	INDIAN SCHOOL AL WADI AL KABIR	
Class: IX	**Department: SCIENCE 2026– 27** **SUBJECT: PHYSICS**	**Date: 18/08/2026**
Worksheet No: 03 **WITH ANSWERS**	**CHAPTER / UNIT: Describing Motion Around Us – Part 2**	**Note:** **A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.:**

OBJECTIVE TYPE OF QUESTIONS (1 MARK):

1) In a distance-time graph, a straight line with a constant positive slope indicates that the object is moving with:
   a) Constant acceleration
   b) Constant speed
   c) Increasing speed
   d) Zero velocity

2) The slope of a velocity-time (v-t) graph represents which physical quantity?
   a) Displacement
   b) Average speed
   c) Acceleration
   d) Total distance

3) The area enclosed under a velocity-time graph represents the magnitude of:
   a) Acceleration
   b) Displacement
   c) Force
   d) Average velocity

4) A car starts from rest and accelerates uniformly at $2\ m/s^2$ for 10 seconds. What is its final velocity?
   a) 5 m/s
   b) 10 m/s
   c) 20 m/s
   d) 100 m/s

5) Why is uniform circular motion considered an accelerated motion even if the speed is constant?
   a) Because the radius is changing.
   b) Because the mass of the object changes.
   c) Because the direction of motion is constantly changing.
   d) Because the object covers unequal distances in equal time.

6) If a distance-time graph is a horizontal straight line parallel to the time axis, the speed of the object is:
   a) Constant and non-zero
   b) Increasing
   c) Decreasing
   d) Zero

7) Suppose a boy is enjoying a ride on a merry-go-round which is moving with a constant speed of $10\ m/s$. It implies that the boy is:
   a) At rest
   b) Moving with no acceleration
   c) In accelerated motion
   d) Moving with uniform velocity

8) Area under a $v - t$ graph represents a physical quantity which has the unit:
   a) m^2
   b) m
   c) m/s
   d) m/s^2

9) The slope of a distance-time graph for an object at rest is:
   a) 1
   b) Infinite
   c) 0
   d) Negative

10) An object is moving in a circular path of radius r with a constant speed. The time taken for one complete revolution is t. The velocity v is given by:
   a) $v = \pi r^2/t$
   b) $v = 2\pi r/t$
   c) $v = 2\pi rt$
   d) $v = r/t$

ASSERTION AND REASONING TYPE OF QUESTIONS (1 MARK):

DIRECTION: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

   a) Both A and R are true, and R is the correct explanation of A.
   b) Both A and R are true, and R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true

11) **Assertion (A):** A body can have a constant speed and still be accelerating.
Reason (R): In uniform circular motion, the speed remains constant but the direction of velocity changes continuously.

12) **Assertion (A):** The slope of a distance-time graph for an object at rest is zero.
Reason (R): For an object at rest, the distance traveled does not change with time.

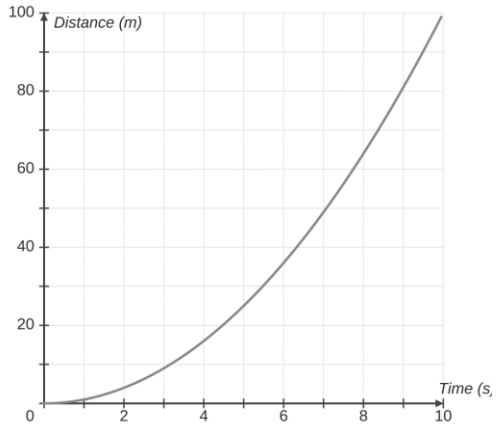
13) **Assertion (A):** A stone tied with a piece of thread describing a circular path with constant velocity on being released moves in a straight line.
Reason (R): Along the circular path, the direction of motion remains the same at every point.

VERY SHORT ANSWER TYPE OF QUESTIONS: (2 MARK)

14) Define uniform circular motion. Why is this type of motion considered to be accelerated motion even if the speed remains constant?

15) An artificial satellite is moving in a circular orbit of radius 42,250 km. Calculate its speed if it takes 24 hours to revolve around the Earth. Express your final answer in km/s.

16) Look at the graph below. Identify the type of motion represented by this curved distance-time graph and explain what is happening to the speed.



17) A merry-go-round of radius 10.5 m completes one revolution in 3 s. Calculate the average speed of a child seated at the rim.

SHORT ANSWER TYPE OF QUESTIONS (3 MARK):

18) A bus travelling at 15 m s^{-1} is brought to rest in 3 s by applying brakes with uniform retardation. Find (i) the retardation, and (ii) the distance travelled before the bus stops.

