

SAQs:

- If the displacement of the particle is proportional to the square of time. State the nature of motion of the body.
 - Define projectile. A projectile is fired at an angle θ with the horizontal. Show that the path followed by projectile is a parabola. Also derive expression for the maximum height, time of flight and horizontal range.
- If the distance travelled by a body in time ' t ' is given by $x = at + bt^2$, then what will be the acceleration of the body?
 - A batter hits a baseball so that it leaves the bat with an initial speed $37m/s$ at an angle of 53° with the horizontal. Find the position of the ball and the magnitude and direction of velocity after 2 seconds. Treat the baseball as a projectile. [Ans: $24.23m/s$, 23.21°]
- Can a body have a constant speed but changing velocity? Explain with example.
 - A stone on the edge of a vertical cliff is kicked so that its initial velocity is $9m/s$ horizontally. If the cliff is $200m$ high, calculate, time taken by stone to reach the ground and how far from the cliff the stone will hit the ground? [Ans: $6.32sec$, $56.92m$]
- Find the angle of projection at which the horizontal range and maximum height of a projectile are equal.
 - Prove these equations graphically: a) $s = ut + \frac{1}{2}at^2$ b) $v^2 = u^2 + 2as$
- Draw displacement time graph for two cases: uniform velocity and non-uniform velocity.
 - Show that the path of a projectile projected horizontally from top of the tower is parabolic. Also calculate time of flight and horizontal range travelled by the projectile.
- Show that there are two angles of projection of a projectile for the same horizontal range.
 - A car travelling with a speed of $15m/s$ is braked and is slowed down with uniform retardation. It covers a distance of $88m$ as its velocity reduce to $7m/s$. If the car continues to slow down with same rate, how far will the car travel becoming to rest. [Ans: $24.5m$]
- A body is thrown vertically upward with initial velocity of $40 m/s$. Draw the v-t diagram for the body.
 - A body falls freely from top of a tower. During the last second of its fall, it falls through $25m$. Find the height of the tower. [Ans: $45m$]
- What does the area under velocity time graph represent, what about area under acceleration time graph?
 - An object is dropped from the top of the tower of height $156.8m$ and at the same time another object is thrown vertically upward with the velocity of $78.1m/s$ from the foot of the tower, when and where the objects meet? [Ans: $2 sec$ and $20m$ below top]
- What would be the effect on maximum range in doubling the initial velocity of a projectile?
 - A projectile is fired from the ground level with a velocity of $500m/s$ at 30° to horizon. Find the horizontal range, and greatest height to which it rises. What is the least speed with which it can be projected in order to achieve the same horizontal range? [Ans: $21651m$, $3125m$, $464m/s$]
- What would be the effect on maximum range in doubling the initial velocity of a projectile?
 - A projectile is launched with an initial velocity of $30m/s$ at an angle of 60° above the horizontal. Calculate the magnitude and direction of its velocity $5sec$ after launch. [Ans: $28.3m/s$ and 58° from horizontal]
- A bomb is to be dropped from a moving helicopter on a target on the ground. Explain how it can hit the target.
 - Two tall buildings are $40m$ apart. With what speed must a ball be thrown horizontally from a window $120m$ above the ground in one building so that it will enter a window $40m$ from the ground in the other building? [Ans: $10m/s$]
 - A car is running on a straight road with accelerating motion. It travels $10m$ distance in 3^{rd} seconds after the start and $12m$ in 5^{th} second. Now, what distance does it travel in 10^{th} second after its start. [Ans: $17m$]
- Under what condition is the average velocity equal to the instantaneous velocity?
 - A stone is thrown horizontally with a speed of $20m/s$ from height $100m$ above the ground, find: its time of flight, Horizontal range, velocity after 2 seconds, velocity with which it hits the ground, position of stone after 2 seconds.