odometer of a car reads 2000 km at the start of a trip and 2400 km at the end of the trip. If the trip took 8 h, calculate the average speed of the car in km h* and msć .
2. A 100 m long train crosses a bridge of length 200 m in 50 seconds with constant velocity. Find the velocity.
3. Rahim, while driving to school, computes the average speed for his trip to be 20 km h*'. On his return trip along the same route, there is less traffic and the average speed is 30 km h*'. What is the average speed for Rahim's trip?
- On a 100 km road, a car travels the first 50 km at a uniform speed of 30 kmh*'. How last must the car travel for the next 50 km so as to has an average speed of 45 kmh*' for the entire journey?

5. A cheetah, the fastest of all land animab over a short distance, accelerates mom rest to 26 ms ^{1}. Assuming that the aoceleration is constant, find the average speed of the cheetah.
6. The table below shmvs the s¡xmd of a moving vehide with respect to time.

Speed (m/s)	0	2	4	6	8	10
Time (s)	0	1	2	3	4	5

(i) Find the acceleration of the vehide.

(ii) Calcuhte the distance covered in abow question in 5 seconds.

7. A car moving along a straight highway with a speed of 126 kmph and is brought to a stop within a distance of 200 m. What is the acceleration of the car and how long does it take for the car to stop?

8. The brakes applied to a car produce an acoeleration of 6 ms*2 in the op¡x›site direction to the motion. It the car takm 2 stostop after the application of brahes, calcuhte the distanoe it travels duñn9 this time.

9. Askier, startinq from rest, aœelerates down a slope at 1.6 ms ^{2}. How far has he gone at the end of 5.0 seconds?

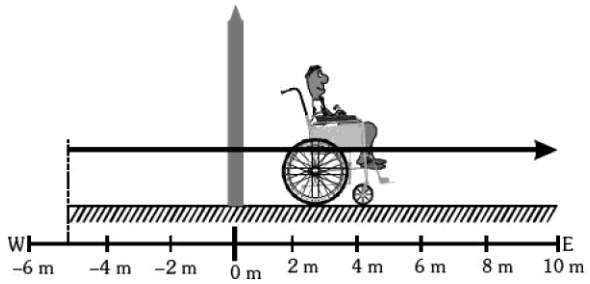
10. A partide is moving around in a circle of radius 1.5 m with a constant speed of 2 s. Find

(i) the centripetal aœeleration

(ii) anqular velocity of the particle

Activity based questions

1. The final distance and displacement moved by a person sitting on a wheel chair from a position 5.0 m lW] to a position 10.0 m [E] is



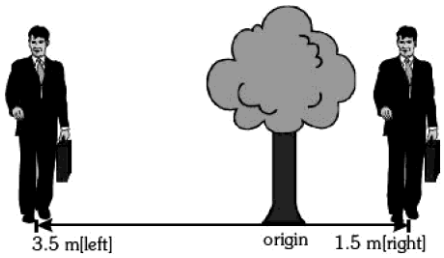
(1) 10 m . +5 m

(2) 15 m . +15 m

(3) 15 m, —10 m

(4) 15 m, — 15 m

2. A traveller initially standing 1.5 m to the right of a tree moves so that he is 3.5 m to the left of the tree. The traveller's displacement is



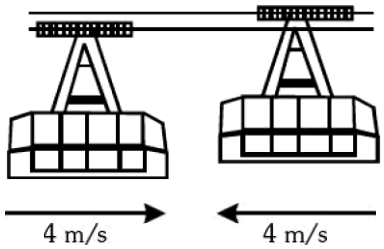
(1) + 2 m

(2) — 2 m

(3) + s

(4) — 5 m

3. Two trolleys moving on parallel ropes are shown in fi9ure. Which of the following statements is correct?



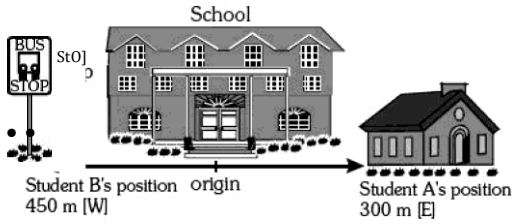
(1) They have same velocity and same speed.

