School Connect Online

SCO INTERNATIONAL OLYMPIAD

SCO IPhO SYLLABUS

A compiled Grade 8-12 Physics Olympiad syllabus for students, teachers, parents, and schools globally

Designed from SCO IPhO Grade 8-12 pathways and aligned with global Physics Olympiad preparation standards for conceptual mastery, experimental thinking, online practice, and future-ready scientific growth.

- grade-wise Physics pathway from foundational science to senior Olympiad readiness
- IPhO-style emphasis on creativity, modelling, SI units, graphs, uncertainty, and experimental reasoning
- three-cycle SCO IPhO model: Spring, Summer, and Winter with multiple exam dates across the year
- pedagogy guidance for schools, teachers, parents, and independent learners globally

Mechanics	Electricity	Optics	Waves	Thermo
Modern	Space	Data	Lab Skills	IPhO Ready

School Connect Online

SCO International Physics Olympiad (SCO IPhO)

1. Compiled Syllabus & Learning Outcomes - Grade 8 to Grade 12

This document presents a globally oriented, grade-wise Physics Olympiad syllabus for SCO IPhO. It is designed for schools, teachers, parents and students who want a clear, structured pathway from foundation-level science to senior Olympiad-level physics readiness.

Global positioning note

SCO IPhO is presented as a structured online Physics Olympiad and preparation pathway. It is aligned with the academic spirit of global Physics Olympiad preparation - strong concepts, modelling, SI units, graphing, data analysis, experimental reasoning and creativity - while remaining a School Connect Olympiad programme with its own schedule, platform flow and student-support model.

2. Global Physics Olympiad Alignment

The SCO IPhO syllabus is designed around the same educational competencies that make international Physics Olympiad preparation valuable: conceptual depth, mathematical modelling, experimental awareness, accurate use of units, graph interpretation, and evidence-based reasoning. Students are encouraged to move beyond memorised formulae and build explanations from physical laws, diagrams, data, approximations and real-world observations.

Global IPhO Standard Area	SCO IPhO Syllabus Response	Pedagogy Used in This Guide
Mechanics	Built progressively from force, pressure, motion and energy to rotational dynamics, gravitation, fluids and elasticity.	Start with physical intuition, then add vector reasoning, modelling, conservation laws and multi-step problem solving.
Electromagnetic Fields and Circuits	Introduced through electric current and magnetism in Grade 10, expanded into electrostatics, current electricity, magnetism, induction, AC and EM waves in Grade 12.	Move from circuit literacy to field-based reasoning, symmetry, graphs, units, and real-world devices.
Oscillations, Waves and Optics	Sound and light begin in Grade 8-10; oscillations, waves, ray optics and wave optics are formalized in Grade 11-12.	Use demonstrations, wave diagrams, lens/mirror modelling, interference reasoning and data interpretation.
Thermodynamics and Statistical Thinking	Thermal properties, thermodynamics and kinetic theory appear in Grade 11 with links to energy conversion and climate/engineering contexts.	Connect macroscopic laws to molecular models, energy quality, engines, and everyday heat-transfer systems.
Modern Physics	Dual nature, atoms, nuclei, semiconductors and communication systems are mapped in Grade 12.	Bridge classical physics to quantum ideas using spectra, photoelectric effect, nuclear energy and device applications.
Experimental Skills	Embedded across all grades through measurement, graphing, uncertainty, online/virtual lab reasoning and school-based practical enquiry.	Train students to estimate, measure, plot, interpret, and justify conclusions instead of memorizing only formulae.

3. SCO IPhO Annual Cycle Model

SCO IPhO is conducted across three major annual cycles - Spring, Summer and Winter - with multiple official exam dates across the year. This helps global schools and learners participate according to regional calendars, school timetables and preparation readiness.

Cycle	Exam Window	Result / Publish Window	Student-Friendly Interpretation
Spring 2026	01 Jan 2026 - 31 Mar 2026	30 Apr 2026	Early-year attempt window for students beginning the academic year or continuing winter preparation.
Summer 2026	01 Apr 2026 - 31 Jul 2026	31 Aug 2026	Mid-year attempt window with multiple official dates for schools and individual learners.

