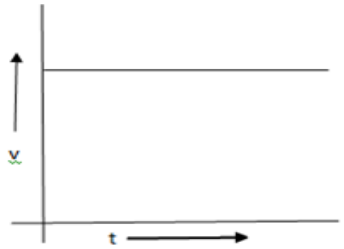
INDIAN SCHOOL AL WADI AL KABIR

Class: IX	**Department: SCIENCE 2020-2021** **SUBJECT-PHYSICS**	**Date of submission:**
Worksheet No:3 **WITH ANSWERS**	**Topic: MOTION-PART1**	**Note:** **A4 FILE FORMAT** **[PORTFOLIO]**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

OBJECTIVE TYPE QUESTIONS

1. From the given v-t graph, it can be inferred that the object is



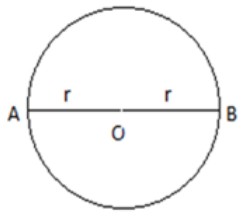
(a) At rest (b) In uniform motion
(c) Moving with uniform acceleration (d) In non-uniform motion

Ans:- (b) In uniform motion

2. Suppose a boy is enjoying a ride on a marry-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

Ans:- (c) In accelerated motion

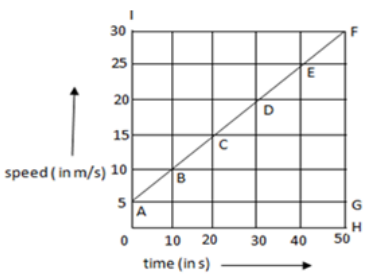
3. A particle is moving in a circular path of radius r. The displacement after half a circle would be:



(a) Zero (b) πr
(c) 2r (d) 2πr

Ans:- (c) 2r

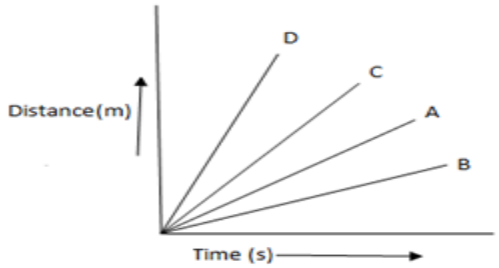
4. The speed - time graph of a car is given here. Using the data in the graph calculate the total distance covered by the car.



(a) 1250 m (b) 875 m
(c) 1500 m (d) 870 m

Ans:- (*b) 875 m (Hint:- distance= area under speed time graph=area of triangle AGH+ area of rectangle AGHO)*

5. Four cars A, B, C and D are moving on a levelled, straight road. Their distance time graphs are shown in the figure below. Which of the following is the correct statement regarding the motion of these cars?



(a) Car A is faster than car D (b) Car B is the slowest
(c) Car D is faster than car C (d) Car C is the slowest

Ans:- (b) and (c)

ASSERTION AND REASONING

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 assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.
(e) Both Assertion and Reason are false.

6. Assertion : An object can have constant speed but variable velocity.
Reason : Speed is a scalar but velocity is a vector quantity.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

7. Assertion : Position-time graph of a stationary object is a straight line parallel to time axis.
Reason : For a stationary object, position does not change with time.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

8. Assertion : A body having non-zero acceleration can have a constant velocity.
Reason : Acceleration is the rate of change of velocity.

Ans : (d) Assertion (A) is false but reason (R) is true

9. Assertion : Displacement of a body may be zero when distance travelled by it is not zero.
Reason : The displacement is the longest distance between initial and final position.

Ans : (c) Assertion (A) is true but reason (R) is false.

10. Assertion: A bus moving due north takes a turn and starts moving towards east with same speed. There will be no change in the velocity of bus.
Reason: Velocity is a vector quantity

Ans : (d) Assertion (A) is false but reason (R) is true

ONE MARK TYPE QUESTIONS

11. Suppose a ball is thrown vertically upwards from a position P above the ground. It rises to the highest point Q and returns to the same point P. What is the net displacement and distance travelled by the ball?

Ans:- Displacement is zero. Distance is twice the distance between position P and Q.

12. Can the displacement be greater than the distance travelled by an object?

Ans : No, it is always either equal to or less than the distance travelled by the object.

