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Question 1:
Distinguish between speed and velocity.
Answer 1:
Speed has only magnitude while velocity has both magnitude and direction. So speed is a scalar quantity but velocity is a vector quantity.

Question 2:
Under what condition(s) is the magnitude of average velocity of an object equal to its average speed?
Answer 2:
The magnitude of average velocity of an object will be equal to its average speed in the condition of uniform velocity in a straight line motion.

Question 3:
What does the odometer of an automobile measure?
Answer 3:
In automobiles, odometer is used to measure the distance.

Question 4:
What does the path of an object look like when it is in uniform motion?
Answer 4:
In the case of uniform motion, the path of an object will look like a straight line.

Question 5:
During an experiment, a signal from a spaceship reached the ground station in five minutes. What was the distance of the spaceship from the ground station? The signal travels at the speed of light, that is, 3×10^8 ms^{-1}.
Answer 5:
Here we have, speed = 3×10^8 m/s
Time = 5 minute = 5×60 s = 300 s
Using, Distance = Speed × Time
$\Rightarrow$ Distance = $3 \times10^8 \times 300$ m = 900×10^8 m= 9.0×10^{10} m

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Question 1:

When will you say a body is in **(i)** uniform acceleration? **(ii)** non-uniform acceleration?

Answer 1:

(i) A body is said in uniform acceleration when its motion is along a straight line and its velocity changes by equal magnitude in equal interval of time.

(ii) A body is said in non-uniform acceleration when its motion is along a straight line and its velocity changes by unequal magnitude in equal interval of time.

Question 2:

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

Answer 2:

Here, $u = 80\ km/h = \frac{80\times1000}{3600}\ ms^{-1} = \frac{200}{9}\ ms^{-1}$

$v = 60\ km/h = \frac{60\times1000}{3600}\ ms^{-1} = \frac{150}{9}\ ms^{-1}$

$t = 5\ s$

Therefore, acceleration, a = ?

We know that, v = u + at

$$\Rightarrow a = \frac{v-u}{t} = \frac{\left(\frac{150}{9}-\frac{200}{9}\right)}{5} = \frac{-\frac{50}{9}}{5} = -\frac{10}{9} = -1.1\ ms^{-2}$$

Therefore, Acceleration is $-1.1\ ms^{-2}$.

Question 3:

A train starting from a railway station and moving with uniform acceleration attains a speed of 40 km/h in 10 minutes. Find its acceleration.

Answer 3:

Here we have,

Initial velocity, u = 0 m/s

Final velocity, v = 40 km/h = $= \frac{40\times1000}{3600}\ ms^{-1} = \frac{100}{9}\ ms^{-1}$

Time (t) = 10 minute = 60 × 10 = 600 s

Acceleration (a) =?

We know that, v = u + at

$$\Rightarrow a = \frac{v-u}{t} = \frac{\left(\frac{100}{9}-0\right)}{600} = \frac{1}{54} = 0.0185\ ms^{-2}$$

$\Rightarrow a = 0.0185\ ms^{-2}$

Science

(Chapter – 8) (Motion)

(Class – IX)

Exercises

Question 1:

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

Answer 1:

Time taken = 2 min 20 sec = 140 sec.

Radius, r = 100 m.

In 40 sec the athlete complete one round.

So, in 140 sec the athlete will complete = 140 ÷ 40 = 3.5 round.

⇒ Distance covered in 140 sec = $2\pi r \times 3.5 = 2 \times 22/7 \times 100 \times 3.5 = 2200$ m.

At the end of his motion, the athlete will be in the diametrically opposite position.

⇒ Displacement = diameter = 200 m.

Question 2:

Joseph jogs from one end A to another end B of a straight 300 m road in 2 minutes and 30 sec 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 **(b)** from A to C?

Answer 2:

(a) For motion from A to B:

Distance covered = 300 m

Displacement = 300 m.

Time taken = 150 sec.

We know that, Average speed = Total distance covered ÷ Total time taken

= 300 m ÷ 150 sec = 2 ms^{-1}

Average velocity = Net displacement ÷ time taken

= 300 m ÷ 150 sec = 2 ms^{-1}

(b) For motion from A to C:

Distance covered = 300 + 100 = 400 m.

Displacement = AB - CB = 300 - 100 = 200 m.

Time taken = 2.5 min + 1 min = 3.5 min = 210 sec.

Therefore, Average speed = Total distance covered ÷ Total time taken

= 400 ÷ 210 = 1.90 ms^{-1}.

Average velocity = Net displacement ÷ time taken

= 200 m ÷ 210 sec = 0.952ms^{-1}.

Question 3:

Abdul, while driving to school, computes the average speed for his trip to be 20 kmh^{-1}. On his return trip along the same route, there is less traffic and the average speed is 30 kmh^{-1}. What is the average speed of Abdul's trip?

Answer 3:

Let one side distance = x km.

Time taken for forward trip at a speed of 20 km/h = Distance / Speed = $x/20$ h.

Time taken in return trip at a speed of 30 km/h = $x/30$ h.

Total time for the whole trip $= \frac{x}{20} + \frac{x}{30} = \frac{3x+2x}{60} = \frac{5x}{60}$ h.

Total distance covered = $2x$ km.

We know, Average speed = Total distance ÷ Total time

$= 2x \div (5x/60) = 24$ kmh^{-1}.

Question 4:

A motor boat starting from rest on a lake 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?

Answer 4:

Here, u = 0 m/s

a = 3 ms^{-2}

t = 8 s

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

$s = 0 \times 8 + \frac{1}{2} \times 3 \times 8^2 = 96$ m.

Question 9:

State which of the following situations are possible and give an example of each of the following:

(a) an object with a constant acceleration but with zero velocity,

(b) an object moving in a certain direction with an acceleration in the perpendicular direction.

Answer 9:

(a) Yes, a body can have acceleration even when its velocity is zero. When a body is thrown up, at highest point its velocity is zero but it has acceleration equal to acceleration due to gravity.

(b) Yes, an acceleration moving horizontally is acted upon by acceleration due to gravity that acts vertically downwards.

Question 10:

An artificial is moving in a circular orbit of radius 42250 km. Calculate its speed if it takes 24 hrs to revolve around the earth.

Answer 10:

Here,

$r = 42250 \text{ km} = 42250000 \text{ m}$

$T = 24 \text{ h} = 24 \times 60 \times 60 \text{ s}$

Using Speed, $v = 2\pi r \div T$

$v = (2 \times 3.14 \times 42250000) \div (24 \times 60 \times 60) \text{ m/s}$

$= 3070.9 \text{ m/s} = 3.07 \text{ km/s}$