

Key Stage 5: Year 12 Physics

Overall Curriculum Goals

A Level Physics aims to encourage learners to:

- Develop essential knowledge and understanding of different areas of Physics and how they relate to each other giving students a richer understanding of the universe around them through the subject of Physics.
- Develop and demonstrate a deep appreciation of the skills, knowledge and understanding of scientific methods giving students an appreciation of how developments in Physics have changed the world in which they live and an understanding of the implications of further development for future generations.
- Develop competence, confidence and the use of a variety of practical, mathematical and problem-solving skills which are pertinent to current and future developments in the field of Physics. Linked to this students should understand how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society (as exemplified in 'How Science Works' (HSW)).
- Develop their interest in and enthusiasm for the subject, including nurturing an interest in further study and careers associated with the subject

Topic summaries

1 Matter and radiation

A recap of key elements of the GCSE curriculum and an introduction to the subatomic world, covering:

- The structure of the atom
- Interactions between particles
- Feynman diagrams
- Anti-matter
- Photons

2 Quarks and leptons

Deeper dive into the classification and interaction of all particles in the standard model, covering:

- Quarks
- Leptons
- Hadrons
- Bosons
- Baryons
- Mesons

3 Quantum phenomena

Studying Einstein's Nobel prize winning ideas about photons and, an introduction into quantum mechanics covering:

- The Photoelectric effect
- Energy levels in atoms
- Wave-particle Duality

12 Electrical Circuits

A recap of key GCSE curriculum and an introduction into the topic of electricity, covering:

- Current
- Potential difference
- Resistance
- Resistivity
- Super conductors
- Diodes

13 DC circuits

A continuation of electricity concepts, covering:

- Circuit rules in series and parallel
- Combinations of resistors
- Potential dividers
- The Electromotive force

6 Forces and Equilibrium

A recap of key GCSE curriculum and an introduction into the topic of Forces, covering:

- Vectors and Scalars
- Balanced and Unbalanced forces
- The principle of moments

7 On the move

A continuation of forces focussing on motion:

- Speed and velocity
- Acceleration
- Free fall
- Projectile motion

8 Newtons laws of Motion

A continuation of forces focussing on Newtons laws:

- Newtons 1st Law
- Newtons 2nd Law
- Newtons 3rd Law
- Applications to vehicle safety

9 Force and Momentum

A continuation of forces focussing on momentum:

- Conservation of momentum
- Impulse
- Elastic and inelastic collisions

10 Work, energy and power

A continuation of forces focussing on Energy:

- Work done
- Kinetic Energy store
- Gravitational Energy Store
- Power
- Efficiency

4 Waves

A recap of key GCSE curriculum and an introduction into the topic of stationary and progressive waves, covering:

- Wavelength
- Frequency
- Phase difference and Path difference
- Interference effects
- Oscilloscopes

5 optics

A continuation of Waves focussing on:

- Applications of Snell's Law
- Single slit interference
- Double slit interference
- Diffraction gratings

11 Materials

A look at the properties of materials, covering:

- Density
- Hooke's law
- Springs in parallel and series
- Stress
- Strain
- The Young Modulus

