	INDIAN SCHOOL AL WADI AL KABIR	
Class: IX	**Department: SCIENCE 2026– 27** **SUBJECT: PHYSICS**	**Date: 23/04/2026**
Worksheet No: 02 **WITH ANSWERS**	**CHAPTER / UNIT: Describing Motion Around Us – Part 1**	**Note:** **A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.:**

OBJECTIVE TYPE OF QUESTIONS (1 MARK):

1) Which of the following is a scalar quantity?
   a) Acceleration
   b) Velocity
   c) Speed
   d) Displacement

2) Displacement depends on:
   a) Speed
   b) Path length
   c) Total distance travelled
   d) Initial and final position

3) A car moves 60 km north and then 80 km south. Its displacement is:
   a) 20 km south
   b) 20 km north
   c) 80 km
   d) 140 km

4) Which of the following can be negative?
   a) Time
   b) Speed
   c) Distance
   d) Velocity

5) A body moving with uniform velocity has:
   a) Increasing acceleration
   b) Negative acceleration
   c) Constant acceleration
   d) Zero acceleration

6) If velocity decreases with time, acceleration is:
   a) Positive
   b) Constant positive
   c) Negative
   d) Zero

7) A runner completes one round of a circular track of radius 70 m in 40 seconds. What is the average velocity?
   a) 0 m/s
   b) 11 m/s
   c) 3.5 m/s
   d) 7 m/s

8) The numerical ratio of displacement to distance for a moving object is
   a) Always less than 1
   b) Always equal to 1
   c) Always more than 1
   d) Equal or less than 1

9) A student claims: "If average speed is equal to average velocity, the motion must be along a straight line." Is this correct?
   a) Yes, because displacement equals distance only in straight-line motion
   b) No, because average speed and velocity are always equal
   c) Yes, but only if acceleration is zero
   d) No, because displacement can equal distance in circular motion too

10) A body moving in a straight line covers successive distances of 10 m, 20 m, and 30 m in equal intervals of time. Which statement is correct
   a) The body has uniform velocity
   b) The body has uniform acceleration
   c) The body has non-uniform acceleration
   d) The body is at rest

ASSERTION AND REASONING TYPE OF QUESTIONS (1 MARK):

DIRECTIONS: 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:** Velocity can be negative, but speed cannot.
   Reason: Speed is a scalar quantity, while velocity is a vector quantity.

12) **Assertion:** A body moving with uniform speed in a straight line has zero acceleration.
   Reason: Acceleration is the rate of change of velocity, and velocity is constant in this case.

13) **Assertion:** Average speed and average velocity of a moving body may be equal.
Reason: Distance travelled is always equal to displacement.

14) **Assertion:** The speedometer of an automobile measures the average speed of the automobile.
Reason: Average velocity is equal to total displacement per total time taken.

15) **Assertion**: An object can have zero velocity and still have non-zero acceleration.
Reason: Acceleration is the rate of change of velocity, and the velocity can be momentarily zero while it is changing.

VERY SHORT ANSWER TYPE OF QUESTIONS: (2 MARKS)

16) A bus decreases its speed from 80 km h^{-1} to 60 km h^{-1} in 5 s. Find the acceleration of the bus.
17) Ram travels on a straight road. He goes from position A to position B. The distance between A and B is 4 km. Now, from position B, he turns back and travels a distance of 2 km to reach position C. Find the total distance travelled by Ram during the whole journey and the magnitude of displacement.
18) Give an example of a body under positive acceleration and a body under negative acceleration.
19) What is the numerical ratio of average velocity to average speed of an object when it is moving in a straight path without changing direction?

SHORT ANSWER TYPE OF QUESTIONS (3 MARKS):

