2. Motion

Multiple Choice Questions

1. Question

Slope of the velocity - time graph gives

A. speed

B. displacement

C. distance

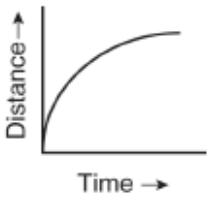
D. acceleration

Answer

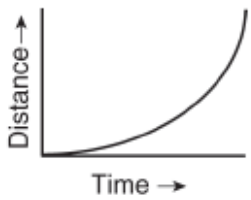
Since Acceleration is defined as $\frac{\text{Velocity}}{\text{time}}$ and Slope of Velocity – time Graph is also denoted by $\frac{\text{Velocity}}{\text{time}}$.

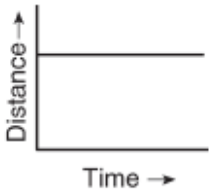
2. Question

Which of the following graph represents uniform motion of a moving particle?

A. 

B. 

C. 

D. 

Answer

Uniform motion is defined as the motion of an object in which the object travels in a straight line and its velocity remains constant.

Note- In option (b) the graph is a straight line hence the velocity remains constant.

3. Question

A body moving with an initial velocity $5ms^{-1}$ and accelerates at $2ms^{-2}$. Its velocity after 10s is

A. $20ms^{-1}$

B. $25ms^{-1}$

C. $5ms^{-1}$

D. $22.55ms^{-1}$

Answer

From the first equation of motion, we have

v = u+a.t -- (i)

$u = 5ms^{-1}$

$a= 2ms^{-2}$

t =10s

putting the values u, a & t in equation (i) we get,

$v = 5\ ms^{-1} + 2m\times\ 10s = 25ms^{-1}$.

4. Question

In a 100 m race, the winner takes 10s to reach the finishing point. The average speed of the winner is

A. $5ms^{-1}$

B. $20ms^{-1}$

C. $40ms^{-1}$

D. $10\ ms^{-1}$

Answer

Average Speed is defined as $\frac{\text{Distance Travelled}}{\text{Time Taken}}$,

Distance is 100m and time taken is 10 sec,

⇒ Average Speed = $\frac{100}{10} = 10\ ms^{-1}$.

5. Question

The area under velocity – time graph represents

A. velocity of the moving object

B. displacement covered by the moving object

C. speed of the moving object

D. acceleration of the moving object

Answer

Area under a velocity-time graph

Is velocity × time, since

Displacement is also defined as

Velocity × time.

6. Question

A car is being driven at a speed of 20 ms^{-1} when brakes are applied to bring it to rest in 5 s. The deceleration produced in this case will be

A. +4 ms^{-2}

B. –4 ms^{-2}

C. –0.25 ms^{-2}

D. +0.25 ms^{-2}

Answer

u (Initial Velocity) = 20 m/sec

v (final velocity) = 0 m/sec (at rest)

time (t) = 5 seconds

v = u + a.t – (i)

$\Rightarrow a = \frac{(v-u)}{t}$

$\Rightarrow a = \frac{(0-20)}{5}$

$a = \frac{20}{5}$

$a = -4\ ms^{-2}$

Therefore Deceleration produced is 4 ms^{-2}

Note : Since in this question value of deceleration has been asked,

Don't get confused with the signs, Deceleration= -(Acceleration).

7. Question

Unit of acceleration is

A. ms^{-1}

B. ms^{-2}

C. ms

D. ms^2

Answer

Acceleration = $\frac{Velocity(ms^{-1})}{s-1}$ = ms^{-2}

8. Question

Which one of the following is most likely not a case of uniform circular motion?

A. The motion of the Earth around the Sun.

B. The motion of a toy train on a circular track.

C. The motion of a racing car on a circular track.

D. The motion of hours' hand on the dial of the clock.

Answer

Racing Car during its motion accelerates or decelerates causing non-uniform motion

9. Question

The force responsible for drying of clothes in a washing machine is ....