19) A truck driver travelling at 54 km h^{-1} sees a speed-limit sign and slows down uniformly to 36 km h^{-1} in 30 s.
(i) Find the acceleration (retardation) of the truck.
(ii) Find the distance travelled by the truck during this 30 s.

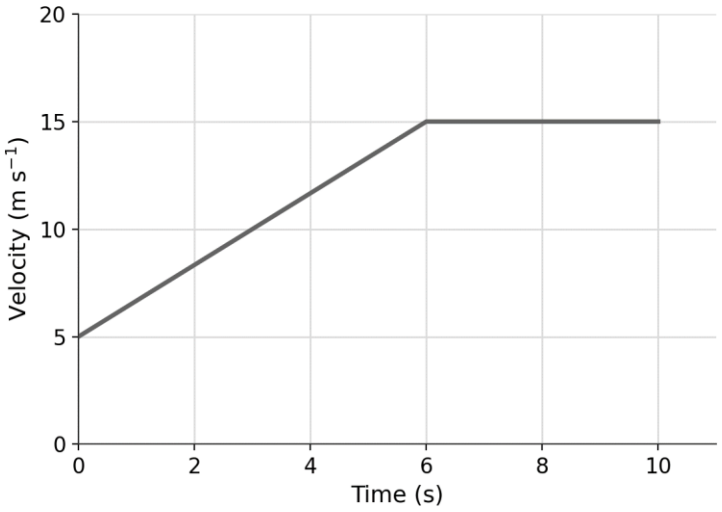
20) A car is moving on a straight road with a uniform acceleration. The following table gives the speed of the car at various instant of time.

Time(s)	0	10	20	30	40	50
Speed (m/s)	5	10	15	20	25	30

(i) Draw the shape of speed-time graph representing the above sets of observations.
(ii) Find the acceleration of the car.

LONG ANSWER TYPE OF QUESTIONS (5 MARK):

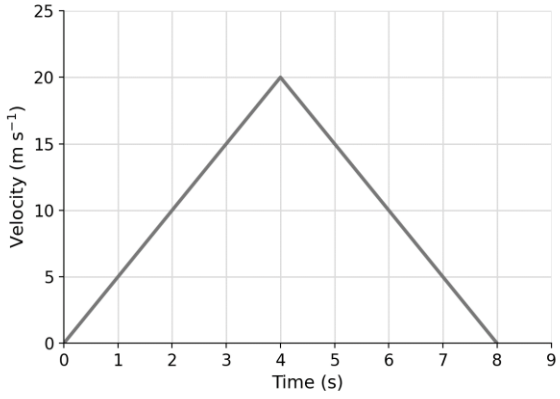
21) The velocity-time graph below shows the motion of a runner over 10 seconds.



a. Find the acceleration of the runner during the first 6 seconds.
b. Find the acceleration of the runner during the last 4 seconds.
c. Calculate the total distance covered by the runner in the 10 seconds, using the area under the graph.
d. What is the average velocity of the runner over the complete 10 s?

22) A car starts from rest and accelerates uniformly to 20 m s^{-1} in 5 s. It then travels at this constant velocity for 10 s, and finally applies the brakes to stop uniformly in 4 s.
a. Draw the velocity-time graph for the entire motion, labelling all values on the axes.
b. Find the acceleration of the car in each of the three phases.
c. Find the total distance travelled by the car using the area under the graph.

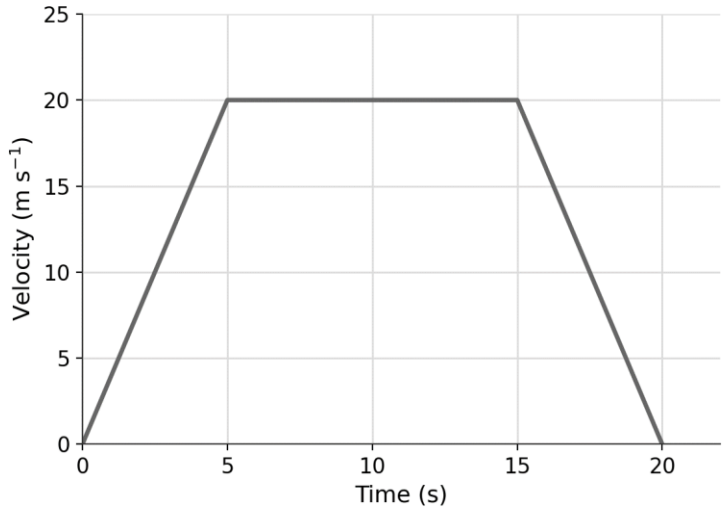
23) The velocity-time graph of an object is given below.



a. Find the acceleration of the object during the first 4 seconds and during the next 4 seconds.

b. Using the area under the graph, find the total distance travelled by the object in 8 s.

