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| | **INDIAN SCHOOL AL WADI AL KABIR** | |
| **Class: XI** | **Department: Science 2022 – 23**<br>**Subject: Physics** | **Date of submission:**<br>**08.08.2022** |
| **Worksheet No:01**<br>**With Answers** | **Topic: MOTION IN A STRAIGHT LINE** | **Note:**<br>**A4 FILE FORMAT** |
| **CLASS/SEC.:** | **NAME OF THE STUDENT:** | **ROLL NO.:** |

**OBJECTIVE TYPE QUESTIONS:**

1) A body is thrown upward and after some time the body reaches its maximum height, at maximum height:

a) Its velocity and acceleration both are zero.

b) Its velocity is zero and acceleration is maximum.

c) Its velocity is maximum and acceleration is minimum.

d) Its velocity is zero and acceleration is equal to the acceleration due to gravity.

2) If the displacement of a body is proportional to the square of time, then:

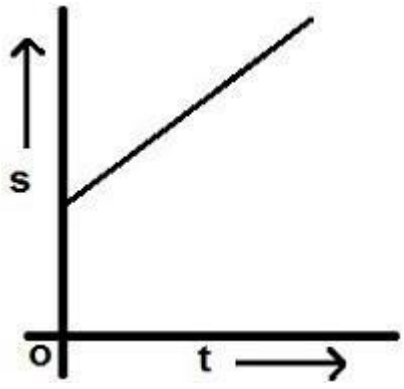
a) The body moves with uniform velocity

b) The body moves with uniform acceleration

c) The body moves with increasing acceleration

d) The body moves with decreasing acceleration

3) The displacement-time curve of a body is shown in the following figure, then:



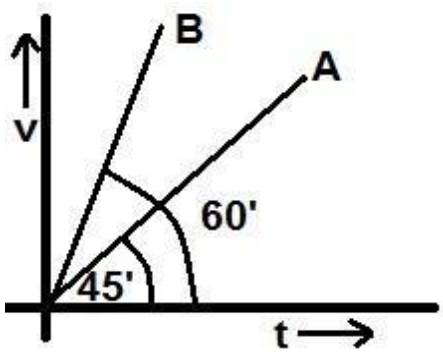

a) The body is moving with uniform velocity with zero initial velocity

b) The body is moving with uniform velocity with a finite initial velocity

c) The body is moving with zero acceleration with zero initial velocity

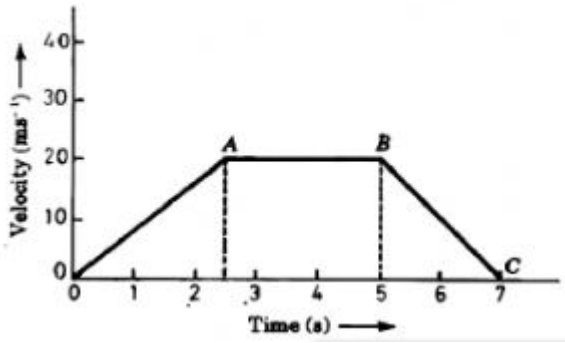
d) The body is moving with uniform velocity with a finite initial velocity

4) The velocity-time graph of two bodies A and B are shown in the figure, the ratio of their accelerationis:



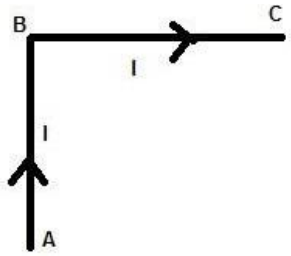

a) 1:√3
b) 1:3
c) √3:1
d) √3:√2

5) Velocity time graph for a vehicle is shown. Find the distance travelled by the body.




a) 90 m
b) 95 m
c) 100 m
d) 110 m

6) A particle follows the path ABC where AB=BC=*l* , The distance and displacement travelled by the particle are:




a) l and 2l

b) 2l and √2l

c) $l^2$ and 2l

d) 2l and $l^2$

7) The acceleration of a moving body can be found from

a) Area under distance – time graph

b) Area under velocity – time graph

c) Slope of the velocity – time graph

d) Slope of the distance – time graph

8) The graph of displacement verses time of a body is a straight line making a positive angle with the x-axis. Then the instantaneous velocity of the body at any point is

a) Equal to the average velocity of the body
b) Lesser than or equal to the average velocity of the body
c) Greater than or equal to the average velocity of the body.
d) Always greater than the average velocity of the body.

