**CLASS XI : ASSIGNMENT : CH-2 : MOTION IN A STRAIGHT LINE : PHYSICS**

## POSITION, DISTANCE AND DISPLACEMENT

1. What will be the distance covered by the particle if the displacement of the particle is zero?
2. Position of a particle moving along a straight line is given by $x = (t^2 - 4t)$ meters. (t is in sec.). Find the displacement and distance travelled between t = 0 and t = 3 seconds.

## SPEED AND VELOCITY

3. A particle moves with speed $v_1$ along a particular direction. After some time it turns back and reaches the starting point again travelling with speed $v_2$. Find (for the whole journey)
    i. Average velocity
    ii. Average speed
4. A bird flies towards east at 10m/s for 100m. it then turns around and flies at 20 m/s for 15 s. find
    i. Its average speed
    ii. Its average velocity
5. The position of a particle moving along X-axis is given by $x = (5t^2 - 4t + 20)$ meter, where t is in seconds.
    i. Find average velocity between 1s and 3s.
    ii. Find velocity as a function of time v(t) and its value at t = 3s.
    iii. Find acceleration at t = 2 sec.
    iv. When is the particle at rest?

## ACCELERATION, EQUATIONS OF KINEMATICS : CONSTANT ACCELERATION

6. The average velocity of a body moving with uniform acceleration travelling a displacement of 3.06 m is 0.34 m/s. If the change in velocity is 0.18m/s during this time. Find the uniform acceleration.
7. Find the acceleration of the particle if the displacement of the particle moving in a straight line is given by: s = $2t^2 + 2t + 4$, where s is in meters and t is in seconds.
8. Consider an object moving with velocity v, covering a distance, x in time, t. The relation between time t and distance x is t = $\alpha x^2 + \beta x$, where $\alpha$ and $\beta$ are constants. Find the retardation.
9. A body of mass 10 kg is moving with a constant velocity of 10m/s. when a constant force acts for 4 sec on it, it moves with a velocity of 2m/s in the opposite direction. Find the acceleration produced in it.
10. On seeing a board of speed limit, you brake a car from speed of 108 km/h to a speed of 72km/h at constant acceleration and car travels 100m during this interval.
    i. What is that acceleration?
    ii. How much time is required for the given decrease in speed?
11. A train is moving with speed 108 km/h. On a straight track receiving red signal its brakes are applied and it retards at the rate of 3m/s$^2$. Find its displacement and average velocity for next 15 sec.
12. A body A moves with a uniform acceleration and zero initial velocity. Another body B, starts from the same point moves in the same direction with a constant velocity v. the two bodies meet after time t. Find t.
13. A student is standing at a distance of 50 meters from the bus. As soon as the bus starts its motion with an acceleration of 1m/s$^2$, the student starts running towards the bus with a uniform velocity u. Assuming the motion to be along a straight road, the minimum value of u, so that the student is able to catch the bus.
14. A car moving with a speed of 50 km/h, can be stopped by applying brakes after at least 6m. If the same car is moving with a speed of 100km/h. find the minimum stopping distance.
15. The velocity of the bullet is reduced from 200 m/s to 100 m/s while travelling through a wooden block of thickness 10 cm. Find the retardation, assuming it to be uniform.
16. A body starts from rest with an acceleration $a_1$. After 2 seconds, another body B starts from rest with an acceleration $a_2$. If they travel equal distance in the 5$^{th}$ second, after the start of A, then find the ratio $a_1:a_2$.
17. A particle travels 10m in first 5 sec and 10m in next 3 sec. Assuming constant acceleration, what is the distance travelled in next 2 sec.
18. A body starts from rest. What is the ratio of the distance travelled by the body during 4$^{th}$ and 3$^{rd}$ second.
19. A body travels for 15 sec starting from rest with constant acceleration. If it travels distances $S_1$, $S_2$ and $S_3$ in the first five seconds, second five seconds and next five seconds respectively. Find the relation between $S_1$, $S_2$ and $S_3$.

## VARIABLE ACCELERATION

20. The displacement of the particle is given by y = a + bt + ct$^2$ – dt$^4$. Find the initial velocity and acceleration.
21. The motion of a particle is described by the equation u = at, where b > 0. Find the distance travelled by the particle in the first 4 seconds.
22. The acceleration of a particle is given by a = 2t$^2$ m/s$^2$. If it is at rest and at the origin at time t = 0, find its position, velocity and acceleration at time t = 1 s.
23. The position x of a particle varies with time t as x = at$^2$ – bt$^3$. Find the time at which acceleration of the particle becomes zero?

## MOTION UNDER GRAVITY

24. A kid throws a ball up, with some initial speed. Comment on magnitudes and signs of acceleration and velocity of the ball.
25. If a body is thrown up with a velocity of 15 m/s then find the maximum height attained by the body. (g = 10m/s$^2$)
26. A man is standing on the top of a building, throws a ball with speed 5 m/s from 30 m height above the ground level. How much time it takes to reach the ground?
27. A body falls from rest in the gravitational field of the earth. Find the distance travelled by it in the 5$^{th}$ second of its motion. (g = 10m/s$^2$)
28. A man drops a ball downside from the roof of a tower of height 400 meters. At the same time another ball is thrown upside with a velocity of 50m/s from the foot of the tower. At what height from the foot of the tower will they meet?
29. A very large number of balls are thrown vertically upwards in quick succession in such a way that the next ball is thrown when the previous one is at the maximum height. If the maximum height is 5m, find the number of balls thrown in one minute. (g = 10m/s$^2$)
30. A particle is thrown vertically upwards. If its velocity at half of the maximum height is 10 m/s, then find the maximum height attained by it. (g = 10m/s$^2$)

## GRAPHS

31. What is the average acceleration for each graph segment in figure? Describe the motion of the object over the total time interval. Also calculate displacement.
32. Figure here gives the velocity time graph for a body. Find the displacement and distance travelled between t = 0 sec and t = 7 sec.