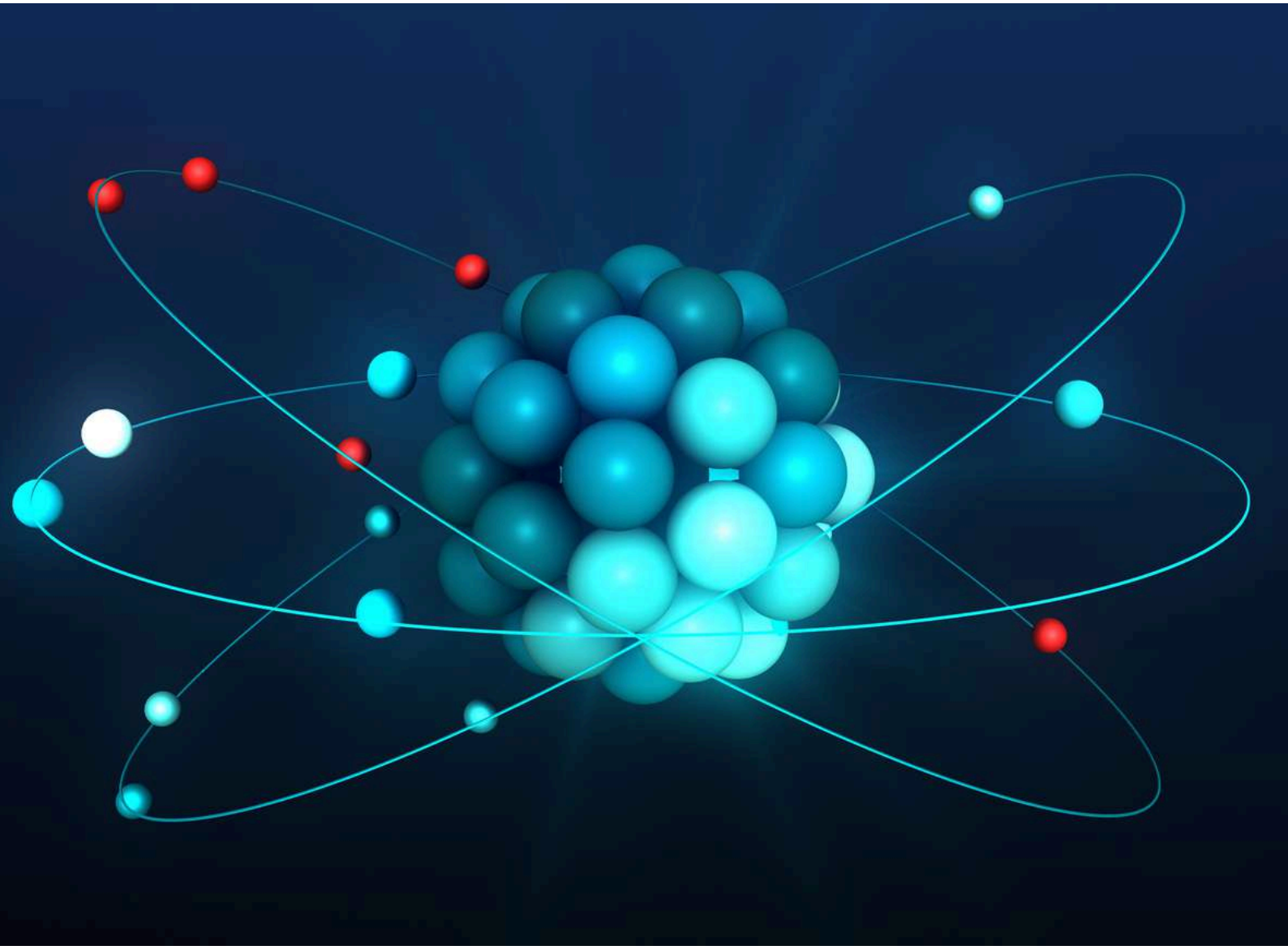

Physics Olympiad Program Level 3

Cheenta Academy for Olympiad & Research

cheenta.com

Since 2010

Passion for Mathematical Science & Research

This program is useful for Physics Olympiads like NSEP, InPhO, KVPY and IIT JEE styled entrances

Success Stories Since 2010

Aryan Kalia

Top 1% globally in American Math Competition,

Attended Math Olympiad Program and School Research Program at cheenta

Attended Student internship program at cheenta

Harvard University in 2022

Sambuddha Majumdar

Scotland Math Olympiad Awardee

Attended Math Olympiad Program at cheenta

Attended Student internship program at cheenta

University of Edinburgh

Anushka Aggarwal

Youngest Indian National Math Olympiad awardee, Europian Girls Math Olympiad awardee

Attended Math Olympiad Program at cheenta

Attended Student internship program at cheenta

MIT (Massachusetts Institute of Technology) in 2022

Akshaj Kadaveru

American Math Competition, AIME and USAJMO awardee

Attended Math Olympiad Program at cheenta

MIT (Massachusetts Institute of Technology)