13. When do the distance and displacement of a moving object have the same magnitude?

Ans : The magnitude of distance and displacement of a moving object are same when the object moves along the same straight line in the same fixed direction.

14. A body is moving with a velocity of 10 m/s. If the motion is uniform, what will be the velocity after 10 s?

Ans:- As the motion is uniform, the velocity remains 10 m/s after 10 s.

15. What would be acceleration of a body if its velocity-time graph is a line parallel to the time axis?

Ans : Zero, as the body possesses uniform velocity.

TWO MARKS TYPE QUESTIONS

16. What is the difference between uniform velocity and non-uniform velocity?

Ans:- Uniform velocity: An object with uniform velocity covers equal distances in equal intervals of time in a specified direction, e.g.,an object moving with speed of 40 kmh^{-1} towards west has uniform velocity.

Non-uniform velocity: When an object covers unequal distances in equal intervals of time in a specified direction, or if the direction of motion changes, it is said to be moving with a non-uniform or variable velocity, e.g., revolving fan at a constant speed has variable velocity.

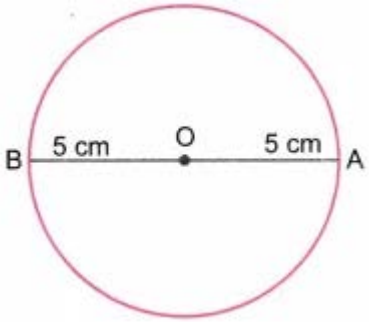
17. What is negative acceleration? Explain with example

Ans:- If the velocity of a body decreases with time, then its final velocity is less than the initial velocity and thus its acceleration is negative. Negative acceleration is called retardation or deceleration. For example, when brakes are applied to a moving truck, its velocity gradually decreases.

18. A particle moves in a circle with O as centre and AO = OB = 5 cm, as radius, as shown in the figure. It starts from A. Calculate:

(a) the distance covered, and

(b) the displacement, when it reaches B.



Ans:-(a) Distance covered = $\pi \times OA = \pi \times 5 = 5\pi$ cm

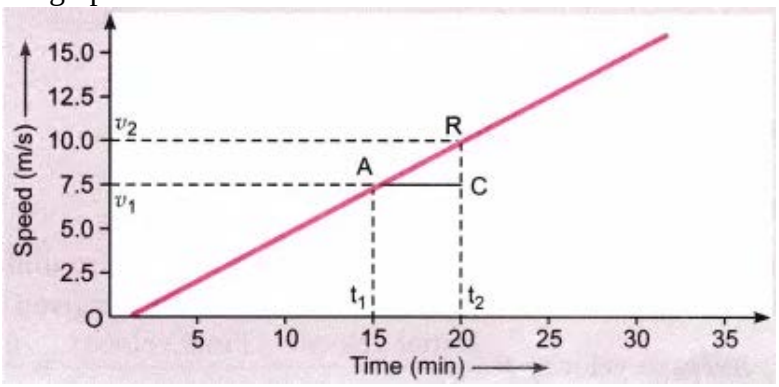
(b) Displacement = 2 × OB

= 2 × 5 = 10 cm along AB

THREE MARKS TYPE QUESTIONS

19. Given below is the velocity-time graph for the motion of the car. What does the nature of

the graph show ? Also find the acceleration of the car.



Ans:- The nature of the graph shows that velocity changes by equal amounts in equal intervals of time. For a uniformly accelerated motion, velocity-time graph is always a straight line.

As we know, acceleration is equal to the slope of the graph

$$i.e, \quad a = \frac{BC}{AC} \text{ or } a = \frac{v_2 - v_1}{t_2 - t_1}$$

$$\therefore \quad a = \frac{(10.0 - 7.5)\ \text{ms}^{-1}}{(20 - 15)\ \text{s}}$$

$$\text{or} \quad a = \frac{2.5\ \text{ms}^{-1}}{5\ \text{s}}$$

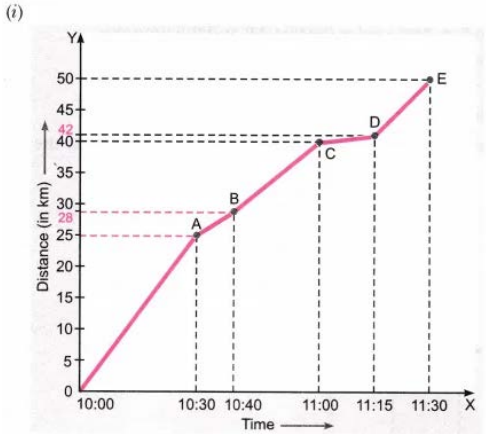
$$\text{or} \quad a = 0.5\ \text{ms}^{-2}$$

