2

Kinematics

A Only One Option is Correct

1. Average velocity of a particle moving in a straight line, with constant acceleration a and initial velocity u in first t seconds is

(a) $u + \frac{1}{2}at$ (b) $u + at$ (c) $\frac{u + at}{2}$ (d) $\frac{u}{2}$

2. During an accelerated motion of a particle

(a) average velocity of the particle is always less than its final velocity

(b) average velocity of the particle is always greater than its final velocity

(c) average velocity of the particle may be zero also

(d) average velocity of the particle is half its final velocity

3. The magnitude of displacement of a particle moving in a circle of radius a with constant angular speed ω varies with time t as

(a) $2a \sin \omega t$ (b) $2a \sin \frac{\omega t}{2}$ (c) $2a \cos \omega t$ (d) $2a \cos \frac{\omega t}{2}$

4. Two particles are released from the same height at an interval of 1 s. How long after the first particle begins to fall will the two particles be 10 m apart ? ($g = 10\ m/s^2$)

(a) 1.5 s (b) 2 s (c) 1.25 s (d) 2.5 s

5. A body travelling along a straight line traversed one third of the total distance with a velocity 4 m/s. The remaining part of the distance was covered with a velocity 2 m/s for half the time and with velocity 6 m/s for the other half of time. The mean velocity averaged over the whole time of motion is

(a) 5 m/s (b) 4 m/s (c) 4.5 m/s (d) 3.5 m/s

6. A particle is projected from the ground with an initial velocity of 20 m/s at an angle of 30° with horizontal. The magnitude of change in velocity in a time interval from $t = 0$ to $t = 0.5$ s is ($g = 10\ m/s^2$)

(a) 5 m/s (b) 2.5 m/s (c) 2 m/s (d) 4 m/s

7. Two cars start off to race with velocities 4 m/s and 2 m/s and travel in straight line with uniform accelerations 1 m/s^2 and 2 m/s^2 respectively. If they reach the final point at the same instant, then the length of the path is

(a) 30 m (b) 32 m (c) 20 m (d) 24 m

8. A particle is projected at an angle of 60° above the horizontal with a speed of 10 m/s. After some time the direction of its velocity makes an angle of 30° above the horizontal. The speed of the particle at this instant is

(a) $\frac{5}{\sqrt{3}}$ m/s (b) $5\sqrt{3}$ m/s (c) 5 m/s (d) $\frac{10}{\sqrt{3}}$ m/s

9. A particle is projected from the ground at an angle of θ with the horizontal with an initial speed of u. Time after which velocity vector of the projectile is perpendicular to the initial velocity is

(a) $u/(g \sin \theta)$ (b) $u/(g \cos \theta)$

(c) $2u/(g \sin \theta)$ (d) $2u \tan \theta$

10. The displacement of a particle moving in a straight line is described by the relation, $s = 6 + 12t - 2t^2$. Here s is in metre and t in second. The distance covered by particle in first 5 s is

(a) 20 m (b) 32 m (c) 24 m (d) 26 m

11. A ball is projected upwards from the foot of a tower. The ball crosses the top of the tower twice after an interval of 6s and the ball reaches the ground after 12s. The height of the tower is ($g = 10\ m/s^2$)

(a) 120 m (b) 135 m (c) 175 m (d) 80 m

12. In projectile motion, the modulus of rate of change of speed

(a) is constant

(b) first increases then decreases

(c) first decreases then increases

(d) None of the above

13. A particle is projected vertically upwards from a point A on the ground. It takes time t_1 to reach a point B, but it still continues to move up. If it takes further t_2 time to reach the ground from point B. Then height of point B from the ground is

(a) $\frac{1}{2}g(t_1 + t_2)^2$ (b) $g\,t_1\,t_2$

(c) $\frac{1}{8}g(t_1 + t_2)^2$ (d) $\frac{1}{2}g\,t_1\,t_2$