INDIAN SCHOOL MUSCAT

SENIOR SECTION
DEPARTMENT OF PHYSICS
CLASS XI
2017-18
KINEMATICS
WORKSHEET -2

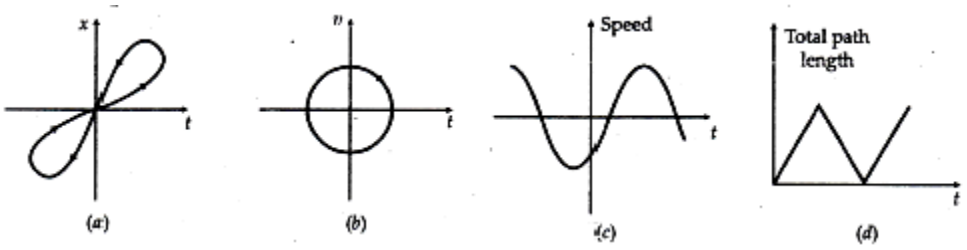
SECTION – A CONCEPTUAL AND APPLICATION TYPE QUESTIONS

1. Define average and instantaneous velocity. 1

2. What does the slope of position-time graph indicate? 1

3. What does the slope of velocity-time graph indicate? 1

4. Look at the graphs (a) to (d) in the figure carefully and state, with reasons, which of these cannot possibly represent one –dimensional motion of a particle. 2



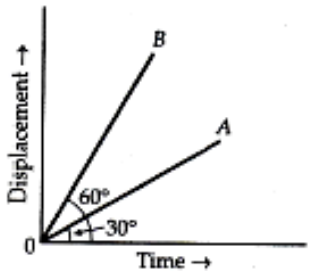
5. Draw the following graphs for an object projected upward with a velocity v_0, which comes back to the same point after some time:

   (i) Acceleration versus time graph.

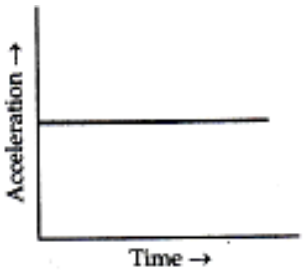
   (ii) Speed versus time graph.

   (iii) Velocity versus time graph. 3

6. Two straight lines drawn on the same displacement-time graph make angles 30^0 and 60^0 with time axis respectively, as shown in figure. Which line represents greater velocity? What is the ratio of the two velocities? 2



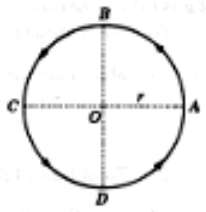
7. Acceleration –time graph of a moving object is shown in figure. Draw the velocity-time graph and displacement-time graph corresponding to this type of motion. 2



8. If in case of a motion, displacement is directly proportional to the square of time elapsed, what do you think about acceleration i.e. constant or variable? 2
9. A player throws a ball upwards with an initial speed of 29.5 m/s. What are the velocity and acceleration of the ball at the highest point of its motion? 1
10. Can a body be at rest as well as in motion at same time? Explain. 1
11. Draw position-time graphs for two objects having zero relative velocity. 1
12. Define: (i) Displacement vectors (ii) Equal vectors (iii) Unit vector (iv)Null vector. 2
13. Can commutative law be applied to vector subtraction? 1
14. Give two conditions necessary for a given to be a vector. 2
15. Explain that the magnitude of the resultant vector of two vectors (i) may be zero (ii) may be equal to each of them.
16. What is angle made by vector $\vec{A} = 2\hat{\imath} + 2\hat{\jmath}$ with X-axis? 2
17. Can the direction of velocity of a body change when acceleration is constant? 1
18. Is the rocket in flight an example of projectile? 1
19. What will be the effect on horizontal range of a projectile when its initial velocity is doubled, keeping the angle of projection same? 2
20. Is it possible to accelerate a particle if it is travelling at constant speed? 1

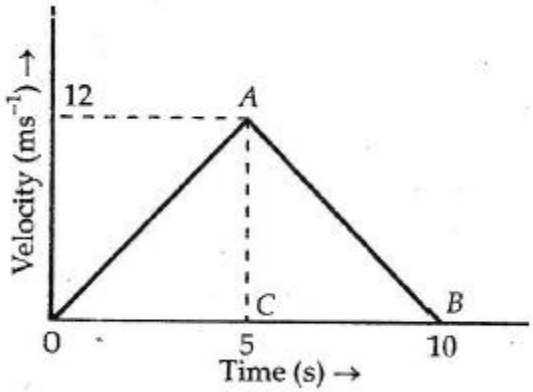
SECTION-B NUMERICAL QUESTIONS

1. In figure,a particle moves along a circular path of radius r.It starts from point A and moves anticlockwise. Find the distance travelled by the particle as it

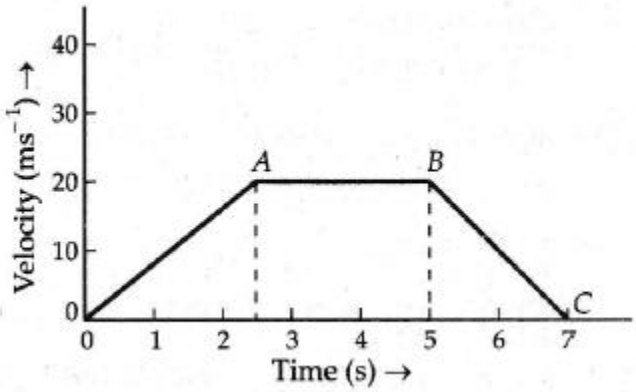


(i) moves from A to B
(ii)moves from A to C
(iii)moves from A to D
(iv) complete one revolution. 3
Also find the magnitude of displacement in each case.