9) A boy moves on a circular distance of radius R. Starting from point A he moves to a point B which is on the other end of the diameter AB. The ratio of distance travelled to the displacement made by him is

a) $\pi/2$
b) $\pi$
c) $2\pi$
d) $4\pi$

10) The numerical ratio of displacement to distance is:

a) Always less than 1
b) Always equal to 1
c) Always more than 1
d) Equal to or less than 1

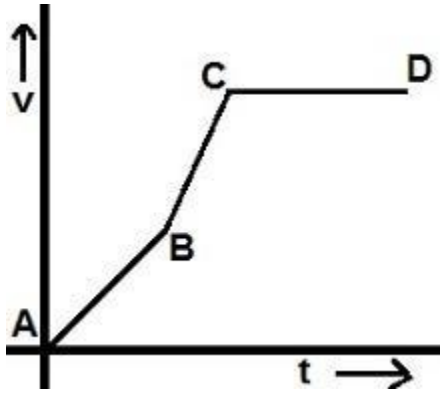
## VERY SHORT ANSWER QUESTIONS (1MARK)

11) Under what conditions s=vt holds good?

12) Can speed of an object be negative? Justify

13) Two stones of different masses are thrown vertically upward with the same initial speed. Which one will rise to a greater height?

14) The velocity-time graph of a moving particle is shown in the figure; the acceleration is maximum for part:




15) A body is thrown with a speed of 40m/s vertically upward; it will return to the thrower's hand after a time of: (assume $g=10m/s^2$)

16) Give an example of a body having zero velocity but non-zero acceleration.

17) When is average velocity equal to average speed

18) What is the shape of the displacement time graph for an object undergoing uniform linear motion?

19) A railway train 400 m long is going from New Delhi railway station to Kanpur railway station. Can we consider railway train as a point object?

20) What causes variation in the velocity of the particle?

## SHORT ANSWER QUESTIONS (2 MARKS)

21) A stone is thrown vertically upwards. Draw the

[i] velocity-time graph

[ii] speed-time graph

for the complete journey of the body.

22) Can a body have a constant speed but a varying velocity? Explain.

23) What do you mean by instantaneous velocity? How can we find it graphically?

24) Can a body have a constant velocity but a varying speed? Explain.

25) If the displacement of a body is zero, is the distance covered by it necessary zero?

comment with illustration.

**SHORT ANSWER QUESTIONS (3 MARKS)**

26) Sahil went on his bike from Delhi to Gurgaon at a speed of 60 km/h and came back at a speed of 40 km/h. What is his average speed for the entire journey?

27) A particle is thrown upward. It reaches a height 'h' after 5 s and after 9 s comes back to the same point as it was at 5 s. What is the speed of the particle at height 'h'?

28) A car moves a distance of 200 km. It covers the first half of the distance at a speed of 40km/h and thesecond half of the distance at speed v. If the average speed is 48km/h, then find the value of v.

29) Draw the nature of a position –time graph for a motion of a particle moving with
[i] positive acceleration
[ii] zero acceleration
[iii] negative uniform velocity.

30) A train takes 1 hr. to go from one station to another. It travels at a speed of 30km/h for first half hour andat a speed of 50km/h for the next half hour. Find the average speed of the train.

31) If a body travels 1/3 distance with a velocity of 2m/s next 1/3 distance with a velocity of 4m/s and theremaining 1/3 distance with a velocity of 6m/s. Find the average velocity of the body?

32) From the top of a tower 30m high, a stone is dropped. At the same instant, another stone is projected vertically upwards from the ground with a speed of 30m/s. After how much time and at what height from theground will the stones cross each other [$g= 10m/s^2$]

33) A ball thrown vertically upwards with a speed of 20m/s from the top of a tower and returns to the groundlevel in 6 s. Find the height of the tower. Take $g = 10\ m/s^2$

34) A stone is dropped from a balloon moving upwards with a velocity of 4.5m/s. The stone reaches theground in 5s. Calculate the height of the balloon when the stone was dropped [$g = 9.8m/s^2$]

35) In a circus, a motorcyclist takes 4 rounds on the same track in the globe of radius r with a velocity $5r$ .
Find (i) total displacement (ii) total distance covered (iii) total time taken by him

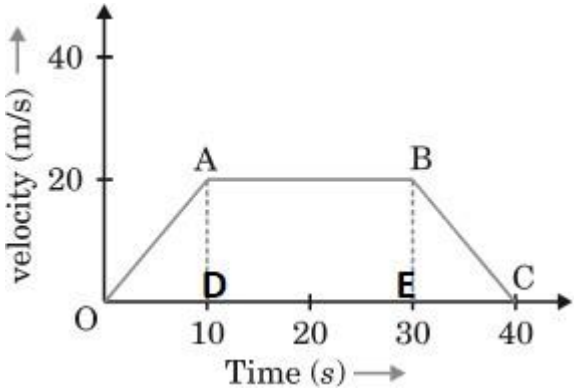
**LONG ANSWER QUESTIONS (5 MARKS)**

36) Derive all the 3 equations of uniformly accelerated motion graphically.