Cycle	Exam Window	Result / Publish Window	Student-Friendly Interpretation
Winter 2026	01 Aug 2026 - 31 Dec 2026	28 Feb 2027	Late-year global window, useful for final benchmark, school cohorts, and international preparation.
Spring 2027	01 Jan 2027 - 31 Mar 2027	30 Apr 2027	Early-year 2027 cycle with the same multi-date online model.
Summer 2027	01 Apr 2027 - 31 Jul 2027	31 Aug 2027	Mid-year 2027 cycle for flexible global school calendars.
Winter 2027	01 Aug 2027 - 31 Dec 2027	29 Feb 2028	Late-year 2027 cycle ending with result publication in February 2028.

4. Exam Preparation Guidance for Schools and Learners

Stakeholder	Recommended Use of This Syllabus
Students	Use the class-wise chapter list as a weekly preparation roadmap. Maintain a formula notebook, graph notebook and error-analysis sheet. Practice explaining why a result is physically reasonable, not only how it was calculated.
Teachers	Use the chapter notes to create lesson bridges from school curriculum to Olympiad reasoning. Add demonstrations, short investigations, graph tasks and cross-topic problems.
Parents	Support regular practice, revision and healthy exam routines. Encourage curiosity, observation and understanding rather than only fast answer selection.
Schools	Plan cohorts by cycle, map chapters to the school academic calendar, conduct mock tests, and use SCO reports for class-level strengthening.

5. IPhO-Style Skills Embedded in SCO IPhO

Conceptual understanding: explain laws and principles in words, diagrams, equations and real situations.

Modelling: simplify real systems while keeping the dominant physics meaningful.

Mathematical formulation: use algebra, vectors, graphs and basic calculus where grade-appropriate.

SI units and dimensions: use correct units, significant figures and dimensional checks.

Experimental reasoning: interpret measurements, graphs, data tables, uncertainty and apparatus limits.

Physical reflection: judge whether numerical answers have the right order of magnitude and direction.

6. Grade-Wise Progression Map

Grade	Developmental Purpose	Major Physics Domains
Class 8	Conceptual foundations: observation, measurement, safety, basic physical quantities and everyday physics.	Force, pressure, friction, sound, basic electricity, light, astronomy.
Class 9	Quantitative foundations: motion, force, gravity, energy and waves with stronger graph and numerical skills.	Motion, Newton's laws, gravitation, energy, sound and graphs.
Class 10	Bridge stage: optics and electricity become formal, equation-based and device-linked.	Reflection, refraction, electricity, magnetism, energy sources and optics applications.
Class 11	Advanced foundation: mathematical modelling, mechanics, properties of matter, thermodynamics, oscillations and waves.	Mathematical physics, mechanics, matter properties, thermodynamics, oscillations and waves.
Class 12	Senior Olympiad readiness: fields, circuits, induction, optics, modern physics and electronics.	Electrostatics, current, magnetism, induction, AC, EM waves, optics, modern physics and electronics.

7. Class 8 SCO IPhO Syllabus

Class 8 Pedagogy Note

Conceptual foundations: observation, measurement, safety, basic physical quantities and everyday physics. At this level, SCO IPhO builds the language of force, light, electricity, sound and astronomy so that learners can later handle IPhO-style mechanics, optics and circuits.

No.	Chapter Title	Chapterwise Note	Learning Outcomes / Skills	IPhO Skill Tags
1	Force and Pressure	Introduces force as push/pull and pressure as force per unit area, with special attention to fluid pressure and applications such as syringes, dams and tyres.	Define force and pressure, use SI units correctly, compare pressure in solids/liquids/gases, and explain daily-life applications.	Mechanics; SI Units; Fluids
2	Friction	Develops an intuitive and practical understanding of static, sliding and rolling friction and why friction can be useful or harmful.	Classify friction types, predict effects on motion, explain wear/heat generation, and suggest ways to increase or reduce friction.	Mechanics; Modelling
3	Sound	Builds wave vocabulary using sound as an accessible physical phenomenon involving vibration, medium, amplitude, pitch and loudness.	Explain sound production and propagation, compare pitch/loudness, describe reverberation, and connect wave ideas to communication and safety.	Waves; Measurement
4	Chemical Effects of Electric Current	Uses electrolysis and electroplating as entry points to current, conductors, electrolytes and energy transformation.	Identify conducting liquids, explain electroplating/electrolysis at a basic level, and connect current effects to technology and household safety.	Electricity; Experimental Reasoning
5	Some Natural Phenomena	Introduces natural electrical and geophysical events such as lightning, earthquakes and auroras with emphasis on cause, evidence and safety.	Explain lightning safety, describe earthquake precautions, and reason from observed phenomena to scientific causes.	Earth Physics; Safety
6	Light	Develops early optics through rectilinear propagation, shadows, reflection and simple image ideas.	Describe light travel, shadow formation, reflection basics and uses of optics in mirrors, instruments and daily environments.	Optics; Diagrams
7	Stars and the Solar System	Builds scientific curiosity around the night sky, planetary motion, constellations and basic scale of the solar system.	Recognize planets/constellations, describe basic celestial motion and connect observation to introductory astronomy.	Astronomy; Scientific Enquiry

