IBH Physics – L6

Curriculum Intent

Physics is the most fundamental science which aims to understand everything from tiny particles to vast galaxies. The aim of all IB programmes is to develop internationally minded people who strive to create a better society.
The course aims for all students to: ·

- Understand that science is only one of eight ways of knowing
- Understand how science is an international pursuit and the benefits and impacts of international collaborations in science.
- Become critically aware, as global citizens, of the ethical implications of the use of science and technology
- To recognise the contributions of all civilisations that led us to our current understanding of the physics
- develop experimental and investigative scientific skills using up to date technology
- develop and demonstrate a deep appreciation of the skills, knowledge and understanding of scientific methods
- promote students' interest in and enthusiasm for the subject, including an interest in further study and careers associated with the subject.

"However difficult life may seem, there is always something you can do and succeed at" – Stephen Hawking

Students will learn: - Term 1:-

Topic B The Particulate Nature of Matter

Molecular theory of solids, liquids. and gases. Temperature and absolute temperature. Internal energy. Specific heat capacity. Phase change. Specific latent heat. Kinetic model of an ideal gas. Mole, molar mass, and Avogadro constant. Differences between real and ideal gases. Charge. Electric field. Coulomb's law. Electric current. Direct current. Potential difference. Circuit diagrams. Kirchhoff's circuit laws. Heating effect of current and its consequences. Resistance. Ohm's law. Resistivity. Power dissipation. Cells. Internal resistance. Secondary cells. Terminal potential difference. Electromotive force

Term 2 - Topic C Wave Behaviour

Simple harmonic oscillations. Time period, frequency, amplitude, displacement, and phase difference. Conditions for simple harmonic motion. Travelling waves. Wavelength, frequency, period, and wave speed. Transverse and longitudinal waves. The nature of electromagnetic waves. The nature of sound waves. Wavefronts and rays. Amplitude and intensity. Superposition. Polarisation. Reflection and refraction. Snell's law, critical angle, and total internal reflection. Diffraction through a single-slit and around objects. Interference patterns. Double slit interference. Path difference. The nature of standing waves. Boundary conditions. Nodes and antinodes.

Term 3 - Topic A Space, Time and Motion

Physical quantities. S.I. units. Measurements and uncertainties. Scalars and vectors. Newton's equations of motion. Car stopping distances. Freefall and g. Projectile motion. Force, mass, and weight. Drag and terminal velocity. Couples and torques. Archimedes' principle. Conservation of energy. Power and efficiency. Newton's law. Linear momentum and impulse.

Knowledge, understanding & Skills - FOR ADDITIONAL HIGHER LEVEL CONTENT
For information on the core curriculum, please see the the IBS Physics L6 map

A closed system is understood to be one in which no mass can be transferred in or out, but energy can be transferred in both directions as heat or as work.
An isolated system is understood to be one in which neither mass nor energy can be transferred in or out.
Problems will use the Clausius' sign convention where Q is the resultant thermal energy supplied to the system and W is the resultant work done by the system.
The second law of thermodynamics should be described in Clausius form and Kelvin form, as well as in terms of entropy change in reversible and irreversible processes occurring in isolated systems.

Work done on a system is taken to be negative.

Work done by a system is taken to be positive.

In quantitative problems, systems will be limited to monatomic ideal gases, including situations where pressure is not constant.

The microstates of a system are equally probable and can be described in a simple combinatorial model (for example, based on coins).

How will we assess impact?

- Peer and self-assessment
- Previous lesson recap quiz
- Check point tasks
- End of topic tests
- Teacher questioning
- Cumulative linear knowledge tests
- End of L6 and mid- U6 PPE examinations using unseen exam board papers

What does excellence look like?

- Carrying out practical processes logically, precisely, and accurately.
- Linking ideas together to answer questions logically and sequenced.
- Linking big ideas to answer real life Physics problems.
- Estimate orders of magnitude in a variety of context
- Checking for homogeneity in manipulated equations
- Process uncertainties and present them graphically
- Use qualitative and quantitative data to evaluate precision and accuracy
- Give examples of scalar and vector quantities
- Able to resolve2 or more coplanar vectors by scale drawing or calculation
- Substitute numerical values into algebraic equations using appropriate units for physical quantities
- Solve algebraic equations, including quadratic equations
- Translate information between graphical, numerical and algebraic forms
- Determine the slope and intercept of graphs
- Change the subject of an equation, including non-linear equations
- Apply the concepts underlying calculus by solving equations involving rates of change, e.g., t x Δ Δ = $-\lambda$ x using a graphical method or spreadsheet modelling.
- Use of pressure gauges, barometers and manometers to take measurements to investigate the gas laws
- Can determine the energy transferred during phase changes both experimentally and by calculation
- Can describe total energy in terms of the potential and kinetic energy of the particles in a substance
- Can use temperature-time graphs to determine energy transferred during phase changes
- Can describe and justify the assumptions that underpin the ideal gas law
- Can use temperature-time graphs to determine energy transferred during phase changes Can plot and interpret graphs describing simple harmonic motion including displacement

