

ANITHA SHREE

DEPARTMENT OF PHYSICS

PON VIDYASHRAM SENIOR SECONDARY SCHOOL, VVKM (2026 – 27)

STD: IX

CLASS WORK NOTES

SUB: PHYSICS

MOTION

I.VERY SHORT ANSWER TYPE (2 MARKS)

1.Under what condition is the magnitude of average velocity equal to average speed?

Answer:

When an object moves along a straight line without changing its direction, the distance travelled is equal to displacement. Therefore, average speed equals the magnitude of average velocity.

2.Give an example of a body which may appear moving for one person and stationary for the other.

Answer:

A passenger sitting inside a moving train appears stationary to another passenger in the same train but appears moving to a person standing on the platform.

3. How can we describe the location of an object?

Answer:

The location of an object can be described with respect to a reference point called the origin.

4. Express average velocity when the velocity of a body changes at a non-uniform rate and a uniform rate.

Answer: For uniform acceleration:

$$\text{Average Velocity} = (u + v)/2$$

For non-uniform motion:

$$\text{Average Velocity} = \text{Total Displacement} / \text{Total Time}$$

5.A particle is moving in a circular path of radius r. What would be the displacement after half a circle?

Answer:

$$\begin{aligned} \text{Displacement after half revolution} &= \text{Diameter} \\ &= 2r \end{aligned}$$

II.SHORT ANSWER TYPE (2 MARKS)

1.A bus starting from rest moves with a uniform acceleration of 0.1 m/s^2 for 2 minutes. Find:

(a) Speed acquired (b) Distance travelled

a) Speed acquired

Given

$$u = 0 \text{ m/s}$$

$$a = 0.1 \text{ m/}$$

$$t = 2 \text{ min} = 120 \text{ s}$$

Formula

ANITHA SHREE

DEPARTMENT OF PHYSICS

$$v = u + at$$

Calculation

$$v = 0 + (0.1 \times 120)$$

$$v = 12 \text{ m/s}$$

Answer:

Speed acquired = 12 m/s

(b) Distance travelled

Formula

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

Calculation

$$s = 0 + \frac{1}{2} \times 0.1 \times (120)^2$$

$$s = 0.05 \times 14400$$

$$s = 720 \text{ m}$$

Answer:

Distance travelled = 720 m

2. A train is travelling at 90 km/h. Brakes produce retardation of 0.5 m/s^2 . Find stopping distance.

Given

$$u = 90 \text{ km/h} = 25 \text{ m/s}$$

$$v = 0$$

$$a = -0.5 \text{ m/s}^2$$

Formula

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

Calculation

$$0 = 25^2 + 2(-0.5)s$$

$$0 = 625 - s$$

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

Answer

Stopping distance = 625 m

3. A trolley moving down an incline has acceleration 2 cm/s^2 . Find velocity after 3 s.

Given

$$u = 0$$

$$a = 2 \text{ cm/s}^2$$

$$t = 3 \text{ s}$$

Formula

$$v = u + at$$

Calculation

$$v = 0 + 2 \times 3$$

$$v = 6 \text{ cm/s}$$

Answer

Velocity = 6 cm/s

4. Train accelerates from 20 km/h to 80 km/h in 4 min. Find distance.

Given

$$u = 20 \text{ km/h} = 5.56 \text{ m/s}$$

$$v = 80 \text{ km/h} = 22.22 \text{ m/s}$$

$$t = 240 \text{ s}$$

Formula

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

ANITHA SHREE

DEPARTMENT OF PHYSICS

Calculation

$$s = [(5.56 + 22.22)/2] \times 240$$

$$s = 13.89 \times 240$$

$$s = 3333.6 \text{ m}$$

Answer

$$\text{Distance} = 3333.6 \text{ m} \approx 3.33 \text{ km}$$

5. Insect moving in circular path of radius 10 cm takes 11 min to reach diametrically opposite point.

Distance

$$\text{Distance} = \pi r$$

$$= 3.14 \times 10$$

$$= 31.4 \text{ cm}$$

Speed

$$\text{Speed} = 31.4/11$$

$$= 2.85 \text{ cm/min}$$

Displacement

$$= \text{Diameter}$$

$$= 20 \text{ cm}$$

Average Velocity

$$= 20/11$$

$$= 1.82 \text{ cm/min}$$

Answers

$$\text{Distance} = 31.4 \text{ cm}$$

$$\text{Speed} = 2.85 \text{ cm/min}$$

$$\text{Displacement} = 20 \text{ cm}$$

$$\text{Average Velocity} = 1.82 \text{ cm/min}$$

6. A boy runs for 10 min at 9 km/h. At what speed should he run for next 20 min to make average speed 12 km/h?

Given

$$\text{Average speed} = 12 \text{ km/h}$$

$$\text{Total time} = 30 \text{ min} = 0.5 \text{ h}$$

Total distance

$$= 12 \times 0.5$$

$$= 6 \text{ km}$$

Distance in first 10 min

$$= 9 \times (1/6)$$

$$= 1.5 \text{ km}$$

Distance in next 20 min

$$= 6 - 1.5$$

$$= 4.5 \text{ km}$$

Required speed

$$= 4.5 \div (1/3)$$

$$= 13.5 \text{ km/h}$$

Answer

$$13.5 \text{ km/h}$$

ANITHA SHREE

DEPARTMENT OF PHYSICS

III.LONG ANSWER TYPE (5 MARKS)

1.A car in a 100 m race leaves 4 m in first second, 30 m in next 4 s, 52 m in another 4 s and finishes the race in 10 s. Calculate:

(i) Average velocity of the car (ii) Time interval during which the average velocity attained by the car is maximum

i) Average velocity of the car

Given:

Distance covered in first 1 s = 4 m

Distance covered in next 4 s = 30 m

Distance covered in another 4 s = 52 m

Total distance = 100 m

Total time = 10 s

Formula:

Average Velocity = Total Displacement / Total Time

Since the car moves in a straight line,

Displacement = Distance = 100 m

Calculation:

Average Velocity = $100 / 10$

= 10 m/s

Answer:

Average Velocity = 10 m/s

(ii) Time interval during which the average velocity attained by the car is maximum

Calculation:

Time Interval	Distance Covered	Average Velocity
First 1 s	4 m	$4/1 = 4 \text{ m/s}$
Next 4 s	30 m	$30/4 = 7.5 \text{ m/s}$
Another 4 s	52 m	$52/4 = 13 \text{ m/s}$
Last 1 s	14 m	$14/1 = 14 \text{ m/s}$

Distance covered in last second:

= $100 - (4 + 30 + 52)$

= $100 - 86$

= 14 m

Average velocity during last second:

= $14/1$

= 14 m/s

Answer:

Maximum average velocity = 14 m/s

It occurs during the last 1 second (from 9 s to 10 s).

2. Athlete completes one round of circular track (diameter 200 m) in 40 s. Find distance and displacement after 2 min 20 s.

Given

Diameter = 200 m

Time = 140 s

Rounds completed = $140/40 = 3.5$

ANITHA SHREE

DEPARTMENT OF PHYSICS

Distance

Circumference = πd

= 200π

Distance = $3.5 \times 200\pi$

= 700π

$\approx 2200 \text{ m}$

Displacement

After 3.5 rounds athlete reaches diametrically opposite point.

Displacement = Diameter

= 200 m

Answer

Distance = 2200 m

Displacement = 200 m