8 . Class 9 SCO IPhO Syllabus

Class 9 Pedagogy Note

Quantitative foundations: motion, force, gravity, energy and waves with stronger graph and numerical skills. Class 9 connects school physics to Olympiad thinking by turning everyday motion and forces into mathematical models, graphs, laws and estimates.

No.	Chapter Title	Chapterwise Note	Learning Outcomes / Skills	IPhO Skill Tags
1	Motion	Moves students from descriptive motion to measured motion using distance, displacement, speed, velocity, acceleration and graphs.	Interpret position-time and velocity-time graphs, calculate speed/acceleration, and distinguish scalar and vector quantities.	Kinematics; Graphs
2	Force and Laws of Motion	Introduces Newtonian reasoning: inertia, net force, action-reaction and the link between force and acceleration.	Apply Newton's laws to simple systems, identify balanced/unbalanced forces, and solve basic force-motion problems.	Dynamics; Modelling
3	Gravitation	Connects falling objects, weight, orbital ideas and universal attraction under a common gravitational law.	Use the universal law qualitatively/quantitatively, explain acceleration due to gravity, and recognize orbital motion as gravitational motion.	Gravity; Astronomy
4	Work, Energy and Power	Frames energy as a transferable, transformable quantity and power as rate of energy transfer.	Calculate work, kinetic energy, potential energy and power; apply conservation of energy in simple contexts.	Energy; Conservation Laws
5	Sound	Revisits sound with stronger wave properties, Doppler effect awareness and applied contexts such as ultrasound and communication.	Analyze frequency, wavelength, speed and amplitude; explain echo, Doppler idea and applications in measurement/diagnosis.	Waves; Applications

9. Class 10 SCO IPhO Syllabus

Class 10 Pedagogy Note

Bridge stage: optics and electricity become formal, equation-based and device-linked. Class 10 is the transition from broad school science to Olympiad physics literacy in circuits, fields, mirrors, lenses and energy systems.

No.	Chapter Title	Chapterwise Note	Learning Outcomes / Skills	IPhO Skill Tags
1	Reflection of Light	Builds precise ray diagrams and image formation with plane and spherical mirrors.	Apply laws of reflection, draw ray diagrams, use mirror formula at an introductory level, and classify images.	Optics; Ray Diagrams
2	The Human Eye and the Colourful World	Connects optical principles to human vision, defects, correction, dispersion and atmospheric optical effects.	Explain eye structure, defects and lenses; describe dispersion, scattering and colour formation in nature.	Optics; Applications
3	Electricity	Establishes circuit analysis using current, potential difference, resistance, Ohm's law and series/parallel combinations.	Use Ohm's law, solve basic circuit problems, compare series/parallel circuits, and explain heating effects.	Circuits; SI Units
4	Magnetic Effects of Electric Current	Introduces magnetic fields, electromagnets, motor effects and electromagnetic induction.	Draw magnetic field patterns, apply hand rules qualitatively, explain motors/generators and link current to magnetism.	Electromagnetism; Devices
5	Sources of Energy	Explores conventional and renewable energy sources with efficiency, sustainability and energy conversion thinking.	Compare energy sources, identify conversion pathways, and evaluate environmental and practical trade-offs.	Energy Systems; Sustainability
6	Refraction of Light	Builds Snell's law, lens behaviour, prism refraction and total internal reflection concepts.	Apply refraction rules, construct lens ray diagrams, explain TIR and connect refraction to optical instruments.	Optics; Quantitative Reasoning

School Connect Online

10. Class 11 SCO IPhO Syllabus

Class 11 Pedagogy Note

Advanced foundation: mathematical modelling, mechanics, properties of matter, thermodynamics, oscillations and waves. Class 11 is the central preparation layer for IPhO-style mechanics and thermodynamics, including vectors, calculus readiness, graphs and approximation.