A. Centripetal force

B. Centrifugal force

C. Gravitational force

D. Electro static force

Answer

The force acting on clothes is away from the centre.

10. Question

The centrifugal force is …….

A. Real force

B. The force of reaction of centripetal force

C. Virtual force

D. Directed towards the centre of the circular path.

Answer

Centrifugal Force has same magnitude and opposite direction as of centripetal force.

Fill In the Blanks

1. Question

Speed is a _____ quantity whereas velocity is a _____ quantity

Answer

Scalar, Vector

Speed has only Magnitude while Velocity has both magnitude as well as direction.

2. Question

The slope of the distance – time graph at any point gives _____

Answer

Speed

Slope in the distance-time graph will be $\frac{\text{distance}}{\text{time}}$ that is equal to speed.

3. Question

Consider an object is rest at position x = 20m. Then its displacement – time graph will be straight line to _____ the axis.

Answer

parallel to X

Since object is at rest, the position of the object will not change with time .

4. Question

Negative acceleration is called _____

Answer

Deceleration

Deceleration=-(acceleration)

5. Question

Area under velocity – time graph shows _____

Answer

Displacement

Area under velocity-time is velocity × time .since, Displacement is also defined as Velocity × time.

True or False

1. Question

The motion of a city bus in a heavy traffic road is an example for uniform motion.

Answer

False

During heavy Traffic Jam, Bus accelerates as well as decelerates following a non-uniform motion.

2. Question

Acceleration can get negative value also.

Answer

True

For Example, If an object is having some initial velocity 'u', after covering some distance, it finally stops i.e 'v' is zero.In this case, acceleration is negative or object decelerates to rest.

3. Question

Distance covered by a particle never becomes zero between any interval of time but displacement becomes zero.

Answer

True

Consider the case of circular motion. If an object completes one revolution. The distance covered will be 2 π r but the displacement will be zero because the object's initial and final positions are same.

4. Question

The velocity-time graph of a particle falling freely under gravity would be a straight line parallel to the x-axis.

Answer

False

Since the body is experiencing a force. It will accelerate and velocity will change, hence it will not be parallel to the x-axis.

5. Question

If the velocity-time graph of a particle is a straight line inclined to time axis then its displacement – time graph will be a straight line?

Answer

False

According to Second Equation of Motion $'s = u.t + \frac{1}{2}.a.t^2'$

The graph will be parabolic not the straight line.

Assertion and Reason Type

1. Question

Assertion: The accelerated motion of an object may be due to change in magnitude of velocity or direction or both of them.

Reason: Acceleration can be produced only by ca hange in magnitude of the velocity it does not depend on the direction.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer

.

2. Question

Assertion: The Speedometer of a car or a motor-cycle measures the average speed of it.

Reason: Average velocity is equal to total displacement divided by the total time taken.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer

.

3. Question

Assertion: Displacement of a body may be zero when distance travelled by it is not zero.

Reason: The displacement is the shortest distance between initial and final position.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

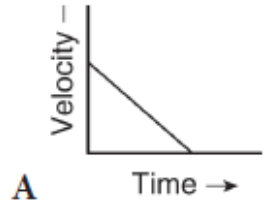
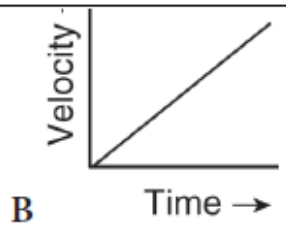
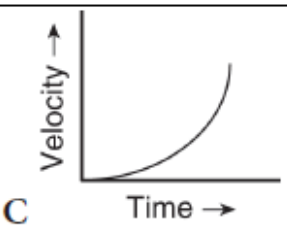
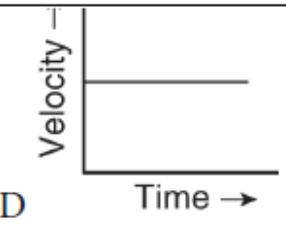
Answer

.