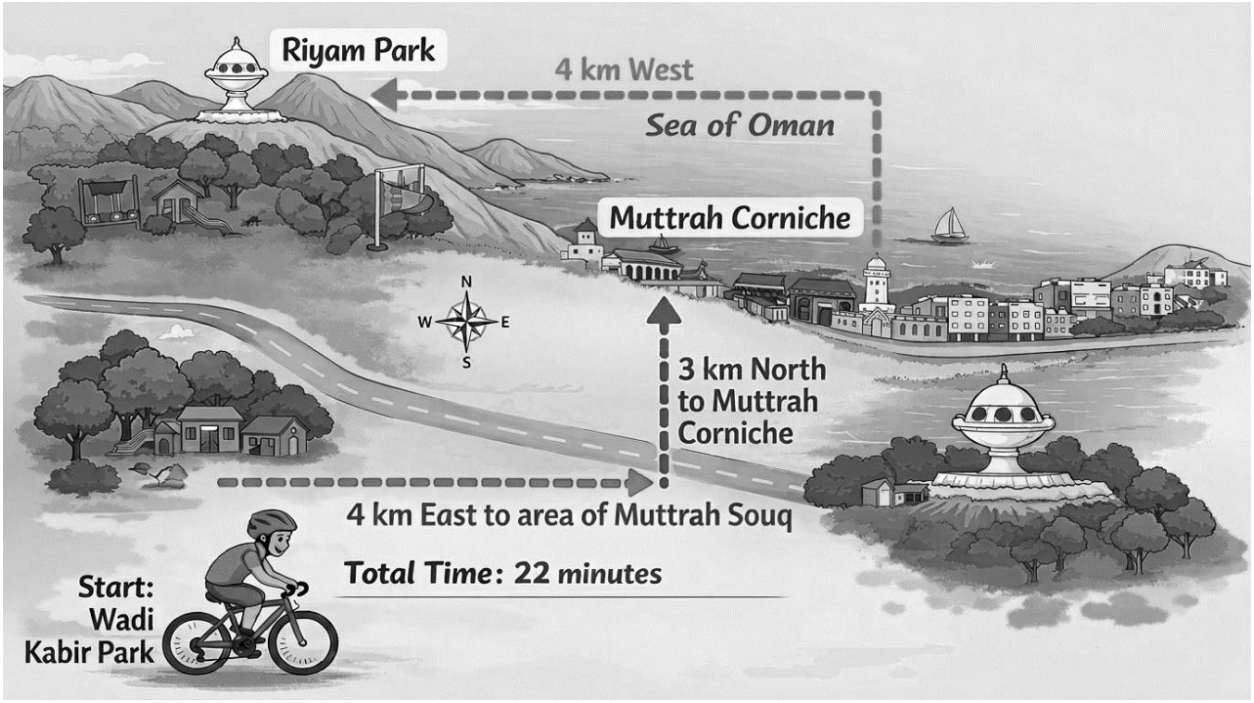
20) A body travels from A to B at 40 m/s and from B to A at 60 m/s. Calculate the average speed and average velocity.
21) A car travels along a straight line for the first half of the time with a speed of 50 km/h and the second half of the time with a speed of 60 km/h. Find the average speed of the car.
22) A train moves with a speed of 30 km/h in the first 15 minutes, with another speed of 40 km/h in the next 15 minutes, and then with a speed of 60 km/h in the last 30 minutes. Calculate the average speed of the train for this journey.
23) An athlete runs along a circular track of radius 100 m. Calculate the displacement of the athlete and the distance travelled by him when he covers $3/4^{th}$ of the track.
24) A cyclist travels a distance of 4 km from A to B and then moves a distance of 3 km at right angle to AB. Find his resultant displacement and total distance travelled.
25) A bus starting from rest moves with a uniform acceleration of 0.1 ms^{-2} for 2 minutes. Find the speed acquired.

LONG ANSWER TYPE OF QUESTIONS (5 MARKS):

26) The minute hand of a wall clock is 10 cm long. Find its displacement and distance covered from 10:00 am to 10:30 am.
27) On a 120 km track, a train travels the first 30 km at a uniform speed of 30 km/h. How fast must the train travel in the next 90 km to achieve an average speed of 60 km/h for the entire trip?
28) Arrange the following speeds in ascending order:
10 m/s, 200 m/min, 30 km/min, 54 km/h, and 10 m/h
29) Anand leaves his house at 8:30 am for his school. The school is 2 km away, and classes start at 9:00 am. If he walks at a speed of 3 km/h for the first kilometre, at what speed should he walk the second kilometre to reach just in time?

CASE STUDY TYPE OF QUESTIONS (4 MARKS):

30) Early on a cool weekend morning, Aarav set out on a cycling trip through some of the most vibrant areas of Muscat. Curious to understand his motion better, he switched on a fitness tracking app that recorded both the distance travelled and the direction of movement.
He began his journey from his home near Wadi Kabir Park. From there, he cycled along a straight road 4 km towards the East, reaching the busy marketplace area of Muttrah Souq.
After enjoying the lively surroundings, Aarav turned left and continued cycling 3 km towards the North, moving along the scenic coastal road until he reached the beautiful Muttrah Corniche, where he stopped briefly to admire the sea.
Feeling refreshed, Aarav resumed his ride. He then took a route heading 4 km towards the West, eventually reaching near Riyam Park.
At the end of his journey, Aarav noticed something interesting—although he had travelled quite a distance and changed directions multiple times, he was still not very far from where he had started. His fitness app showed that the total time taken was 22 minutes.