(2) They have different velocity and same speed.

(3) They have different velocity and different speed.

(4) They have same velocity and different speed.

4. At the end of the school day, student A and student B sap qoodbye and head in opposite directions. walkinq at constant rates. Student B heads west to the bus stop, wlüle student A walks east to her house. After 3.0 min, student A is 300 m [E] and student B is 450 m [W]. The velocities in s of student A and student B are



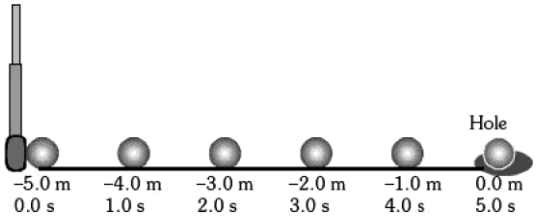
(1) +1.67 nt/s ; -2.5 m/s

(2) + 1.67 m/s ; +2.5 m/s

(3) + 2.5m/s;—1.67m/s

(4) - 1.67 m/s ; +2.5 m/s

5 In a golf tournament, if we designate the hole as the origin, and the putter{like a bat) is at — 5.0 m at time 0s, the average velocity of the ball when it reaches the hole is



(1) +5mA (2) -1 m/s

(3) +1m/s (4) —5 s

6. In question 5, the motion of the qolt ball is

(1) Non-uniform motion with variable acceleration

(2) Non-uniform motion with constant acceleration

(3) Uniform motion

(4) Information insufficient to predict

7. In question 5, the velocity-time graph for the golf ball will be

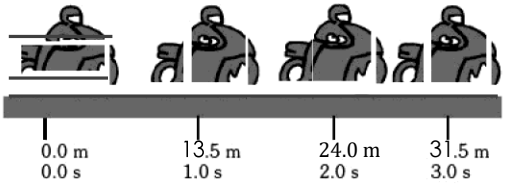
(1) a straight line inclined to the time axis

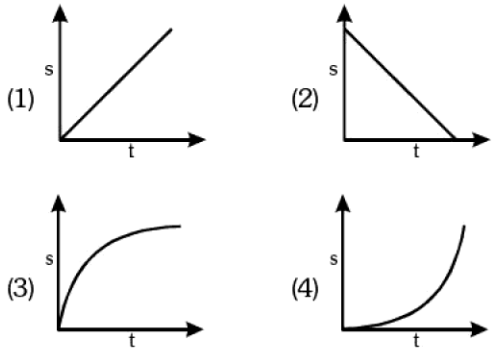
(2) a straight line parallel to the time axis

(3) a concave curve

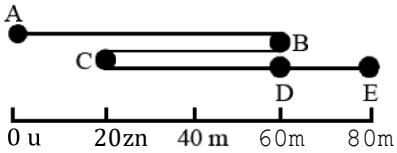
(4) a convex curve

8. Motion of a motorcyclist is shown in the figure. The distance-time graph for this motion is





9. A walker folows the path from A to E as shown in figure.



What total distance does the walker cover between A and E?

(1) 160m (2) 80m

(3) 20 m (4) 40 m

10. In above fi9ure what is the walker's total displacement from A to E?

(1) +160m (2) +80m

(3) —20m (4) —40 m

EXERCISE # 2 ANSWER KEY

Numerical problems

1. 50 kms or 13.9 m/s
2. 6 m/s
3. avezagespeed-24km/h
4. 90 k
5. 13 ms ^{1}
6. (i) 2 m/s^2 (ii) 25 m
7. —3.06 ms—*, 11.43 s
8. 12 m
9. 20 m
10. (i) 2.67 m/s^2, 1.33 ra@sec

Activity based questions

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	2	4	2	1	3	3	2	3	1	2