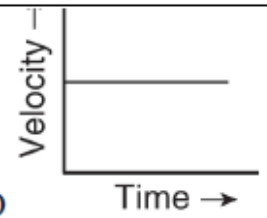
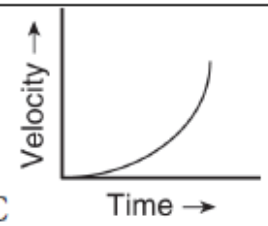
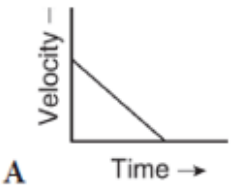
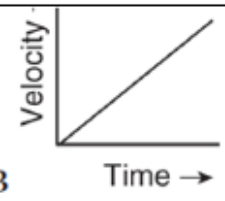
Match The Following

1. Question

Match the Following

List I	List II
The motion of a body covering equal distances in equal interval of time	
Motion with non uniform acceleration	
Constant retardation	
Uniform acceleration	

Answer

List I	List II
Motion of a body covering equal distances in equal interval of time	
Motion with nonuniform acceleration	
Constant retardation	
Uniform acceleration	

Short Answer Type

1. Question

Define velocity?

Answer

Velocity is the rate of change of displacement. It is the displacement of unit time. It is a vector quantity. The SI unit of velocity is ms^{-1}. Thus,

$$\text{Velocity} = \frac{\text{Displacement}}{\text{time taken}}$$

2. Question

Distinguish distance and displacement?

Answer

Distance: The actual length of the path covered by a moving body irrespective of the direction is called the distance travelled by the body. It is measured in meter in SI system. It is a scalar quantity having magnitude only.

Displacement: It is defined as the change in position of a moving body in a particular direction. It is vector quantity having both magnitude and direction. It is also measured in meter in SI system.

3. Question

What do you mean by uniform motion?

Answer

An object is said to be in uniform motion if it covers equal distances in equal intervals of time how so ever big or small these time intervals may be.

For example, suppose a car covers 60 km in the first hour, another 60 km in the second hour, and again 60 km in the third hour and so on.

Meaning of how so ever big or small time intervals are - In this example, the car travels a distance of 60 km in each hour. For the motion to be uniform the car should travel 30 km in each half an hour, 15 km in every 15 minutes, 10 km in every 10 minutes, 5 km in every 5 minutes and 1 km in every 1 minute.

4. Question

Compare speed and velocity?

Answer

Speed	Velocity
It is the rate of change of distance	It is the rate of change of displacement
It is a scalar quantity having magnitude only	It is a vector quantity having both magnitude and direction
It is measured in m/s in SI system	It is also measured in ms-1 in SI system
Speed in any direction would be a positive quantity since the distance in any direction is a positive quantity.	Velocity can have both positive and negative values. If velocity in one direction is assumed to be positive, then the velocity in the opposite direction would be a negative quantity. Velocity can have zero value also, even for an object under motion.

5. Question

What do you understand about negative acceleration?

Answer

Acceleration = $\frac{\text{change of velocity}}{\text{time taken}}$ =

$$\frac{\text{final velocity} - \text{initial velocity}}{\text{time taken}}$$

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

In the above formula if v < u, i.e. if final velocity is less than initial velocity, the velocity decreases with time and the value of acceleration is negative. It is called negative acceleration.

6. Question

What remains constant in uniform circular motion? And What Changes continuously in uniform circular motion?

Answer

Speed remains constant whereas velocity changes in uniform circular motion.

7. Question

Is the uniform circular motion accelerated? Give reasons for your answer?

Answer

Yes, uniform circular motion is an accelerated motion, since it undergoes change in velocity.

8. Question

What is meant by uniform circular motion? Give two examples of uniform circular motion.

Answer

When an object moves with constant speed along a circular path, the motion is called uniform circular motion.