37) A particle moving with a uniform acceleration travels 24 metres and 64 metres in the first two consecutive intervals of 4 s each. What is its initial velocity?

38) The velocity time graph of a body is shown in the following figure. Answer the following questions:

a) State the kind of motion represented by OA, AB and BC




b) What is the velocity of the body after 10 s and after 40 s?

c) Find the value of acceleration between 0 to 10 s and 30 s to 40 s

d) Find the distance travelled by the body during the time interval between 10s and 30s.

39) A stone is thrown in a vertically upward direction with a velocity of 5 ms−1. If the acceleration of the stone during its motion is 10 ms−2 in the downward direction, what will be the height attained by the stone and how much time will it take to reach there?

40) A train is travelling at a speed of 90 km/h. Brakes are applied so as to produce a uniform acceleration of −0.5 ms−2. Find how far the train will go before it is brought to rest?

| Q. NO. | ANSWERS |
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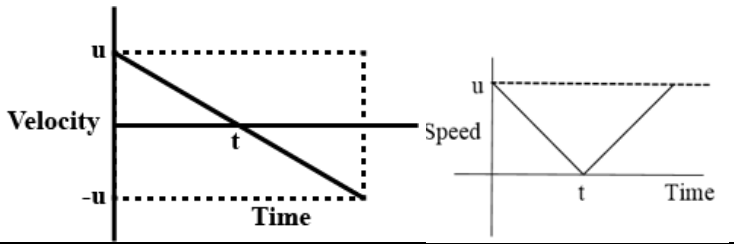
| 1 | (d) Its velocity is zero and acceleration is equal to acceleration due to gravity. |
| 2 | (b) The body moves with uniform acceleration |
| 3 | (a) The body is moving with uniform velocity with zero initial velocity |
| 4 | (a) acceleration = slope = tanθ |
| 5 | (b) 95 m |
| 6 | (b) 2l and √2l |
| 7 | (c) Slope of the velocity – time graph |
| 8 | (a) Equal to the average velocity of the body |
| 9 | (a) π/2 |
| 10 | (d) Equal to or less than 1 |
| 11 | When there is no acceleration, which means body is moving with constant velocity. |
| 12 | Neither time nor distance covered by a body can be negative, therefore, speed also cannot be negative. |
| 13 | Both the stones will rise to the same height. It is because, for a body moving with given initial velocity and acceleration, the distance covered is same. It does not depend on body's mass |
| 14 | BC |
| 15 | V =0, u =20m/s, a = -10m/s2 v=u + at, Time to go up = 2 s Time of ascent = time of descent Total time = 2 + 2 = 4 s |
| 16 | For a body which is thrown up, at the maximum height it has zero velocity but non-zero acceleration. |
| 17 | When a body moves along a straight line |
| 18 | Displacement time graph for uniform motion is a straight line with non-zero slope. |
| 19 | Yes because length of the train is smaller as compared to the distance between New Delhi and Kanpur. |
| 20 | (1) If magnitude of velocity changes (2) If direction of motion changes |
| 21 |  |
| 22 | Yes, for a body executing uniform circular motion |
| 23 | It is the velocity of an object at a particular instant of time or at a particular point of its path. It is also called the limiting value of the average velocity.<br>We can find the instantaneous velocity by taking its slope |
| 24 | No, speed gives the magnitude of velocity. So, if speed changes velocity also will change. |
| 25 | No, A body moving in circular path for one rotation |
| 26 | Average velocity = 2v1v2/v1 + v2 = 2 x 60 x 40/60 + 40 = 48km/hr |

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| | OR<br>Let the distance to one side = x<br>Total distance = 2x<br>Time taken for the forward journey = $\frac{x}{60}$<br>Time taken for the return journey = $\frac{x}{40}$<br>Total time = $\frac{x}{60} + \frac{x}{40} = \frac{100x}{2400}$<br>Average speed = $\frac{\text{Total distance}}{\text{Total Time}} = \frac{2x}{\left(\frac{100x}{2400}\right)}$ = 48 kmph |
| 27 | $s = ut - \frac{1}{2}gt^2$<br>$0 = 4v - \frac{1}{2} \times 9.8 \times (4)^2$<br>$4v = \frac{1}{2} \times 9.8 \times (4)^2$<br>$v = \frac{\frac{1}{2} \times 9.8 \times (4)^2}{4}$<br>$v = 19.6\ m/s$ |
| 28 | average speed = s1 + s2 /(s1 / v1 + s2 / v2 ) = 200/( 100/ 40 + 100 /$v$) = 48<br>On solving v = 60km/h |
| 29 |  |
| 30 | average speed = $\frac{\text{total distance}}{\text{total time}} = \frac{d1+d2}{t1+t2} = \frac{s1\ x\ t1\ \ +s2\ x\ t2}{t1+t2}$<br>On solving average speed = 40 km/h |

