

7. A boy playing on the roof of a 10 m high building throws a ball with a speed of 10m/s at an angle of 30° with the horizontal. How far from the throwing point will the ball be at the height of 10 m from the ground ?

$$[g = 10\text{m/s}^2, \sin 30^\circ = \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}]$$

- (a) 5.20m (b) 4.33m (c) 2.60m (d) 8.66m
8. The angle of projection at which the horizontal range and maximum height of projectile are equal is

- (a) 45° (b) $\theta = \tan^{-1}(0.25)$
 (c) $\theta = \tan^{-1} 4$ (d) 60°

9. The equation of a projectile is $y = \sqrt{3}x - \frac{gx^2}{2}$

The angle of projection is given by

- (a) $\tan \theta = \frac{1}{\sqrt{3}}$ (b) $\tan \theta = \sqrt{3}$
 (c) $\frac{\pi}{2}$ (d) zero.

10. A projectile projected at an angle 30° from the horizontal has a range R. If the angle of projection at the same initial velocity be 60° , then the range will be

- (a) R (b) 2R (c) R/2 (d) R^2

11. At the height 80 m, an aeroplane is moving with a speed of 150 m/s. A bomb is dropped from it so as to hit a target. At what distance from the target should the bomb be dropped (given $g = 10 \text{ m/s}^2$)

- (a) 605.3 m (b) 600m (c) 80m (d) 230m

12. A cricketer hits a ball with a velocity 25 m/s at 60° above the horizontal. How far above the ground it passes over a fielder 50 m from the bat (assume the ball is struck very close to the ground)

- (a) 8.2m (b) 9.0m (c) 11.6m (d) 12.7m

13. A gun is aimed at a target in a line of its barrel. The target is released and allowed to fall under gravity at the same instant the gun is fired. The bullet will

- (a) pass above the target (b) pass below the target
 (c) hit the target (d) certainly miss the target

14. If time of flight of a projectile is 10 seconds and range is 500 meters. The maximum height attained by it will be
(a) 125 m (b) 50 m (c) 100 m (d) 150 m
15. A body is thrown with a velocity of 9.8 m/s making an angle of 30° with the horizontal. It will hit the ground after a time
(a) 1.5 s (b) 1 s (c) 3 s (d) 2 s
16. A cricketer can throw a ball to a maximum horizontal distance of 100 m. The speed with which he throws the ball is (to the nearest integer)
(a) 30 ms^{-1} (b) 42 ms^{-1}
(c) 32 ms^{-1} (d) 35 ms^{-1}
17. Two bodies are thrown up at angles of 45° and 60° respectively, with the horizontal. If both bodies attain same vertical height, then the ratio of velocities with which these are thrown is
(a) $\sqrt{\frac{2}{3}}$ (b) $\frac{2}{\sqrt{3}}$ (c) $\sqrt{\frac{3}{2}}$ (d) $\frac{\sqrt{3}}{2}$
18. An object is projected at an angle of 45° with the horizontal. The horizontal range and the maximum height reached will be in the ratio of
(a) 1:2 (b) 2:1 (c) 1:4 (d) 4:1
19. At the highest point of the path of a projectile, its
(a) kinetic energy is maximum
(b) potential energy is minimum
(c) kinetic energy is minimum
(d) total energy is maximum
20. A ball thrown by one player reached the other in 2 s. The maximum height attained by the ball above the point of projection will be ($g = 10 \text{ m/s}^2$)
(a) 2.5 m (b) 5 m (c) 7.5 m (d) 10 m
21. If for two vectors \vec{A} and \vec{B} , sum $(\vec{A} + \vec{B})$ is perpendicular to the difference $(\vec{A} - \vec{B})$. The ratio of their magnitude is
(a) 1 (b) 2
(c) 3 (d) None of these
22. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection is
(a) 60° (b) $\tan^{-1}\left(\frac{1}{2}\right)$
(c) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (d) 45°
23. Two cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 , respectively. Their speeds are such that they make complete circles in the same time t . The ratio of their centripetal acceleration is
(a) $m_1 r_1 : m_2 r_2$ (b) $m_1 : m_2$
(c) $r_1 : r_2$ (d) 1:1
24. **Statement 1** : Multiplying any vector by a scalar is a meaningful operation.
Statement 2 : In uniform motion, speed remains constant.
(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement -1
(b) Statement-1 is True, Statement -2 is True; Statement-2 is NOT a correct explanation for Statement -1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement -2 is True
25. **Assertion** : During flight under action of gravity, the change in velocity of a projectile in same time intervals is same. (Neglecting air friction).
Reason : Neglecting air friction, the acceleration of projectile is constant during flight.
(a) Assertion is True, Reason is True; Reason is a correct explanation for Assertion
(b) Assertion is True, Reason is True; Reason is NOT a correct explanation for Assertion
(c) Assertion is True, Reason is False
(d) Assertion is False, Reason is True