Examples-

(1) Revolution of earth around the sun.

(2) The tip of the second's hand of a clock.

Paragraph Questions

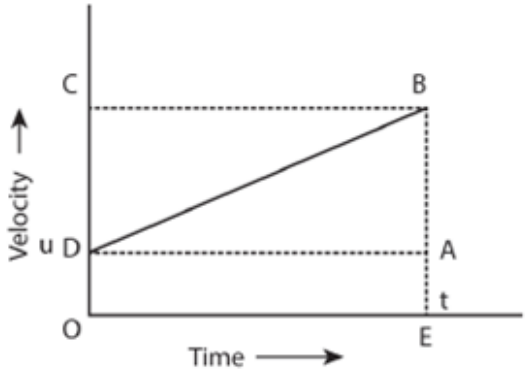
1. Question

Derive equations of motion by graphical method.

Answer

Derivation of equations by graphical method.

Equations of motion from velocity-time graph:



The graph shows the change in velocity with time for a uniformly accelerated object. The object starts from the point D in the graph with velocity u. Its velocity keeps increasing and after time t it reaches the point B on the graph.

The initial velocity of the object = u = OD = EA

The final velocity of the object = v = OC = EB

Time = t = OE = DA

Also from the graph we know that, AB = DC

First equation of motion

By definition, acceleration $= \frac{\text{change in velocity}}{\text{time}}$

$$= \frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$$

$$= \frac{(OC - OD)}{OE}$$

$$= \frac{DC}{OE}$$

$$a = \frac{DC}{t}$$

DC = AB = at

From the graph EB = EA + AB

<u>v = u + at</u>

This is the first equation of motion

Second equation of motion

From the graph, the distance covered by the object during time t is given by the area of quadrangle DOEB

s = area of the quadrangle DOEB

= area of the rectangle DOEA + area of the triangle DAB

= (AE × OE) + (1/2× AB × DA)

<u>s =</u> $\underline{ut + \frac{1}{2}at^2}$

This is the second equation of motion.

The third equation of motion

From the graph, the distance covered by the object during time t is given by the area of the quadrangle DOEB.

Here DOEB is a trapezium.

Then,

S = area of trapezium DOEB

= 1/2 × sum of length of parallel side × distance between parallel sides

= 1/2 × (OD + BE) × OE

$= \frac{1}{2} \times (u + v) \times t$

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

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

Therefore $s = \frac{1}{2} \times (v + u) \times (\frac{v-u}{a})$

$\underline{2as = v^2 - u^2}$

Exercise Problems

1. Question

During an experiment, a signal from a spaceship reached the ground station in five seconds. What was the distance of the spaceship from the ground station? The signal travels at the speed of light that is 3×10^8 m/s

Answer

Given: speed of signal = 3×10^8 m/s

Time is taken by signal to reach the ground = 5s

Distance = speed $\times$ time

= 3×10^8 (m/s) $\times$ 5 (s)

= $\underline{15 \times 10^8}$ $\underline{\text{m}}$

2. Question

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

Answer

Given : height(s) = 20m

Acceleration = 10 ms^{-2}

To find the final velocity of ball as it reach the ground we will use 3rd equation of motion

We have, initial velocity(u) = 0 m/s

height(s) = 20m

Acceleration(a) = 10 ms^{-2}

The third equation of motion

$2as = v^2 - u^2$

$2 \times 10 \times 20 = v^2 - 0$

$v = \sqrt{2 \times 10 \times 20}$

$\underline{v = 20\ m/s}$

To find the time taken by ball the to reach the ground we will use 1st the equation of motion

We have, initial velocity(u) = 0 m/s

Final velocity(v) = 20 m/s

Acceleration(a) = 10 ms^{-2}

1st equation of motion

v = u + at

$20 = 0 + 10 \times t$

$t = \frac{20}{10} = \underline{2\ s}$

time taken to reach the ground is 2s

3. Question

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 m and 20 s?