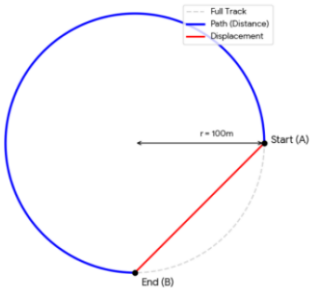
Answer the following questions based on the above scenario:

a) What is the total distance and displacement of Arav?
b) What is his average speed and average velocity in km/h?
c) Why can a person travel a long distance but still have a small displacement?

ANSWER KEY	
1	c)speed
2	d)initial and final position
3	a)20 km south
4	d)velocity
5	d)zero acceleration
6	c)negative
7	a)0 m/s
8	d)equal or less than 1
9	a)Yes, because displacement equals distance only in straight – line motion.
10	b)The body has uniform acceleration
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	d)A is false but R is true
15	a) Both A and R are true, and R is the correct explanation of A.
16	First convert the speeds to m/s: • $80\,\text{km/h} = \frac{80\times1000}{3600} = 22.22\,\text{m/s}$ • $60\,\text{km/h} = \frac{60\times1000}{3600} = 16.67\,\text{m/s}$ a=v-u/t $a = \frac{16.67 - 22.22}{5} = \frac{-5.55}{5} = -1.11\,\text{m/s}^2$
17	**1. Total distance travelled** • From A to B = 4 km • From B to C = 2 km (backwards) Total distance = $4 + 2 = 6$ km **2. Displacement (magnitude)** Displacement depends on the **initial and final positions**, not the path. • Start at A • Go 4 km forward to B • Then come back 2 km → final position C is **2 km away from A** So, displacement = $4 - 2 = 2$ km
18	Speeding up a car is an example of positive acceleration and slowing down a moving

	vehicle is an example of negative acceleration.
19	When an object is moving along a straight path without changing direction, the magnitude of average velocity is equal to the average speed. Therefore, the numerical ratio of average velocity to average speed is one.
20	**Time from A to B (t_1):** Using $t = \frac{\text{distance}}{\text{speed}}$, we get $t_1 = \frac{d}{40}$. **Time from B to A (t_2):** Similarly, $t_2 = \frac{d}{60}$. **Total Distance:** $d + d = 2d$. **Total Time:** $t_1 + t_2 = \frac{d}{40} + \frac{d}{60} = \frac{3d+2d}{120} = \frac{5d}{120} = \frac{d}{24}$. $\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{2d}{\frac{d}{24}} = 2 \times 24 = 48 \text{ m/s}$ $\text{Average Velocity} = \frac{\text{Total Displacement}}{\text{Total Time}} = \frac{0}{t_1 + t_2} = 0 \text{ m/s}$
21	Let the total time of travel be T. The car travels for two equal time intervals, each being $t = \frac{T}{2}$. The distance covered in the first half of the time (d_1) is: $d_1 = v_1 \times \frac{T}{2} = 50 \times \frac{T}{2}$ The distance covered in the second half of the time (d_2) is: $d_2 = v_2 \times \frac{T}{2} = 60 \times \frac{T}{2}$ The total distance (D) is the sum of these two distances: $D = d_1 + d_2 = \frac{T}{2}(50 + 60) = 55T$ $v_{avg} = \frac{\text{Total Distance}}{\text{Total Time}}$ $v_{avg} = \frac{55T}{T} = 55 \text{ km/h}$ **OR**

	$$v_{avg} = \frac{v_1 + v_2}{2}$$ $$v_{avg} = \frac{50 + 60}{2} = 55 \text{ km/h}$$
22	$t_1 = 15 \text{ min} = \frac{15}{60} = 0.25 \text{ h}$ $t_2 = 15 \text{ min} = \frac{15}{60} = 0.25 \text{ h}$ $t_3 = 30 \text{ min} = \frac{30}{60} = 0.5 \text{ h}$ **d = v(t)** $d_1 = 30 \text{ km/h} \times 0.25 \text{ h} = 7.5 \text{ km}$ $d_2 = 40 \text{ km/h} \times 0.25 \text{ h} = 10 \text{ km}$ $d_3 = 60 \text{ km/h} \times 0.5 \text{ h} = 30 \text{ km}$ Total distance (D) = $7.5 + 10 + 30 = 47.5$ km Total time (T) = $0.25 + 0.25 + 0.5 = 1.0$ h $$v_{avg} = \frac{\text{Total Distance}}{\text{Total Time}}$$ $$v_{avg} = \frac{47.5 \text{ km}}{1.0 \text{ h}} = 47.5 \text{ km/h}$$
23	$$d = \frac{3}{4} \times 2\pi r = \frac{3}{2} \pi r$$ $$d = \frac{3}{2} \times \pi \times 100 = 150\pi \approx 471.24 \text{ m}$$