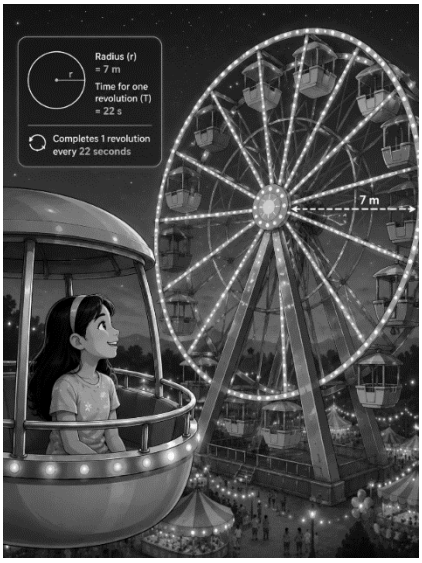
24) The velocity-time graph below shows the motion of an object over 20 s.



a. Shade region of the graph that represents the displacement while the object moves with constant velocity, and calculate this displacement.
b. Shade the region representing the displacement while the velocity is decreasing, and calculate this displacement.
c. Calculate the total displacement over the full 20 s.

CASE STUDY TYPE OF QUESTIONS (4 MARK):

25) Every year, a large village fair is held near Meera's town, complete with food stalls, music, and a brightly lit giant wheel that can be seen from far away. This year, Meera finally convinces her parents to let her take a ride on it with her cousin. The giant wheel has a radius of 7 m and rotates at a constant speed, completing one full revolution every 22 seconds. As their cabin rises to the top and comes back down, again and again, Meera notices that she keeps pressing slightly against the side of the cabin even though the ride never seems to speed up or slow down — a detail that makes her wonder about the physics of her circular ride. She enjoys four complete revolutions before the wheel gradually stops for the next set of riders.

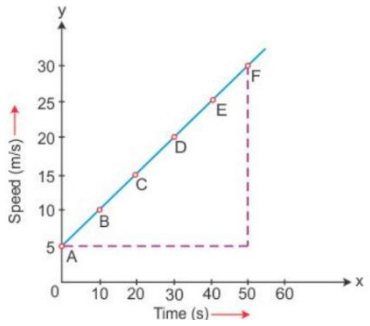


Answer the following questions based on the above scenario:

a) Calculate the distance travelled by Meera's cabin in one complete revolution.
b) What is Meera's net displacement after the four complete revolutions?
c) Is Meera's cabin accelerating at any point during the ride, even though her speed is constant? Explain.
d) Calculate Meera's average speed during the ride.

ANSWER KEY	
1	b) Constant speed
2	c)Acceleration
3	b)Displacement
4	c)20 m/s
5	c)Because the direction of motion is constantly changing.
6	d)Zero
7	c)In accelerated motion
8	b) m
9	c) 0
10	$b)\ v = 2\pi r/t$
11	a)Both A and R are true, and R is the correct explanation of A.
12	a)Both A and R are true, and R is the correct explanation of A.
13	c)A is true but R is false.
14	Uniform circular motion occurs when an object travels along a circular path at a constant speed. It is considered an accelerated motion because velocity is a vector quantity that depends on both speed and direction; as the object moves, its direction changes continuously at every point.

15	Speed = distance/time 1 hour = 3,600 seconds $24 \text{ hours} = 24 \times 3,600 = \mathbf{86,400} \text{ seconds}$ $\text{Distance} = 2 \times \pi \times 42,250 \text{ km}$ $\text{Distance} \approx \mathbf{265,464.58} \text{ km}$ $v = \frac{265{,}464.58 \text{ km}}{86{,}400 \text{ s}}$ $v \approx \mathbf{3.07} \text{ km/s}$
16	Non uniform motion/ Accelerated motion. Speed is increasing.
17	Speed = distance/time Radius (r) = 10.5 m Time (T) = 3 s Distance = $2\pi r$ = 65.97 m Speed = 65.97/3 = 21.99 m/s
18	a = v-u / t = 0 – 15 / 3 a = -5 m/s^2 Hence retardation is 5 m/s^2 $v^2 = u^2 + 2as$ $s = \frac{v^2 - u^2}{2a}$ $s = \frac{0^2 - (15)^2}{2 \times (-5)}$ $s = \frac{-225}{-10} = \mathbf{22.5} \text{ m}$
19	Initial velocity (u) = $54 \text{ km h}^{-1} = 54 \times \frac{5}{18} = \mathbf{15} \text{ m s}^{-1}$ Final velocity (v) = $36 \text{ km h}^{-1} = 36 \times \frac{5}{18} = \mathbf{10} \text{ m s}^{-1}$ a = v-u/t = 10 – 15 / 30 = -1/6 m/s^2 $v^2 = u^2 + 2as$ $10^2 = 15^2 + 2(-1/6)s$