Answer

Given: diameter of circular track(d) = 200 m

Time is taken to complete one round = the 40s

Therefore, length of the track = π d

= 200π

Speed of the athlete= distance travelled/time taken

= 200π /40

= 5π m/s

Distance covered after 2m 20s (140s)

Distance = speed × time

= 5π× 140

=700π (m)

During the coverage of 700π (m) the athlete makes 3 and half round of the circular track. So the displacement is equal to the diameter of the track = 200 m.

4. Question

A racing car has a uniform acceleration of 4 ms^{-2}. What distance it covers in 10 s after start?

Answer

Given: acceleration(a) = 4 ms^{-2}

Time (t) = 10 s

Distance(s) = ?

To find distance covered in 10s, we use 2nd equation of motion

We have, initial velocity = 0 m/s

acceleration(a) = 4 ms^{-2}

Time (t) = 10 s

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

$s = 0 \times 10 + 1/2(4 \times 10^2)$

<u>s = 200 m</u>

5. Question

A train travelling at a speed of 90 kmph. Brakes are applied 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?

Answer

Given: speed(s) = 90 kmph

Acceleration = –0.5 ms^{-2}

Distance travelled = ?

We use 3rd equation of motion to find the distance travelled

We have, speed(s) = 90 kmph

$= 90 \times \frac{1000}{3600}$ m/s

= 25 m/s

Acceleration = $-0.5\ ms^{-2}$

Final speed = 0 m/s

$$2as = v^2 - u^2$$

$$2 \times \left(-\frac{1}{2}\right) \times s = 0^2 - 25^2$$

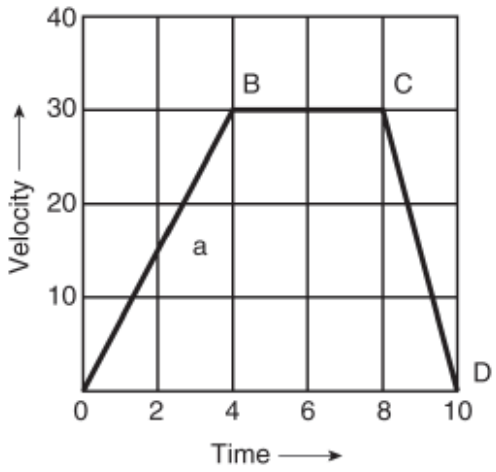
$$-s = -25^2$$

$$\underline{s = 625m}$$

So train will travel 625m before it comes to rest.

6. Question

The adjacent diagram shows the velocity time graph of a body. During what time interval is the motion of the body accelerated. Find the acceleration in the time interval mentioned in part 'a'. What is the distance travelled by the body in the time interval mentioned in part a?



Answer

The body is accelerated between 0 to 4 unit and 8 to 10 unit. Since velocity is changing as time changes

Acceleration is constant in part 'a'

$$\text{Acceleration} = \frac{\text{change of velocity}}{\text{time taken}} = \frac{\text{final velocity} - \text{initial velocity}}{\text{time taken}}$$

In part 'a' final velocity= 30

Initial velocity =0

Time interval is 4s

Acceleration = $\frac{30-0}{4}$ ms^{-2}

=7.5 ms^{-2}

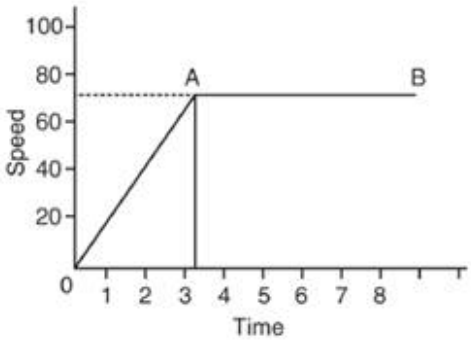
Distance travelled is the area covered by the velocity time graph

So, In part 'a' area covered = $1/2 \times 4 \times 30$

= 60 (m)