20. Distance travelled by a train and time taken by it is shown in the following table, (i) Plot distance-time graph. (ii) What is the average speed of the train?

Time	Distance (in km)
10:00 AM	0
10:30 AM	25
10:40 AM	28
11:00 AM	40
11:15 AM	42
11:30 AM	50

Ans:-

(i)



(*ii*) Average speed $= \dfrac{\text{Total distance travelled}}{\text{Total time taken}}$

In this problem, total distance travelled = 50 km.

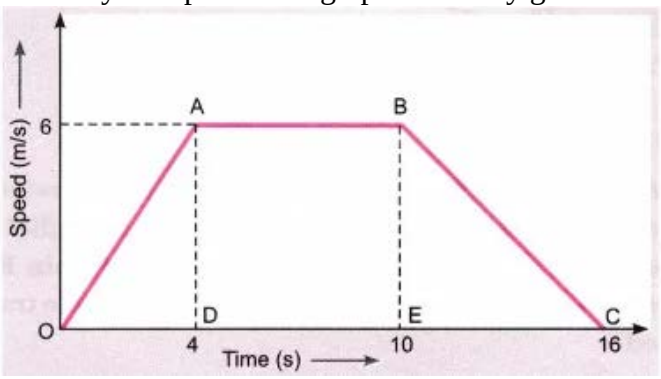
Total time taken 10:00 AM to 11: 30 AM

$= 1 \text{ hour } 30 \text{ minutes} = 1\dfrac{1}{2}\text{ h} = \dfrac{3}{2}\text{ h}$

$\therefore$ Now average speed $= \dfrac{50 \text{ km}}{\frac{3}{2}\text{ h}} = \dfrac{100}{3}\text{ km / h} = \mathbf{33.33\ kmh^{-1}}$

FIVE MARKS TYPE QUESTIONS

21. Study the speed-time graph of a body given here and answer the following questions:



(a) What type of motion is represented by OA?
(b) What type of motion is represented by AB?
(c) What type of motion is represented by BC?
(d) Find out the acceleration of the body.
(e) Calculate the retardation of the body.
(f) Find out the distance travelled by the body from A to B.

Ans:-

(a) OA is a straight line graph between speed and time, and it is sloping upward from O to A. *Therefore, the graph line OA represents uniform acceleration.*

(b) AB is a straight line graph between speed and time, which is parallel to the time axis (x-axis).

So, AB represents uniform speed. There is no acceleration from A to B.

(c) BC is a straight line graph between speed and time which is sloping downwards from B to C. Therefore, BC represents uniform retardation or negative acceleration.

(d) Acceleration of the body as we see from graph line OA represents it. So, the slope of velocity-time graph OA will give the acceleration of the body. Thus,

Acceleration = Slope of line OA = AD/OD

We have, AD = 6 m/s, and OD = 4 s

So, acceleration = $\frac{6\text{m/s}}{4\text{s}}$ *= 1.5 m/s*

(e) The slope of line graph BC represents the retardation of the body.

So, retardation = Slope of line BC = BE/EC

We have, BE = -6m/s, EC = 16 – 10 = 6s

Retardation = -6/6 = -1m/s^2

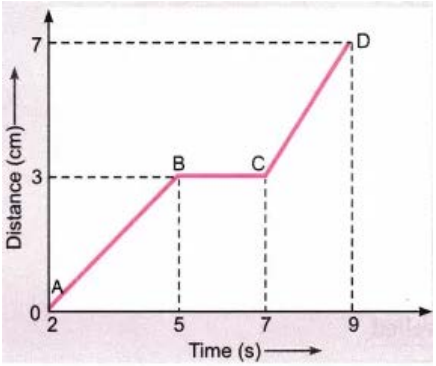
(f) Distance travelled from A to B = Area under the line AB and the time axis

= Area of rectangle DABE = DA × DE

Here, DA = 6 m/s and DE = 10 – 4 = 6 s

Distance travelled from A to B = 6 × 6 = 36m

22. The graph given below shows the positions of a body at different times. Calculate the speed of the body as it moves from
(i) A to B
(ii) B to C and
(iii) C to D.