No.	Chapter Title	Chapterwise Note	Learning Outcomes / Skills	IPhO Skill Tags
1	Mathematics in Physics	Gives students the mathematical language needed for vectors, rates of change, graphs and modelling.	Use vector algebra, basic calculus ideas and dimensional reasoning to represent physical situations.	Mathematics; Modelling
2	Physical World and Measurement	Establishes units, dimensions, significant figures, uncertainty and scientific communication.	Use SI units, analyze dimensions, report significant figures, and estimate errors in measured quantities.	Measurement; Uncertainty
3	Motion in a Straight Line	Deepens one-dimensional kinematics with equations and graph-based interpretation.	Solve constant-acceleration problems, derive relationships from graphs and interpret physical meaning.	Kinematics; Graphs
4	Motion in a Plane	Develops vector motion, projectile motion and relative motion in two dimensions.	Resolve vectors, analyze projectiles, use relative velocity and connect equations to trajectories.	Vectors; Mechanics
5	Laws of Motion	Strengthens Newtonian dynamics using free-body diagrams and multi-force systems.	Build FBDs, solve connected-body problems, analyze friction and identify constraints.	Dynamics; Problem Solving
6	Work, Energy and Power	Uses energy methods as efficient tools for mechanics problems.	Apply work-energy theorem, potential energy, conservation and power concepts to mechanical systems.	Energy; Conservation
7	System of Particles and Rotational Motion	Introduces centre of mass, torque, moment of inertia, angular momentum and rolling motion.	Analyze rotational equilibrium/dynamics, calculate torque and reason with angular momentum.	Rotational Mechanics
8	Gravitation	Extends gravity to fields, potential, satellites and planetary motion.	Use gravitational field/potential ideas, solve orbital-energy problems and interpret Kepler-type motion.	Celestial Mechanics
9	Mechanical Properties of Solids	Studies elasticity, stress-strain relations and material behaviour.	Analyze elastic deformation, Young's modulus and practical limits of solids.	Elasticity; Materials
10	Mechanical Properties of Fluids	Builds pressure, buoyancy, viscosity and Bernoulli reasoning.	Apply Pascal/Archimedes/Bernoulli ideas and interpret flow in real systems.	Fluids; Hydrodynamics
11	Thermal Properties of Matter	Connects temperature, heat, expansion and calorimetry.	Use heat-capacity concepts, calorimetry equations and thermal expansion relations.	Thermal Physics
12	Thermodynamics	Introduces the first and second laws, heat engines and entropy at a conceptual-problem level.	Analyze thermodynamic processes, heat/work transfer and engine efficiency.	Thermodynamics
13	Kinetic Theory of Gases	Links molecular motion to pressure, temperature and gas laws.	Use molecular interpretation of gases, RMS speed ideas and ideal-gas relations.	Statistical Thinking
14	Oscillations	Develops SHM through force, energy and time-period analysis.	Model SHM, analyze pendulums/springs and interpret energy exchange in oscillations.	Oscillations
15	Waves	Builds general wave language, superposition, standing waves and sound applications.	Analyze wave speed, interference, standing waves and resonance in strings/air columns.	Waves; Resonance

School Connect Online

11. Class 12 SCO IPhO Syllabus

Class 12 Pedagogy Note

Senior Olympiad readiness: fields, circuits, induction, optics, modern physics and electronics. Class 12 aligns closely with IPhO senior topics by combining field theory, advanced circuits, wave optics, quantum ideas, nuclear physics and device thinking.