7. Question

The following graph shows the motion of a car. What do you infer from the graph along OA and AB? What is the speed of the car along AB and what time it reached this speed



Answer

Along OA graph the car is going with constant acceleration

Along AB graph the car has constant speed and zero acceleration

Speed of the car is 70 along AB

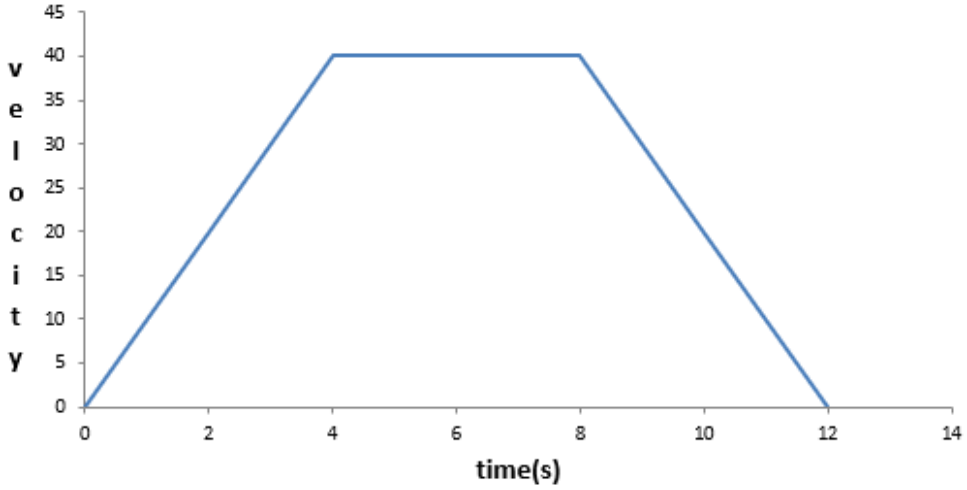
Car reaches this speed between time interval 3 to 4

8. Question

From the following Table, check the shape of the graph

Time (s)	0	2	4	6	8	10	12
Velocity(ms^{-1})	0	20	40	40	40	20	0

Answer



From t = 0s to 4s, the object is accelerating.

t = 4s to 8s, the acceleration is zero.

t = 8s to 12s, the object is decelerating.

Question Paper-I Multiple Choice Questions

1. Question

The area under velocity time graph represents

A. Velocity of the moving object

B. Displacement covered by the moving object

C. Speed of the moving object

Answer

Area under velocity-time graph is velocity × time, since

Displacement is also defined as Velocity × time.

2. Question

Unit of acceleration is

A. ms^{-1}

B. ms^{-2}

C. ms

D. ms^2

Answer

Acceleration = $\frac{\text{Velocity(m/s)}}{\text{time taken(s)}}$ = ms^{-2}

3. Question

When a body starts from rest, the acceleration of the body after 2second in _____ of its displacement

A. Half

B. Twice

C. Four times

D. One fourth

Answer

Here initial velocity (u) = 0

Let acceleration be 'a' ms^{-2}

Displacement be 's' m

Then from second equation of motion, we have

$S = (1/2) .a.2^2$

$S = 2.a$

Or $a = \frac{S}{2}$

Question Paper-I Short Answer Type

1. Question

A bus travel, a distance of 20km from Chennai central airport in 45 minutes. What is the average speed?

Answer

Given: total distance travelled = 20km= 20,000m

Total time taken = 45 min = $45\times 60\ (s)$

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

$= \frac{20,000}{45\times 60}$

=7.4 m/s

2. Question

Why did the actual speed differ from average speed!

Answer

Actual speed is the speed you are traveling at any given moment at any given point. Average speed is figured by dividing the distance you traveled by the time

it took you to drive that distance.

3. Question

Mention the uses of velocity–time graph

Answer

(a) The variation in velocity of an object with time can be represented by velocity – time graph.

(b) We can also study about uniformly accelerated motion by plotting its velocity – time graph.