Ans:- (i) The distance-time graph represents the line AB which shows the speed of the body. So,

Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{3\text{cm}}{(5-2)\text{s}}$ *= 1 cm/s*

(ii) The distance-time graph shows that the body is at rest between graph line B to C, it means no movement. So speed is zero i.e.,

Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{0}{(7-5)\text{s}} = \frac{0}{2\text{s}}$ *= 0*

(iii) The distance-time graph represents the line CD which shows the speed of the body. So,

Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{(7-3)\text{cm}}{(9-7)\text{s}} = \frac{4\text{cm}}{2\text{s}}$ *= 2 cm/s*

23. The table given below shows distance (in cm) travelled by bodies A, B and C. Read this data carefully and answer the following questions.

Distance (in cm) covered by different bodies

Time in (s)	Body (A)	Body (B)	Body (C)
1st Second	20	20	20
2nd Second	20	36	60
3rd Second	20	24	100
4th Second	20	30	140
5th Second	20	48	180

(i) Which of the bodies is moving with
(a) constant speed?
(b) constant acceleration?
(c) non-uniform acceleration?
(ii) Which of the bodies covers
(a) maximum distance in 3rd second?
(b) minimum distance in 3rd second?
Answer:
(i) (a) Body A (b) Body C (c) Body B
(ii) (a) Body C. Total distance travelled = 100 – 60 = 40 cm
(b) Body B. Total distance travelled = 24 – 36 = -12 cm
The negative sign implies deceleration.

PREVIOUS YEAR BOARD QUESTIONS

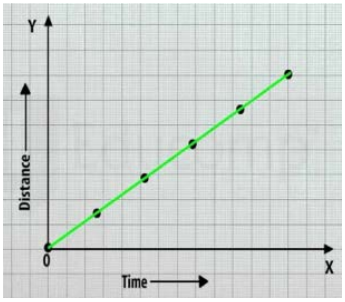
24. What is the numerical ratio of average velocity to average speed of an object when it is moving along a straight path. CBSE 2014
Ans:-Ratio is 1(both are equal)

25. What do you mean by positive acceleration? CBSE 2013

Ans:- When the change in velocity of a body takes place in the direction of motion of the body , then the acceleration is positive.

26. What will you say about the motion of a body if its distance-time graph is a straight line having a constant angle with time axis? CBSE 2010

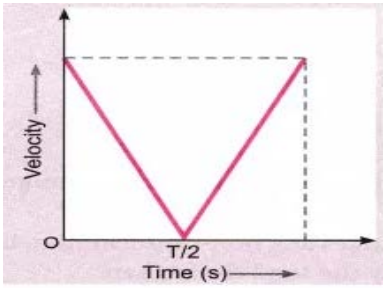
Ans:- Body is in uniform motion



EXEMPLAR QUESTIONS

27. Draw a velocity versus time graph of a stone thrown vertically upwards and then coming downwards after attaining the maximum height.

Ans:



28. Usha swims in a 90 m long pool. She covers 180 m in one minute by swimming from one end to the other and back along the same straight path. Find the average speed and average velocity of Usha.

Ans:-

Total distance covered by Usha in 1 min is 180 m.

Displacement of Usha in 1 min = 0 m

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

$$= \frac{180\ \text{m}}{1\ \text{min}} = \frac{180\ \text{m}}{1\ \text{min}} \times \frac{1\ \text{min}}{60\ \text{s}}$$

$$= 3\ \text{m s}^{-1}$$

$$\text{Average velocity} = \frac{\text{Displacement}}{\text{Total time taken}}$$

$$= \frac{0\ \text{m}}{60\ \text{s}}$$

$$= 0\ \text{m s}^{-1}$$

The average speed of Usha is 3 m s^{-1} and her average velocity is 0 m s^{-1}.

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