1. The height y and the distance x along the horizontal plane of a projectile on a certain planet (with no surrounding atmosphere) are given by $y = 8t - 5t^2$ metre and $x = 6t$ metre, where t is in seconds. The velocity with which the projectile is projected is (Acceleration due to gravity = 9.8 m s^{-2})
 (a) 6 m s^{-1} (b) 8 m s^{-1}
 (c) 10 m s^{-1} (d) 14 m s^{-1} (2011)
2. A projectile is projected at 10 m s^{-1} by making an angle 60° to the horizontal. After some time its velocity makes an angle of 30° to the horizontal. Its speed at this instant (in m s^{-1}) is
 (a) $\frac{10}{\sqrt{3}}$ (b) $10\sqrt{3}$
 (c) $\frac{5}{\sqrt{3}}$ (d) $5\sqrt{3}$ (2013)
3. Which of the following is not a vector quantity?
 (a) Momentum (b) Weight
 (c) Potential energy (d) Nuclear spin (2014)
4. A stone is thrown vertically at a speed of 30 m s^{-1} making an angle of 45° with the horizontal. What is the maximum height reached by the stone? Take $g = 10 \text{ m s}^{-2}$.
 (a) 15 m (b) 30 m
 (c) 10 m (d) 22.5 m (2014)
5. A particle is projected with a velocity v so that its horizontal range twice the greatest height attained. The horizontal range is
 (a) $\frac{2v^2}{3g}$ (b) $\frac{v^2}{2g}$
 (c) $\frac{v^2}{g}$ (d) $\frac{4v^2}{5g}$ (2015)
6. The ratio of angular speed of a second-hand to the hour-hand of a watch is
 (a) 60 : 1 (b) 72 : 1
 (c) 720 : 1 (d) 3600 : 1 (2015)
7. Three projectiles A, B and C are projected at an angle of 30° , 45° , 60° respectively. If R_A , R_B and R_C are ranges of A, B and C respectively then (velocity of projection is same for A, B and C)
 (a) $R_A = R_B = R_C$ (b) $R_A = R_C > R_B$
 (c) $R_A < R_B < R_C$ (d) $R_A = R_C < R_B$ (2016)
8. The component of a vector \vec{r} along x -axis will have a maximum value if
 (a) \vec{r} is along +ve x -axis
 (b) \vec{r} is along +ve y -axis
 (c) \vec{r} is along -ve y -axis
 (d) \vec{r} makes an angle of 45° with the x -axis (2016)
9. If $\vec{A} = 2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to $\vec{B} = 4\hat{j} - 4\hat{i} + \alpha\hat{k}$, then the value of ' α ' is
 (a) 1 (b) $\frac{1}{2}$ (c) -1 (d) $-\frac{1}{2}$ (2017)
10. The angle between velocity and acceleration of a particle describing uniform circular motion is
 (a) 180° (b) 45°
 (c) 90° (d) 60° (2017)
11. The trajectory of a projectile projected from origin is given by the equation $y = x - \frac{2x^2}{5}$. The initial velocity of the projectile is
 (a) 25 m s^{-1} (b) $\frac{2}{5} \text{ m s}^{-1}$
 (c) $\frac{5}{2} \text{ m s}^{-1}$ (d) 5 m s^{-1} (2019)
12. Rain is falling vertically with a speed of 12 m s^{-1} . A woman rides a bicycle with a speed of 12 m s^{-1} in east to west direction. What is the direction in which she should hold her umbrella?
 (a) 30° towards West
 (b) 45° towards West
 (c) 30° towards East
 (d) 45° towards East (2020)
13. A wheel starting from rest gains an angular velocity of 10 rad s^{-1} after uniformly accelerated for 5 sec. The total angle through which it has turned is
 (a) $25\pi \text{ rad}$
 (b) $50\pi \text{ rad}$ about a vertical axis
 (c) 25 rad
 (d) 100 rad (2020)

14. The maximum range of a gun on horizontal plane is 16 km. If $g = 10 \text{ m s}^{-2}$, then muzzle velocity of a shell is
 (a) 160 m s^{-1} (b) $200\sqrt{2} \text{ m s}^{-1}$
 (c) 400 m s^{-1} (d) 800 m s^{-1} (2021)
15. The trajectory of a projectile is
 (a) semicircle (b) an ellipse
 (c) a parabola always
 (d) a parabola in the absence of air resistance. (2021)
16. For a projectile motion, the angle between the velocity and acceleration is minimum and acute at
 (a) only one point (b) two points
 (c) three points (d) four points. (2021)
17. A particle starts from the origin at $t = 0 \text{ s}$ with a velocity of $10 \hat{j} \text{ m s}^{-1}$ and moves in the $x - y$ plane with a constant acceleration of $(8\hat{i} + 2\hat{j}) \text{ m s}^{-2}$. At an

instant when the x -coordinate of the particle is 16 m, y -coordinate of the particle is

- (a) 16 m (b) 28 m
 (c) 36 m (d) 24 m (2021)
18. Two objects are projected at an angle θ° and $(90 - \theta)^\circ$, to the horizontal with the same speed. The ratio of their maximum vertical heights is
 (a) $1 : \tan\theta$ (b) $1 : 1$
 (c) $\tan^2\theta : 1$ (d) $\tan\theta : 1$ (2022)
19. A particle is in uniform circular motion. Related to one complete revolution of the particle, which among the statements is incorrect?
 (a) Average acceleration of the particle is zero.
 (b) Displacement of the particle is zero.
 (c) Average speed of the particle is zero.
 (d) Average velocity of the particle is zero. (2023)

ANSWER KEY