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Solution 17

Yes, uniform circular motion is accelerated because the velocity changes due to continuous change in the direction of motion.

Solution 18

The speed of a body moving along a circular path is given by the formula:

where, v= speed

= 3.14 (it is a constant)

r = radius of circular path

t= time taken for one round of circular path

The speed of a body moving along a circular path is given by the formula:

$$v = \frac{2\pi r}{t}$$

where, v= speed

π=3.14 (it is a constant)

r= radius of circular path

t= time taken for one round of circular path

Solution 19

The motion of a body which is moving with constant speed in a circular path is said to be accelerated because its velocity changes continuously due to the continuous change in the direction of motion.

Solution 20

Uniform linear motion is uniform motion along a linear path or a straight line. T he direction of motion is fixed. So, it is not accelerated. For e.g: a car running with uniform speed of 10km/hr on a straight road.

Uniform circular motion is uniform motion along a circular path. T he direction of motion changes continuously. So, it is accelerated. For e.g: motion of earth around the sun.

Solution 21

An important characteristic of uniform circular motion is that the direction of motion in it changes continuously with time, so it is accelerated.

Centripetal force brings about uniform circular motion.

Solution 22

Initial velocity, u=?

Final velocity, v=0m/s (car is stopped)

Retardation, a=-2.5 m/s^2

Time, t=10s

v=u + at

0=u +(-2.5)x 10

u=25m/s

Solution 23

The velocity of this body is increasing at a rate of '10 metres per second' every second.

Initial velocity, u=0m/s

Time, t=2s

Acceleration, a=10m/s^2

The velocity of this body is increasing at a rate of '10 metres per second' every second.
Initial velocity, u=0m/s
Time, t=2s
Acceleration, a=10m/s^2
Using, $s = ut + \frac{1}{2}at^2$

$= 0 \times 2 + \frac{1}{2} \times 10 \times 2 \times 2$

$= 0 + 20 = 20$ m

Solution 24
Initial velocity, u=5m/s
Final velocity, v=?
Acceleration, a=0.2m/s^2
Time, t=10 sec
Using , v=u + at
v=5 + 0.2 x 10
v=5 + 2 =7 m/s
Now distance travelled in time is calculated;

Initial velocity, u=5m/s
Final velocity, v=?
Acceleration, a=0.2m/s^2
Time, t=10 sec
Using , v=u + at
v=5 + 0.2 x 10
v=5 + 2 =7 m/s
Now distance travelled in time is calculated;

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

$s = 5 \times 10 + \frac{1}{2} \times 0.2 \times 10 \times 10$

$s = 50 + 10 = 60$ m

Solution 25
Initial velocity, u=18km/h
Final velocity, v=0m/s
Time, t=2.5 sec
Acceleration, a=?
Using , v= u + at

Initial velocity, u=18km/h

$$u = 18 \times \frac{1000}{3600} = \frac{18000}{3600} m/s = 5m/s$$

Final velocity, v=0m/s
Time, t=2.5 sec
Acceleration, a=?
Using , v= u + at

$$a = \frac{v-u}{t} = \frac{0-5}{2.5} = -2m/s^2$$

So, retardation is 2m/s^2.

So, retardation is 2m/s^2.
Solution 26
Initial velocity, u=0m/s
Final velocity, v=?
Acceleration, a=0.2 m/s^2

Time, t=5min= 5 x60=300 sec
Using, v = u + at
v =0 + 0.2 x 300=60m/s
And the distance travelled is

Initial velocity, u=0m/s
Final velocity, v=?
Acceleration, a=0.2 m/s^2
Time, t=5min= 5 x60=300 sec
Using, v = u + at
v =0 + 0.2 x 300=60m/s
And the distance travelled is

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

$$s = 0 \times 300 + \frac{1}{2} \times 0.2 \times 300 \times 300$$

$$s = 0 + 9000 = 9000 \text{ m} = 9 \text{km}$$

Solution 27
(a) Distance and Time
(b) Speed (or velocity) and Time
Solution 28
Initial velocity,
u=0m/s
Final velocity, v=?
Acceleration, a=2m/s^2
Time, t=10s
(a) Using,
v = u + at
v=0 + 2 x 10= 20 m/s
(b)Distance travelled is:

Initial velocity, u=0m/s
Final velocity, v=?
Acceleration, a=2m/s^2
Time, t=10s
(a) Using, v = u + at
v=0 + 2 x 10= 20 m/s
(b) Distance travelled is:

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

$$s = 0 \times 10 + \frac{1}{2} \times 2 \times 10 \times 10$$

$$s = 0 + 100 = 100 \text{ m}$$

Solution 29
Initial velocity, u=20m/s
Time, t=30 s
Acceleration,
a=0.5m/s^2
Distance travelled is:

Initial velocity, u=20m/s
Time, t=30 s
Acceleration, a=0.5m/s^2
Distance travelled is:

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

$$s = 20 \times 30 + \frac{1}{2} \times 0.5 \times 30 \times 30$$

$$s = 600 + 225 = 825 \text{ m}$$

Solution 30
Initial velocity, u=15m/s
Final velocity, v=0m/s
Distance, s=18m
Acceleration, a=?
So, deceleration is 6.25 m/s^2.

