



Notre Dame High School

Physics

A-level course guide

What is physics?

Physics is the study of matter, energy and their interaction at all possible scales in the Universe. Through the Year 12 course, you will develop a thorough grounding in fundamental aspects of the subject, including mechanics, electricity and wave behaviour, and also study a unit covering topics in quantum physics. The Year 13 course develops a deeper understanding of mechanics through the study of circular and simple harmonic motion, and introduces new concepts including electric, gravitational and magnetic fields of force. Other topics covered in Year 13 include thermal physics, nuclear and particle physics, astrophysics and medical imaging. Practical work is a vital element of the course, and practical skills are developed and assessed across the two years of study.

Will I enjoy physics?

YES – if you:

- have wide interests – physics isn't for the nerd
- like to have a go at practically anything – and aren't put off by a setback
- drove your parents mad when you were small by taking everything in the house apart
- are really curious, even nosy, about lots of things...
- ... and want to know WHY
- like maths and logical reasoning
- enjoy science programmes on TV, radio or the internet.

What can I do with an A-level in physics?

Our A-Level course is designed to extend your experience and understanding of Physics and, in doing so, provides a solid foundation for advanced study in the physical sciences and engineering. The problem solving, analytical and mathematical skills acquired also lend themselves to a wide variety of less obvious career choices, including finance, communications and project management.

Why should I choose Notre Dame for A-level Physics?

Because you will benefit from:

- specialist physics teachers who will inspire you and support you all the way
- excellent practical facilities: Physics at A-level is both more practical and more mathematical than at GCSE
- our wide experience in supporting students towards Oxbridge and Russell Group destinations
- and – most important of all - a proven track record in providing outstanding physics teaching

A-level Physics results at N.D.H.S.

Graded 'Excellent' (in the top 10% of schools nationally) in 2014-15

Graded 'Outstanding' (in the top 25% of schools nationally) in 2015-16

Graded 'Outstanding' (in the top 25% of schools nationally) in 2016-17

Graded 'Outstanding' (in the top 25% of schools nationally) in 2017-18

Graded 'Excellent' (in the top 10% of schools nationally) in 2018-19

What will I study?

Module 1: Development of practical skills in physics

- **Planning** Experimental design / Identification of variables / Evaluation of experimental method
- **Implementing** Techniques for the use of practical apparatus / Units of measurement / Presentation of data
- **Analysis** Processing, analysing and interpreting data / Significant figures / Plotting and interpretation of graphs
- **Evaluation** How to evaluate and draw conclusions / Anomalies / Limitations of experimental procedure / Precision and accuracy / Refining of experimental design
- **Practical skills*** Practical skills / Use of apparatus and techniques (*assessed in the practical endorsement)

Module 2: Foundations of physics

- **Physical quantities and units** S.I base and derived units / Prefixes / Estimation
- **Making measurements and analysing data** Random and systematic errors / Precision and accuracy / Graphical treatment of errors
- **Nature of quantities** Scalar and vector quantities / Vector addition and subtraction / Resolution of vectors

Module 3: Forces and motion

- **Motion** Kinematics / Linear motion / Projectile motion
- **Forces in action** Dynamics / Motion with non-uniform acceleration / Equilibrium / Density and pressure
- **Work, energy and power** Work & conservation of energy / Kinetic & potential energies / Power
- **Materials** Springs / Mechanical properties of matter
- **Newton's laws of motion and momentum** Newton's laws of motion / Collisions

Module 4: Electrons, waves & photons

- **Charge and current** Charge / Mean drift velocity
- **Energy, power and resistance** Circuit symbols / E.m.f. & p.d. / Resistance / Resistivity / Power
- **Electrical circuits** Series & parallel circuits / Internal resistance / Potential dividers
- **Waves** Wave motion / Electromagnetic waves / Superposition / Stationary waves
- **Quantum physics** Photons / The photoelectric effect / Wave-particle duality

Module 5: The Newtonian world and astrophysics

- **Thermal physics** Temperature / Solid, liquid and gas / Thermal properties of materials / Ideal gases
- **Circular motion** Kinematics of circular motion / Centripetal force
- **Oscillations** Simple harmonic oscillations / Energy of a simple harmonic oscillator / Damping
- **Gravitational fields** Point and spherical masses / Newton's law of gravitation / Planetary motion / Gravitational potential energy
- **Astrophysics and cosmology** Stars / Electromagnetic radiation from stars / Cosmology

Module 6: Particles and medical physics

- **Capacitors** Capacitors / Energy / Charging and discharging capacitors
- **Electric fields** Point and spherical charges / Coulomb's law / Uniform electric field / Electric potential energy
- **Electromagnetism** Magnetic fields / Motion of charged particles / Electromagnetism
- **Nuclear and particle physics** The nuclear atom / Fundamental particles / Radioactivity / Nuclear fission and fusion
- **Medical imaging** Using X-rays / Diagnostic methods in medicine / Using ultrasound

How will I be assessed?

<p>Content is split into six teaching modules:</p> <ul style="list-style-type: none"> • Module 1 – Development of practical skills in physics • Module 2 – Foundations of physics • Module 3 – Forces and motion • Module 4 – Electrons, waves and photons • Module 5 – Newtonian world and astrophysics • Module 6 – Particles and medical physics <p>Component 01 assesses content from modules 1, 2, 3 and 5.</p> <p>Component 02 assesses content from modules 1, 2, 4 and 6.</p> <p>Component 03 assesses content from all modules (1 to 6).</p>	<p>Modelling physics (01)</p> <p>100 marks</p> <p>2 hours 15 minutes</p> <p>written paper</p>	<p>37% of total A level</p>
	<p>Exploring physics (02)</p> <p>100 marks</p> <p>2 hours 15 minutes</p> <p>written paper</p>	<p>37% of total A level</p>
	<p>Unified physics (03)</p> <p>70 marks</p> <p>1 hour 30 minutes</p> <p>written paper</p>	<p>26% of total A level</p>
	<p>Practical endorsement in physics (04)* (non exam assessment)</p>	<p>Reported separately (see Section 5h)</p>

Useful books, websites and contacts

- ★ Our recommend textbooks are:
 - *OCR AS/A level Physics A – book 1* (by Mike O’Neill; published by Pearson)
 - *OCR A level Physics A – book 2* (by Mike O’Neill; published by Pearson)
- ★ To ease the transition from GCSE to AS-level, our Year 12 students receive a copy of *Headstart to AS Physics* (CGP Publications; ISBN 1847621155).
- ★ Our Physics students have access to the school’s own physics website. This has lots of really useful supporting materials as well as links to videos and other relevant web sites.
- ★ Full details of the A-level Physics course are available at <http://www.ocr.org.uk>.
 Help with A-level physics and further reading:
 - <http://www.splung.com>
 - <http://www.schoolphysics.co.uk/age16-19>
 - <http://www.physics.org>
 - <http://www.physlink.com/Index.cfm>
- ★ If you have any questions about the A-level Physics course taught at Notre Dame High School please do not hesitate to contact **Dr Thistlewood** (Head of Physics - lthistlewood@ndhs.org.uk).