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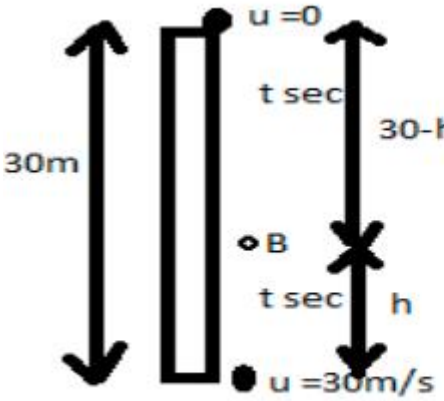
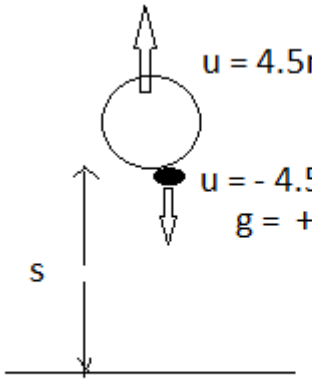
| 31 | Average velocity $= \frac{\text{total displacement}}{\text{total time}} = \frac{3d}{t1+t2+t3} = \frac{3d}{\frac{d1}{v1}+\frac{d2}{v2}+\frac{d3}{v3}} = \frac{3d}{\frac{d}{2}+\frac{d}{4}+\frac{d}{6}} = \frac{36}{11}$m/s |
| 32 |  <br>At 'B' both the stones meet each other<br>For stone S1:<br>$30-h = 1/2 \times 10t^2$ --[1]<br>For stone s2:<br>$h = 30 \times t - 1/2\ 10xt^2$ --[2]<br>[1] + [2] , gives , t = 1s<br>{1]gives , h = 25m |
| 33 | $S = ut + \frac{1}{2} at^2$<br>= 60m |
| 34 |  <br>$S = ut + \frac{1}{2} gt^2 = -4.5 \times 5 + \frac{1}{2} \times 9.8 \times [5]^2 = 100$m |
| 35 | displacement = 0<br>total distance covered in 4 rounds = $4 \times 2\pi r = 8\pi r$<br>$t = \frac{\text{Total Distance}}{\text{Velocity}}$<br>$= \frac{8\pi r}{5r} = \frac{8}{5} \times \frac{22}{7} = 5$s. |
| 36 | Derive uing v-t graph |
| 37 | Equation of motion, $s=ut+1/2at^2$<br>When s=24 m, t=4s, |

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| | we get $24=4u+1/2a(4)^2$<br>$\Rightarrow 24=4u+8a$<br>$\Rightarrow 6=u+2a$ ——(1)<br>When body travels a total distance of 24+64=88 min 8 s,<br>we get $88=8u+1/2a(8)^2$<br>$\Rightarrow 88=8u+32a$<br>$\Rightarrow 11=u+4a$ ——(2)<br>Solving Eqs. 1 and 2, we get u=1m/s |
| 38 | (a) OA - Uniform acceleration, AB - Zero acceleration / constant velocity and BC - uniform deceleration.<br>(b) After 10s velocity= 20m/s and after 40s velocity is zero / body comes to rest<br>(c) Acceleration = 20-0/10-0 = $2m/s^2$<br>Retardation = (0 - 20) / (40 - 30) = $-2\ ms^2$<br>(d) Distance between 10th and 30th second<br>= area of the rectangle ABED = length X breadth = (30 - 10) s × 20 m/s = 400 m |
| 39 | Given, initial velocity, $u=5ms^{-1}$<br>Final velocity, v=0<br>$a=-10ms^{-2}$<br>(i) Using the relation, $v^2-u^2=2as$,<br>$s=v^2-u^2/2a$<br>$=(0)^2-(5)^2/2\times(-10)=1.25m$<br>(ii) v=u+at<br>0=5+(−10)t or<br>t=5/10=0.5s |

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| 40 | Acceleration $a=-0.5m/s2$<br>Speed $v=90km/h=25m/s$<br>$v=u+at$<br>Finally train will be rest so, final velocity,$v=0$<br>$0=25-0.5t$<br>$t=50$ sec<br>$S=ut+1/2at^2$<br>$s=625$ m |

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