	S = 375 m
20	a)  b) $a = \frac{30-5}{50-0} = 0.5\ m/s^2$
21	**a. Acceleration during the first 6 seconds** $$a = \frac{v-u}{t}$$ $$a = \frac{15-5}{6} = \frac{10}{6}$$ $$\boxed{a = 1.67\ \text{m s}^{-2}}$$ **b. Acceleration during the last 4 seconds** The velocity remains constant at 15 m s^{-1}. $$a = \frac{15-15}{4}$$ $$\boxed{a = 0\ \text{m s}^{-2}}$$ **c. Total distance covered** Distance = **Area under the velocity–time graph** The area consists of a **trapezium** from 0–6 s and a **rectangle** from 6–10 s. **Area of trapezium:** $$= \frac{1}{2}(5+15)(6)$$ $$= 60\ \text{m}$$ **Area of rectangle:** $$= 15 \times 4 = 60\ \text{m}$$ Total distance = 120 m **d. Average velocity** $$\text{Average velocity} = \frac{\text{Total displacement}}{\text{Total time}}$$ Since the motion is entirely in the same direction: $$= \frac{120}{10}$$ $$\boxed{\text{Average velocity} = 12\ \text{m s}^{-1}}$$

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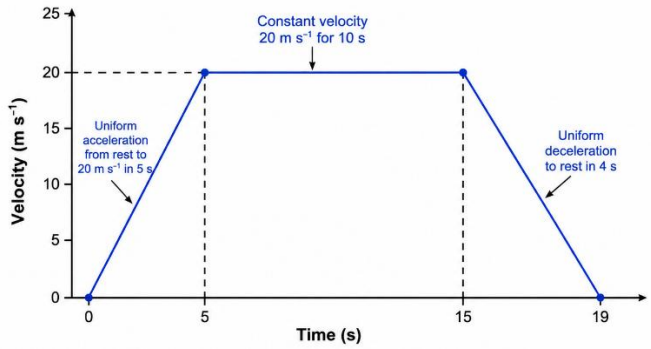
(i) **Velocity–time graph**



(ii) Acceleration in each phase

1. First phase (0–5 s):

$$a = \frac{20 - 0}{5} = \boxed{4\ \text{m/s}^2}$$

2. Second phase (5–15 s):

$$a = \frac{20 - 20}{10} = \boxed{0\ \text{m/s}^2}$$

3. Third phase (15–19 s):

$$a = \frac{0 - 20}{4} = \boxed{-5\ \text{m/s}^2}$$

Total distance travelled = area under the velocity–time graph

The area under the graph = Area of triangle (0–5 s) + Area of rectangle (5–15 s) + Area of triangle (15–19 s)

Area of first triangle = $\frac{1}{2}$ × base × height = $\frac{1}{2}$ × 5 × 20 = 50 m

Area of rectangle = length × breadth = 10 × 20 = 200 m

Area of last triangle = $\frac{1}{2}$ × base × height = $\frac{1}{2}$ × 4 × 20 = 40 m

Total distance travelled = 50 + 200 + 40 = 290 m

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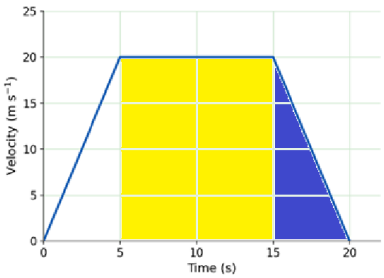
a=v-u/t = 20-0/4 = 5 m/s^2

a=v-u/t = 0-20/4 = -5 m/s^2

$$\text{Distance} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 8 \times 20$$

$$\boxed{\text{Distance} = 80\ \text{m}}$$

24	 Yellow color – Constant velocity Blue color – Decreasing velocity Distance covered with constant velocity: Area = (l)(b) =10(20)= 200 m Distance covered during decreasing velocity: Area = ½ (b)(h) = ½ (5)(20)=50 m Total displacement: Area = ½ (20+10)(20)=300 m
25	a) Distance = 2πr = 44 m b) Zero c) Yes, the cabin **is accelerating** throughout the ride. Acceleration means a change in **velocity** (which depends on both speed and direction). Even though the **speed is constant**, the **direction of motion is continuously changing** as the cabin moves in a circle. This change in direction implies a **centripetal acceleration** directed **towards the centre** of the wheel at all times. d) Average speed: $$v_{\text{avg}} = \frac{s_{\text{total}}}{t_{\text{total}}} = \frac{56\pi}{88} = \frac{14\pi}{22} = \frac{7\pi}{11} \approx 2.0 \text{ m s}^{-1}$$

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