	Using the Pythagorean theorem for the right-angled triangle formed by the radius to the start point, the radius to the end point, and the displacement vector: $$s = \sqrt{r^2 + r^2} = \sqrt{2r^2} = r\sqrt{2}$$ Given $r = 100$ m: $$s = 100\sqrt{2} \approx 100 \times 1.414 = 141.42 \text{ m}$$ 
24	Distance $= 4 \text{ km} + 3 \text{ km} = 7 \text{ km}$ $c = \sqrt{a^2 + b^2}$ $c = \sqrt{4^2 + 3^2}$ $c = \sqrt{16 + 9}$ $c = \sqrt{25} = 5 \text{ km}$
25	a=v-u/t 0.1=v-0/120 v= 12 m/s
26	

	Using the formula for the circumference of a circle $C = 2\pi r$, the distance d for a half-circle is: $$d = \frac{1}{2} \times 2\pi r = \pi r$$ Given the length of the hand (radius r) is 10 cm: $$d = \pi \times 10 = 10\pi \approx 31.42 \text{ cm}$$ Displacement = 2r = 20 cm
27	$$T_{\text{total}} = \frac{\text{Total Distance}}{\text{Average Speed}} = \frac{120 \text{ km}}{60 \text{ km/h}} = 2 \text{ hours}$$ $$t_1 = \frac{\text{Distance}_1}{\text{Speed}_1} = \frac{30 \text{ km}}{30 \text{ km/h}} = 1 \text{ hour}$$ **Remaining Distance:** $120 \text{ km} - 30 \text{ km} = 90 \text{ km}$ **Remaining Time:** $2 \text{ hours} - 1 \text{ hour} = 1 \text{ hour}$ $$\text{Required Speed} = \frac{\text{Remaining Distance}}{\text{Remaining Time}} = \frac{90 \text{ km}}{1 \text{ hour}} = 90 \text{ km/h}$$
28	$200 \text{ m/min} = \frac{200}{60} \text{ m/s} \approx \mathbf{3.33} \text{ m/s}$ $30 \text{ km/min} = \frac{30 \times 1{,}000}{60} \text{ m/s} = \frac{30{,}000}{60} \text{ m/s} = \mathbf{500} \text{ m/s}$ $54 \text{ km/h} = \frac{54 \times 1{,}000}{3{,}600} \text{ m/s} = \frac{54{,}000}{3{,}600} \text{ m/s} = \mathbf{15} \text{ m/s}$ $10 \text{ m/h} = \frac{10}{3{,}600} \text{ m/s} \approx \mathbf{0.0028} \text{ m/s}$ **10 m/h < 200 m/min < 10 m/s < 54 km/h < 30 km/min**
29	$T_{\text{total}} = 30 \text{ minutes} = 0.5 \text{ hours}$

	The distance for the first part is $d_1 = 1$ km and the speed is $v_1 = 3$ km/h. $$t_1 = \frac{d_1}{v_1} = \frac{1}{3} \text{ hours}$$ $\frac{1}{3} \times 60 = 20$ minutes Anand has used 20 minutes of his 30-minute window. $$t_2 = 30 \text{ min} - 20 \text{ min} = 10 \text{ minutes}$$ The remaining distance is $d_2 = 1$ km $t_2 = \frac{10}{60} = \frac{1}{6}$ hours $v_2 = \frac{1 \text{ km}}{1/6 \text{ h}} = 6$ km/h
30	a) Total distance = 4 + 3 + 4 = 11 km Displacement = 3 km North b) Time in hours $= \frac{22}{60}$ hours $\approx$ **0.3667** hours. Average Speed $= \frac{11 \text{ km}}{22/60 \text{ hours}} = 11 \times \frac{60}{22}$ km/h $= \frac{660}{22}$ km/h $=$ **30** km/h. Average Velocity $= \frac{3 \text{ km (North)}}{22/60 \text{ hours}} = 3 \times \frac{60}{22}$ km/h $= \frac{180}{22}$ km/h $\approx$ **8.18** km/h (towards North) c) Because distance measures the **actual route**, while displacement measures the **straight-line change in position**. If a person changes direction many times, the total distance can be large even though the final position is not far from the starting point.

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