Curriculum 96 week program, 17 modules

Mechanics

Module 1

Kinematics — 3 Lessons

- Motion in two and three dimensions
- Projectile Motion and Uniform Circular Motion
- Relative Motion

Module 2

Work, Power, Energy — 3 Lessons

- Definition of Work, Kinetic Energy and Potential Energy
- Work Energy Theorem and Conservation of Mechanical Energy
- Moment of Inertia and Rotational Kinetic Energy

Module 3

Newton's Laws of Motion

7 Lessons

- Basics of Newton's laws of Motion
- Calculations based on Free Body Diagram
- Non-inertial frame and pseudo force
- Conservation of Linear Momentum
- Elastic and Inelastic Collisions
- Circular Motion - Angular Momentum and Torque (Basics)
- Polar Coordinates - Centrifugal and Coriolis Force
- Review & Evaluation

Module 4

Central Force

6 Lessons

- Conservation Laws in a Central Force Problem
- Examples of Central Force: Gravitation and Coulomb Force, Definition of Flux
- Field Calculation and Gauss's Law
- Gravitation - Field and Potential Energy due to Earth
- Gravitation - Kepler's Laws and Motion of Orbiting Satellites, Orbital and Escape Speed
- Review & Evaluation

Module 5

Rigid Body Dynamics

8 Lessons

- Torque and Angular Motion
- Moment of Inertia of a Rigid Body
- Rotational Equilibrium
- Combined Motion and Angular Momentum
- Rotational Kinetic Energy and Conservation Laws
- Rigid Body Collisions - I & II
- Review & Evaluation

Module 6

Simple Harmonic Motion

10 Lessons

- SHM as a Homogenous Linear Differential Equation
- Linear Simple Harmonic Motion
- SHM Equation from Free Body Diagram
- SHM Equation from Energy Conservation
- Superposition of multiple SHM
- Damped Harmonic Motion
- Approximations to SHM
- Combinations of Spring Pulley Systems
- Advanced Problems
- Review & Evaluation

Module 7

Fluid Mechanics

3 Lessons

- Pascal's Law and Archimedes' Principle
- Steady and Turbulent Flow
- Equation of Continuity and Bernoulli's Equation
- Applications of Bernoulli's Equation

Module 8

5 Lessons

Surface Tension

- Origin of Surface Tension
- Surface Energy
- Contact angle and Rise of Liquid in a Capillary Tube
- Excess Pressure in a Liquid Drop or Bubble

Module 9

Properties of Bulk Matter

5 Lessons

- Elasticity, Stress and Strain
- Hook's Law and Module of Elasticity
- Relation between Longitudinal Stress and Strain
- Elastic Potential Energy of a Strained Body
- Review & Evaluation

Module 10

4 Lessons

Viscosity

- Viscosity and Poisseuilli's Equation
- Stoke's Law and Terminal Velocity
- Critical velocity and Renold's Number
- Review & Evaluation

Curriculum

Non - Mechanics

Module 1

Heat and Thermodynamics

8 Lessons

- Zeroth Law of Thermodynamics and Ideal Gas
- Specific Heat and Calorimetry
- First Law of Thermodynamics, Work done by a Gas and Heat
- Thermodynamic Processes, Heat Engines
- Second Law, Reversible and Irreversible Process
- Entropy and Carnot Engine
- Specific Heat Capacities of Gases
- Review & Evaluation

Module 2

Heat Transfer

5 Lessons

- Method of Heat Transfers
- Conduction of Heat through Solids
- Blackbody Radiation, Stefan's Law, Wein's Law
- Newton's Law of Cooling
- Review & Evaluation

Module 3

5 Lessons

Sound Waves

- Sound Waves and Velocity in Different Mediums
- Speed of Sound in Air, Intensity
- Doppler Effect
- Inetrference and Diffraction

Module 4

Wave Motion

6 Lessons

- Motion of Wave Pulse on a String and Velocity of a Pulse
- Power Transmitted By a Sinusoidal Wave Pulse
- Interference and the Principle of Superposition
- Reflection and Transmission of Waves
- Standing Waves
- Vibration of Strings for close and open ends
- Transverse and Longitudinal Waves, Polarization of Waves
- Review & Evaluation

Module 5

Electrostatics

7 Lessons

- Coulomb's Law, Electric Field and Forces, Field Calculations
- Electrostatic Potential and Equipotential Surface
- Electric Dipole, Torque and Potential Energy of a Dipole in External Field
- Conductors and Insulators, Electric Field inside a Conductor
- Electric Flux and Gauss's Law
- Review & Evaluation

Module 6

Electrodynamics

8 Lessons

- Capacitance
- Ohm's Law and Electric Current in Conductors, Equivalent Resistance Calculations
- Kirchoff's Laws
- Magnetic Field
- Magnetic Field due to a Current
- Electromagnetic Induction
- Alternating Currents and EM Waves
- Review & Evaluation

Module 7

Ray Optics

4 Lessons

- Reflection Laws, Spherical Mirrors
- Refraction Laws, Thin Slab and Prism
- Refraction at a Curved Surface
- Review & Evaluation

and more...