No.	Chapter Title	Chapterwise Note	Learning Outcomes / Skills	IPhO Skill Tags
1	Electrostatics	Begins field-based physics with Coulomb's law, electric fields, potential and Gauss's law.	Calculate electric force/field/potential, reason with symmetry and apply Gauss's law in standard cases.	Electromagnetic Fields
2	Current Electricity	Moves beyond Ohm's law into drift, resistivity, Kirchhoff rules and instruments.	Solve DC circuits, use Kirchhoff laws, compare meters and analyze resistance networks.	Circuits; Instruments
3	Moving Charges and Magnetism	Studies magnetic force, charged-particle motion and magnetic effects of currents.	Apply Lorentz force, understand cyclotron motion and analyze fields due to currents.	Magnetism; Fields
4	Magnetism and Matter	Connects magnetic properties of materials to earth's magnetism and hysteresis.	Classify magnetic materials, interpret hysteresis and explain magnetic applications.	Materials; Magnetism
5	Electromagnetic Induction	Develops Faraday/Lenz laws, induced emf and energy reasoning.	Predict induced current direction, compute emf and explain eddy currents/transformers.	Induction; Energy
6	Alternating Current	Analyzes AC generation, RMS values, impedance, resonance and power factor.	Use phasor/impedance ideas, solve AC circuit cases and interpret power in AC systems.	AC Circuits
7	Electromagnetic Waves	Frames EM waves as linked oscillating electric and magnetic fields across the spectrum.	Identify EM spectrum regions, properties and uses in communication/technology.	EM Waves
8	Ray Optics and Optical Instruments	Extends geometrical optics to lenses, mirrors and instruments.	Use lens/mirror formulae, magnification and principles of microscopes/telescopes.	Geometrical Optics
9	Wave Optics	Introduces interference, diffraction and polarization as wave evidence for light.	Analyze Young's experiment, diffraction patterns and polarization effects.	Wave Optics
10	Dual Nature of Radiation and Matter	Builds quantum transition through photoelectric effect and matter waves.	Explain photoelectric effect, calculate photon energy and apply de Broglie relation.	Quantum Physics
11	Atoms	Connects atomic models to spectra and quantized energy levels.	Explain Bohr model, energy levels and emission/absorption spectra.	Atomic Physics
12	Nuclei	Studies nuclear structure, radioactivity, binding energy and nuclear reactions.	Calculate mass defect/binding energy, interpret decay and compare fission/fusion.	Nuclear Physics
13	Semiconductor Electronics: Materials, Devices and Simple Circuits	Links solid-state physics to devices such as diodes, transistors and logic gates.	Explain p-n junctions, rectification, logic gates and simple semiconductor circuits.	Electronics; Devices
14	Communication Systems	Connects physics to information transfer, modulation, bandwidth and satellite systems.	Explain modulation, bandwidth and communication channels with digital/analog comparisons.	Applied Physics

12. SCO IPhO Preparation Roadmap

Preparation Layer	Student Action	Teacher/School Action
Foundation	Read the chapter note, revise school concepts, write key definitions and SI units.	Deliver concept lessons, demonstrations and baseline quizzes.
Application	Solve mixed problems and explain each step in words.	Use class discussions, peer explanations and graded problem sets.
Olympiad Reasoning	Attempt unfamiliar contexts, approximation problems and multi-concept questions.	Introduce challenge sets, data interpretation and error-analysis items.
Experimental Thinking	Practice graphs, tables, uncertainty, instruments and physical interpretation.	Use low-cost labs, virtual labs or data sets with measurement questions.

Preparation Layer	Student Action	Teacher/School Action
Mock Readiness	Take timed mock tests in the SCO platform and review mistakes by chapter and skill.	Use score reports to identify weak chapters and plan targeted revision.

13. Global Competency Checklist

Competency	What Students Should Demonstrate by Grade 12
Physics understanding	Explain phenomena using laws, models, diagrams and equations.
Mathematical skill	Use algebra, vectors, calculus ideas, graphs and approximations responsibly.
Experimental literacy	Understand measurement, uncertainty, apparatus limitations and data fitting.
Scientific communication	Use correct SI units, significant figures, labelled diagrams, tables and graphs.
Problem-solving maturity	Check limiting cases, order of magnitude, sign convention and physical reasonableness.
Future readiness	Connect school physics with engineering, astronomy, climate, electronics, communication and modern science.

14. Academic Standard Reference Basis

This SCO IPhO syllabus is structured to support global Olympiad preparation and classroom implementation. The academic design reflects public IPhO-style expectations such as creativity over rote calculation, SI-unit discipline, mechanics/electromagnetism/waves/optics/thermodynamics/modern physics coverage, and experimental skills including safety, measurement, accuracy, uncertainty and data analysis.

SCO IPhO should be communicated as a School Connect Olympiad programme and global online preparation/assessment pathway. It should not be described as the official International Physics Olympiad; instead, it is positioned as a strong online alternative and preparation benchmark for students aiming to build international-standard Physics Olympiad readiness.

15. Final Pedagogical Message

A strong Physics Olympiad syllabus should help students ask better questions, build models, test ideas, read graphs, understand measurement and explain the physical meaning of an answer. SCO IPhO uses this Grade 8-12 pathway to make international-standard Physics Olympiad preparation accessible to schools and learners across different academic calendars and regions.