(c) One can also determine the distance moved by the car from its velocity – time graph.

4. Question

The speed of a particle is constant. Will it have acceleration? Justify with an example

Answer

If speed of particle is constant then the particle may have acceleration or not.

If direction of the particle changes with constant speed then there is acceleration, and if direction doesn't changes there is no acceleration.

5. Question

Distinguish distance and displacement of a moving object

Answer

Distance: The actual length of the path covered by a moving body irrespective of the direction is called the distance travelled by the body. It is measured in meter in SI system. It is a scalar quantity having magnitude only.

Displacement: It is defined as the change in position of a moving body in a particular direction. It is vector quantity having both magnitude and direction. It is also measured in meter in SI system.

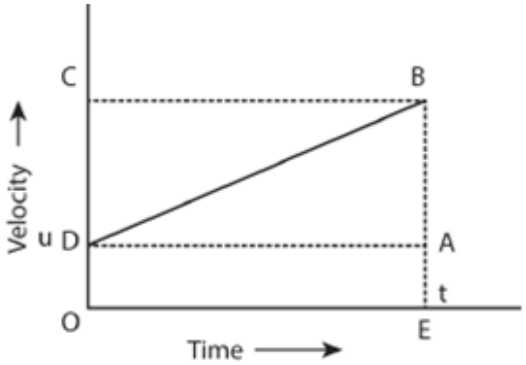
Question Paper-I Answer the Following Question

1. Question

Derive the three equations of motion by graphical method.

Answer

Equations of motion from velocity – time graph:



Graph shows the change in velocity with time for an uniformly accelerated object. The object starts from the point D in the graph with velocity u. Its velocity keeps increasing and after time t it reaches the point B on the graph.

The initial velocity of the object = u = OD = EA

The final velocity of the object = v = OC = EB

Time = t = OE = DA

Also from the graph we know that, AB = DC

First equation of motion

By definition, acceleration = change in velocity / time

= (final velocity – initial velocity)/ time

= (OC – OD) / OE

= DC / OE

a = DC / t

DC = AB = at

From the graph EB = EA + AB

<u>v = u + at</u>

This is first equation of motion

Second equation of motion

From the graph the distance covered by the object during time t is given by the area of quadrangle DOEB

s = area of the quadrangle DOEB

= area of the rectangle DOEA + area of the triangle DAB

= (AE × OE) + (1/2 × AB × DA)

<u>s = $ut + \frac{1}{2}at^2$</u>

This is second equation of motion.

Third equation of motion

From the graph the distance covered by the object during time t is given by the area of the quadrangle DOEB.

Here DOEB is a trapezium.

Then,

S = area of trapezium DOEB

= 1/2 × sum of length of parallel side × distance between parallel sides

= 1/2 × (OD + BE) × OE

$= \frac{1}{2} \times (u + v) \times t$

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

Therefore $s = \frac{1}{2} \times (v + u) \times (\frac{v-u}{a})$

$\underline{2as = v^2 - u^2}$

Question Paper-II Multiple Choice Questions

1. Question

In a 100 m race, the winner takes 10s to reach the finishing point. The average speed of the winner is _____ ms^{-1}

A. 5

B. 10

C. 20

D. 40

Answer

Average Speed is defined as $\frac{\text{Distance Travelled}}{\text{Time Taken}}$, Distance is 100m and time taken is 10 sec, making Average Speed as 10 ms^{-1}.

2. Question

Force involved in uniform circular motion is given by _____

A. $f = \frac{mv^2}{r}$

B. f = mvr

C. $f = \frac{mr^2}{v}$

D. $f = \frac{v^2}{r}$

Answer

Acceleration in uniform circular motion is given by $\frac{v^2}{r}$ and Force is defined as mass $\times$ acceleration that is equal to $m\frac{v^2}{r}$.