Initial velocity, u=15m/s
Final velocity, v=0m/s
Distance, s=18m
Acceleration, a=?

using relation, $v^2 - u^2 = 2as$

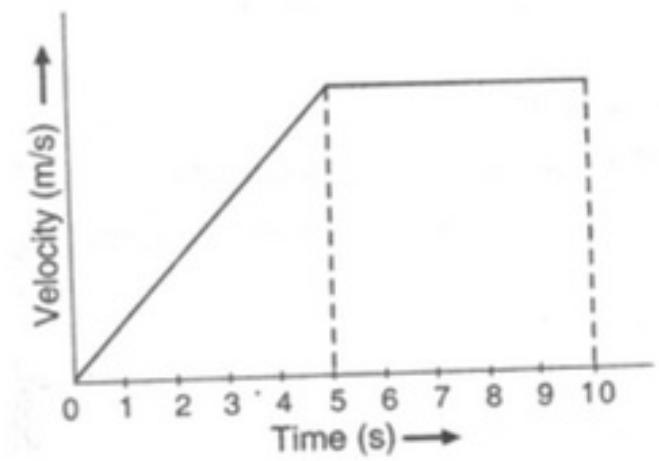
$$0^2 - (15)^2 = 2\,a \times 18$$

$$-225 = 36\,a$$

$$a = \frac{-225}{36} = -6.25 m/s^2$$

So, deceleration is 6.25 m/s^2.

Solution 31



Solution 32
(a) The train has a uniform velocity.
(b) There is no acceleration.
Solution 33
(a) v=u + at is the first equation of motion. It gives the velocity acquired by a body in time t when the body has initial velocity u and uniform acceleration a.
(b) Initial velocity, u=0m/s
Time, t=5 s
Distance, s=100m
Acceleration, a=?

Time, t=5 s

Distance, s=100m

Acceleration, a=?

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

$$100 = 0 \times 5 + \frac{1}{2} \times a \times 5 \times 5$$

$$100 = 0 + \frac{25a}{2}$$

$$a = \frac{200}{25} = 8m/s^2$$

Solution 34

(a) Consider a body having initial velocity 'u'. Suppose it is subjected to a uniform acceleration 'a' so that after time't' its final velocity becomes 'v'. Now, from the definition of acceleration we know that:

(b) Initial velocity, u=54km/h= 15m/s

Final velocity, v=0m/s

Time, t=8s

Acceleration, a=?

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time taken}}$$

$$\text{or Acceleration} = \frac{\text{Final velocity- Initial velocity}}{\text{time taken}}$$

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

$at = v - u$

and, $v = u + at$

where v=final velocity of the body

u= initial velocity of the body

a= acceleration

and t= time taken

(b) Initial velocity, u=54km/h= 15m/s

Final velocity, v=0m/s

Time, t=8s

Acceleration, a=?

$$a = \frac{v-u}{t} = \frac{0-15}{8} = \frac{-15}{8} m/s^2 = -1.875 m/s^2$$

Solution 35

(a) Suppose a body has an initial velocity 'u' and a uniform acceleration' a' for time 't' so that its final velocity becomes 'v'. Let the distance travelled by the body in this time be 's'. The distance travelled by a moving body in time 't' can be found out by considering its average velocity. Since the initial velocity of the body is 'u' and its final velocity is 'v', the average velocity is given by:

(b) Initial velocity, u=0m/s

Final velocity, v=36km/h=10m/s
Time, t=10min =10 x 60=600 sec

$$\text{Average velocity} = \frac{\text{Initial velocity + Final velocity}}{2}$$

That is, $\text{Average velocity} = \frac{u+v}{2}$

Also, Distance travelled = Average velocity x Time

So, $s = \left(\frac{u+v}{2}\right) \times t$ ----------(1)

From the first equation of motion ,we have, v = u+ at.
Put this value of v in equation (1), we get:

$$s = \left(\frac{u + u + at}{2}\right) \times t$$

or $s = \frac{(2u + at) \times t}{2}$

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

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

where, s= distance travelledby the body in time t
u = initial velocity of the body
and a= acceleration

$$\text{Acceleration} = \frac{\text{Final velocity- Initial velocity}}{\text{time taken}}$$

So, $a = \frac{v-u}{t} = \frac{10-0}{600} = \frac{10}{600} m/s^2 = \frac{1}{60} m/s^2 = 0.016 m/s^2$

Solution 36

(b) Initial velocity, u=0m/s
Final velocity, v=72km/h=20m/s
Time, t=10s

(i) $\text{Acceleration} = \frac{\text{Final velocity- Initial velocity}}{\text{time taken}}$

So, $a = \frac{v-u}{t} = \frac{20-0}{10} = \frac{20}{10} m/s^2 = 2 m/s^2$

(ii) $\text{Average velocity} = \frac{\text{Initial velocity + Final velocity}}{2}$

$\text{Average velocity} = \frac{0+20}{2} = \frac{20}{2} m/s = 10 m/s$

(iii) Distance travelled = Average velocity × Time
= 10 m/s × 10s = 100m

Solution 37
(a) When a body moves in a circular path with uniform speed (constant speed), its motion is called uniform circular motion. For e.g.
(i) Artificial satellites move in uniform circular motion around the earth.
(ii) Motion of a cyclist on a circular track.
(b) The speed of a body moving along a circular path is given by the formula:
Given, t=60 sec
Radius, r=10.5cm=0.105 m

$$v = \frac{2\pi r}{t}$$

Given, t=60 sec

Radius, r=10.5cm=0.105 m

$$v = \frac{2\pi r}{t} = \frac{2 \times 22 \times 0.105}{7 \times 60} = \frac{4.62}{420} = 0.011 m/s$$

********** END **********