NEET	Class – 11th	Topic – Projectile_Motion

Definition:

Projectile motion is the motion of an object thrown into the air, subject only to acceleration due to gravity.

Key Assumptions:

- Air resistance is negligible.
- Acceleration due to gravity (g) is constant and acts vertically downward.

Types of Projectile Motion:

- Horizontal Projection – velocity is only in horizontal direction initially.
- Oblique Projection – velocity has both horizontal and vertical components.

Components of Initial Velocity (u):

- Horizontal: $u_x = u \cdot \cos\theta$
- Vertical: $u_y = u \cdot \sin\theta$

Time of Flight (T):

$T = (2u \cdot \sin\theta) / g$

Maximum Height (H):

$H = (u^2 \cdot \sin^2\theta) / (2g)$

Horizontal Range (R):

$R = (u^2 \cdot \sin2\theta) / g$

Equation of Trajectory:

$y = x \cdot \tan\theta - (g \cdot x^2)/(2 \cdot u^2 \cdot \cos^2\theta)$

(This is the equation of a parabola)

Important Observations:

- Maximum range is achieved when $\theta = 45°$
- Complementary angles give the same range (e.g., 30° and 60°)

- Range is symmetric; the path is parabolic
- Time to reach maximum height = T/2

Graphical Summary:

- Path: Parabola
- Velocity-time graph: vx = constant, v = linear
- Acceleration: constant (g), always downward

Useful Tips:

- Always resolve the initial velocity into components.
- Use sin 2θ identity: $\sin(2\theta) = 2 \cdot \sin\theta \cdot \cos\theta$ for range problems.
- Check units: use m/s for velocity, m for distance, and s for time.

Common NEET Traps:

- Ignoring component resolution
- Not using the correct trigonometric values
- Confusing time of flight with time to reach maximum height