Question Paper-II Choose Correct Statement

1. Question

Choose the correct statement

A. Action and reaction forces act on same object

B. Action and reaction forces act on different objects

C. Both (a) and (b) are possible

D. Neither (a) nor (b) is correct

Answer

Action and reaction act on different bodies. For example when we push a wall with our hand, the reaction of the wall is on our hand whereas action done by us is on the wall.

Question Paper-II Short Answer Type

1. Question

A motorcycle travelling at $20ms^{-1}$ has an acceleration of 4ms-2. What does it explains about the velocity of the motorcycle.

Answer

Since acceleration is positive, that means velocity of the body is increasing.

Explanation: from first equation of motion, we can see that final velocity changes for t =1s,2s,3s… as 24,28,32 ms^{-1} respectively.

2. Question

Complete of following sentences

a. The acceleration of the body that moves with a uniform velocity will be _____

b. A train travels from A to station B with a velocity of 100 km/h and returns from station B to station A with a velocity of 80km/h. Its average velocity during the whole journey in _____ and its average speed is _____

Answer

(a) Zero

An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force(acceleration).

(b) Zero, 89 km/h

let the distance from Station A to B be 's' km,

Then the time taken to travel from A to B 't1' = s/100 hours

The time taken to travel from B to A 't2' = s/80 hours.

Total time taken t1+t2

Total Distance Travelled = 2s km

Average speed = $\frac{\text{Total Distance}}{\text{time taken}} = \frac{2s}{\frac{s}{100}+\frac{s}{80}}$ = 89 km/h

Displacement will be zero, because initial and final positions are same.

Average Velocity = $\frac{\text{Total Displacement}}{\text{time taken}}$ = 0

3. Question

Distinguish speed and velocity.

Answer

Speed	velocity
It is the rate of change of distance	It is the rate of change of displacement
It is a scalar quantity having magnitude only	It is a vector quantity having both magnitude and direction
It is measured in m/s in SI system	It is also measured in ms^{-1} in SI system
Speed in any direction would be a positive quantity, since the distance in any direction is a positive quantity.	Velocity can have both positive and negative values. If velocity in one direction is assumed to be positive, then the velocity in the opposite direction would be a negative quantity. Velocity can have zero value also, even for an object under motion.

4. Question

What is meant by negative acceleration?

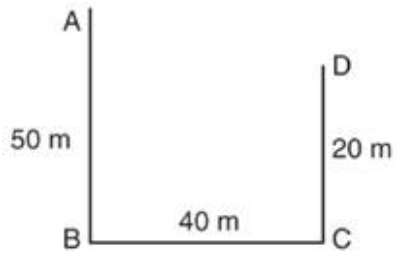
Answer

Negative Acceleration also known as Retardation or Deceleration is produced when the force on the object is applied to the opposite of the direction of the motion.

Question Paper-II Answer the Following Question

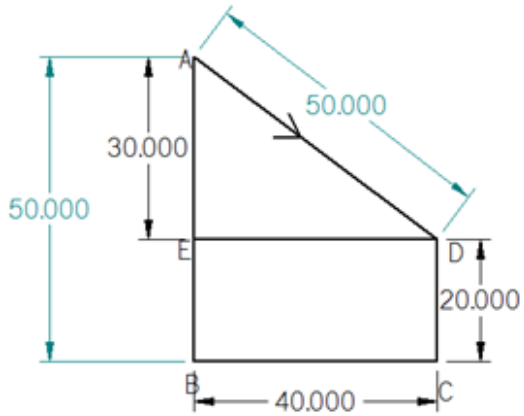
1. Question

A boy moves along the path ABCD. What is the total distance Covered by the boy? What is his net displacement?



Answer

Displacement will be shortest vector joining the initial position (A) and final position (D). Let us join A and D by a vector. The length of AD will be the displacement vector.



From the figure, For finding the length of AD, consider triangle ADE, using Pythagoras theorem.

$AD^2 = AE^2 + ED^2$

AD comes out to be 50 m.

Hence displacement = 50 m