2. A man walks on a straight road from his home to a market 2.5km away with speed of 5km/h. Finding the market closed, he instantly turns and walks back home with a speed of 7.5km/h. What is the
(a)magnitude of average velocity, and
(b) average speed of the man over the interval of time 3
(i) 0 to 30min , (ii) 0 to 50min , (iii) 0 to 40min?
3. The velocity- time graph of a particle moving along a fixed direction is shown in figure. Obtain the distance travelled by the particle between
(i) t = 0 to 10 s
(ii) t = 2 to 6 s.
What is the average speed of the particle in intervals in (i) and (ii) 3



4. The velocity-time graph for a vehicle is shown in figure. Draw acceleration-time graph from it. 2



5. The velocity of a particle is given by the equation, $v = 2t^2 + 5$ cm/s. Find (i) the change in velocity of the particle during the time interval between $t_1 = 2$ s and $t_2 = 4$ s (ii) the average acceleration during the same interval and (iii) the instantaneous acceleration at $t_2 = 4$ s. 3
6. A car moving along a straight highway with speed of 126 km/h is brought to a stop within a distance of 200m. What is retardation of the car (assumed uniform), and how long does it take for the car to stop? 2
7. A player throws a ball upwards with an initial speed of 29.5m/s.
   (i) What is the direction of acceleration during the upward motion of the ball?
   (ii) What are the velocity and acceleration of the ball at the highest point of its motion?
   (iii)To what height does the ball rise and after how long does the ball return the player's hands? (Take $g = 9.8\ ms^{-2}$, and neglect air resistance). 3
8. A parachutist bails out from an aeroplane and after dropping through a distance of 40m, he opens the parachute and decelerates at $2ms^{-2}$. If he reaches the ground with a speed of $2ms^{-1}$, how long is he in the air? At what height did he bail out from the plane? (Take $g = 9.8\ ms^{-2}$) 3
9. Two balls are thrown simultaneously, 'A' vertically upwards with a speed of 20m/s from the ground and 'B' vertically downwards from a height of 40m with the same speed and along the same line of motion. At what points do the two balls collide? (Take $g = 9.8\ ms^{-2}$) 2
10. A body covers 12m in 2ndsecond and 20m in 4th second. How much distance will it cover in 4 seconds after the 5th second? 2

11. A driver takes o.20 s to apply the brakes after he sees a signal. This is called the reaction time of driver. If he is driving car at a speed of 54 km/h and the brakes cause a deceleration of 6.0 ms^{-2}, find the distance travelled by the car after he sees the signal to put the brakes. 2
12. Two trains 'A' and 'B' of length 400m each are moving on two parallel tracks with a uniform speed of 72 km/h in the same direction, with 'A' ahead of 'B'. The driver of 'B' decides to overtake 'A' and accelerates by 1 ms^{-2}. If after 50 seconds, the guard of 'B' just brushes past the driver of 'A', what was the original distance between them? 3
13. On a two- lane road, car 'A' is travelling with a speed of 36km/h. Two cars 'B' and 'C' approach car 'A' in opposite directions with a speed of 54km/h each. At a certain instant, when the distance AB is equal to AC, both being 1km, 'B' decides to overtake 'A' before C does. What minimum acceleration of car B is required to avoid an accident? 3
14. A particle has a displacement of 12m towards east and 5m towards north and then 6m vertically upward. Find the magnitude of the sum of these displacements. 2
15. A man can swim with a speed of 4km/h in still water. How long does he take to cross the river 1km wide, if the river flows steadily at 3km/h and he makes his strokes normal to the river current? How far from the river does he go, when he reaches the other bank? 2
16. Rain is falling vertically with a speed of 30m/s. A woman rides a bicycle with a speed of 10m/s in the north to south direction. What is the relative velocity of rain with respect to the women? What is the direction in which she should her umbrella to protect herself from the rain? 3
17. An aeroplane take off at an angle of 30^0 to the horizontal. If component of its velocity along the horizontal is 250km/h, what is the actual velocity of plane? Find also the vertical component of the velocity. 2
18. Find the value of λ so that the vectors $\vec{A} = 2\hat{\imath} + \lambda\,\hat{\jmath} + \hat{k}$ and $\vec{B} = 4\hat{\imath} - 2\hat{\jmath} - 2\hat{k}$ are perpendicular to each other. 2
19. Find the components of $\vec{A} = 2\hat{\imath} + 3\hat{\jmath}$ along the directions of vectors $\hat{\imath} + \hat{\jmath}$ and $\hat{\imath} - \hat{\jmath}$. 2
20. Determine a unit vector perpendicular to both $\vec{A} = 2\hat{\imath} + \hat{\jmath} + \hat{k}$ and $\vec{B} = \hat{\imath} - \hat{\jmath} + 2\hat{k}$. 2
21. A projectile is fired horizontally with a velocity of 98m/s from the top of a hill 490m high. Find (i) the time taken to reach the ground (ii) the distance of the target from the hill and (iii) the velocity with which the projectile hits the ground. 3
22. A body is projected with a velocity of 30m/s at an angle of 30^0 with the vertical. Find the maximum height, time of flight and the horizontal range. 3
23. Prove that the maximum horizontal range is four times the maximum height attained by a projectile which is fired along the required oblique direction. 2
24. An insect trapped in a circular groove of radius 12cm moves along the groove steadily and completes 7 revolutions in 100 s . (i) What is the angular speed and the linear speed of the motion? (ii) Is the acceleration vector a constant vector? What is its magnitude? 3
25. A cyclist is riding with a speed of 27km/h. As he approaches a circular turn on the road of radius 80m, he applies brakes and reduces his speed at constant rate of 0.5m/s every second. What is the magnitude of net acceleration of the cyclist on circular turn? 2