

KINEMATICS

Physics Class 11 - Complete Study Notes

Module 1: Introduction & Basic Concepts

Kinematics is the branch of mechanics that describes the motion of objects without considering forces.

Key Terms:

- Displacement: Change in position (vector quantity)
- Distance: Total path length (scalar quantity)
- Speed: Distance/Time (scalar)
- Velocity: Displacement/Time (vector)

Module 2: Speed & Velocity

Average Speed = Total Distance / Total Time

Average Velocity = Displacement / Time

Instantaneous Velocity = ds/dt

Module 3: Acceleration

Acceleration = Change in Velocity / Time

$a = dv/dt$

Module 4: Equations of Motion

First Equation: $v = u + at$

Where:

v = final velocity

u = initial velocity

a = acceleration

t = time

Second Equation: $s = ut + \frac{1}{2} at^2$

s = displacement

Third Equation: $v^2 = u^2 + 2as$

Module 5: Graphical Analysis

Position-Time Graph: Slope = Velocity

Velocity-Time Graph: Slope = Acceleration

Area under v - t curve = Displacement

Module 6: Relative Motion

Relative Velocity: $v_{AB} = v_A - v_B$

Important for river crossing and
rain problems in kinematics

Module 7: Projectile Motion

Motion under gravity in 2D

Horizontal: $x = u \cos(\theta) \cdot t$

Vertical: $y = u \sin(\theta) \cdot t - \frac{1}{2} g t^2$

Time of Flight: $T = \frac{2u \sin(\theta)}{g}$

Maximum Height: $H = \frac{u^2 \sin^2(\theta)}{2g}$

Range: $R = \frac{u^2 \sin(2\theta)}{g}$

Maximum range at 45 degrees

Key Formulas Summary

$v = u + at$

$s = ut + \frac{1}{2} at^2$

$v^2 = u^2 + 2as$

Average velocity = $\frac{(u + v)}{2}$

End of Kinematics Notes

For more practice questions, refer to the Practice section on the website.