Knowledge, understanding & Skills - FOR ADDITIONAL HIGHER LEVEL CONTENT

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The vector nature of torque and angular momentum need not be addressed, but the sense (clockwise or counter-clockwise) of a torque should be included.
A calculation of the centre of mass of bodies is not required; there should be an understanding that when considering linear motion, the mass of an extended body may be taken as concentrated at the centre of mass.
The equation for the moment of inertia of a specific mass distribution will be provided when necessary.
Simultaneous rotational and translational motion will be restricted to rolling without slipping.
Angular speed will be used rather than angular velocity as a formal vector treatment.
The term angular velocity will be used although a formal vector treatment is not required.
Situations should involve change of moment of inertia in extended bodies and coupled pairs of bodies.

An inertial reference frame is non-accelerating.
The derivation of the Lorentz transformation equations and the relativistic velocity addition equations are not required.
The derivation of the time dilation and length contraction equations is not required.
The time axis on space–time diagrams will be labelled ct.
The discussion of world lines of moving particles will be limited to constant velocity.
Time dilation, length contraction and simultaneity can be visualized using space–time diagrams.
The scales on the time axes ct and ct′ and on the space axes x and x′ of two inertial reference frames moving relative to one another are not the same and are defined by lines of constant space–time interval.

What does excellence look like?

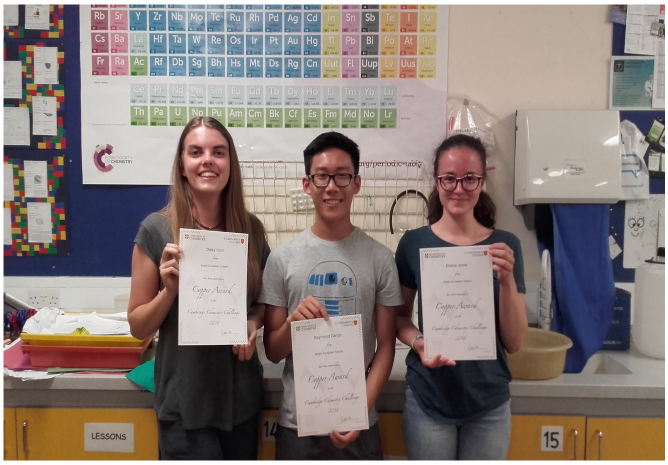
- time, velocity–time, acceleration–time and acceleration–displacement graphs
- Can use and manipulate equations linking displacement, velocity and acceleration in a simple harmonic oscillator Can derive the defining equation for simple harmonic motion from first principles
- Can present both longitudinal and transverse waves using wavefronts and rays and use such diagrams to show and determine speed changes in different media
- Can use and manipulate Malus's law to determine transmission and absorption of incident light
- Can use and manipulate Snell's law in terms of angle, velocity or refractive index
- Calculate force or field strength using or manipulating Coloumb's law
- Derive expressions for work done, field strength and potential using Coloumb's law
- Use IV graphs to characterise electric components and take measurements from these to determine resistance
- Use data loggers to improve reliability of measurements
- Use video analysis to describe objects in circular motion

How can you enhance your learning at home?

- IB Physics revision
- Grade Gorilla
- Isaac Physics
- Physics Tube
- The institute of physics
- Physics and maths tutor
- Minute Physics
- Hyperphysics

Suggested homework task

- Learn definitions of key terms
- Group and independent research projects
- Past examination question practice
- Practical activity preparation, simulations and follow up.



ENTRY REQUIREMENTS

To study Standard Level Physics, you will need:

- A grade 6 in GCSE Physics OR a grade 6-6 in Combined Sciences
- In addition, you will need a grade 6 in Maths
- It is also strongly advised that you study Higher Level Maths as part of your diploma

International Opportunities

Visits Programmes

- **Community lectures on International themes**
- **International day across the school**
- **Primary research using student cultural diversity**

Within the Curriculum

The Physics IB Standard curriculum is designed to deepen understanding and appreciation of how our International society makes decisions about world scientific issues.

Students are encouraged to research each theme beyond lessons using International research methods and set work to ensure that they can draw on a worldwide knowledge of the skills, techniques and theoretical understanding required for the further study of Physical Sciences at an International level.

"Physics is really nothing more than a search for ultimate simplicity, but so far all we have is a kind of elegant messiness." **Bill Bryson, A Short History of Nearly Everything**