CURRICULUM MAP YEAR 12

Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
<p>1 Matter and radiation 2 Quarks and leptons 12 Electrical Circuits</p>	<p>3 Quantum phenomena 13 DC circuits</p>	<p>4 Waves 6 Forces and Equilibrium 7 On the move</p>	<p>5 optics 8 Newtons laws of Motion 9 Force and Momentum and power</p>	<p>11 Materials 10 Work energy and power</p>	
CPAC					
<p>5. Resistivity</p>	<p>6. EME Add. work function</p>	<p>1 Stationary waves</p>	<p>2. Diffraction 3. Determination of g</p>	<p>4. Young Modulus</p>	
Key Explicit Vocabulary					
<p>Atom Nucleon Proton Neutron Electron Nucleus Charge Diameter Mass Charge relative to proton Mass relative to proton Proton number Atomic number Nucleon number Mass number Isotope Specific charge Magnitude Strong nuclear force Electrostatic force Alpha radiation Beta radiation Gamma radiation Neutrino Anti neutrino Photon Electromagnetic waves Electromagnetic radiation Photon energy Frequency Plank constant Power of a beam Antimatter Pair production Annihilation Weak nuclear force W boson Electron capture Feynman diagrams Hadron Baryon Meson</p>	<p>Photoelectric effect Photo electron Conduction electron Atomic electron Threshold frequency Work function Stopping potential Electron volt Vacuum photocell Ionisation Excitation Energy level Ground state De-exaction Indirect de-excitation Fluorescence Spectra Diffraction De Broglie wavelength diode LED Variable resistor Resistor Thermistor LDR Negative temperature coefficient Internal resistance Lost volts Potential divider</p>	<p>Mechanical wave Electromagnetic wave Transverse Longitudinal Compression rarefaction Parallel perpendicular Progressive Stationary Wavelength Frequency Amplitude Polarisation Unpolarised Plane-polarised Displacement Time period Cycle Phase difference Path difference Radians Reflection Refraction Diffraction Parabolic Wavefront Superposition Supercrest Supertrough Interference Coherent Node Antinode Harmonic Oscilloscope Time base y-gain scalar vector distance</p>	<p>Normal Refractive index Total internal reflection Dispersion Critical angle Material dispersion Modal dispersion Coherent bundle Monochromatic Diffraction grating Order Line emission spectra Line absorption spectra</p>	<p>Density Rho Mass Volume Regular solid Irregular solid Alloy Hooke's Law Extension Elastic limit Spring constant Deformation Elasticity Tensile Compressive Stress Strain The Young Modulus Elastic deformation Plastic deformation Ultimate Tensile stress Breaking stress Brittle Ductile Limit of proportionality</p>	

<p>Quark Lepton Muon Pion Kaon Up Down Strange Strangeness Baryon number Lepton number Current Insulator Conductor Semiconductor Potential difference Electromotive force (EMF) Resistance Resistivity Ohms law Superconductor Critical temperature Ammeter Voltmeter cell battery diode</p>		<p>displacement resolve</p> <p>parallelogram balanced</p> <p>moment principle of moments equilibrium centre of mass</p> <p>couple</p> <p>stable equilibrium unstable equilibrium</p> <p>tilted topple</p> <p>free body diagram weight support force</p>			
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ILC: Isaac Physics (see MHW/ILC checklist)

ILC Half Term 1	ILC Half Term 2	ILC Half Term 3	ILC Half Term 4	ILC Half Term 5	ILC Half Term 6
<p>A1 Using and Rearranging Equations — Isaac Physics A2 Derived and Base SI Units — Isaac Physics A3 Standard Form and Prefixes — Isaac Physics C Charge carriers and resistivity — Isaac Physics A4 Converting Units — Isaac Physics</p>	<p>A5 Gradients and Intercepts of Graphs — Isaac Physics A6 Equations of Graphs — Isaac Physics C4 Kirchhoff's Laws — Isaac Physics C4a Additional Kirchhoff's Laws — Isaac Physics L2 Fundamental Particles and Interactions — Isaac Physics C6 Internal Resistance — Isaac Physics D6 The Photoelectric Effect — Isaac Physics</p>	<p>D7 Quantum Calculations — Isaac Physics C5 Potential Dividers — Isaac Physics D9 Energy Levels — Isaac Physics C6a Additional Internal Resistance — Isaac Physics D3 Path Difference — Isaac Physics</p>			

Formative Assessment Materials

- Weekly Monday Homework
- DO NOW tasks/ questions that arise from them
- Summary Question book
- Isaac Physics
- Seneca

Key Stage 5: Year 13 Physics

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Topic summaries

17 Circular motion

A continuation of motion concepts, underpinning most concepts in fields (as all fields can cause orbits) covering:

- Uniform circular motion
- Centripetal acceleration
- Applications to varied situations

21 Gravitational fields

A fundamental field of the universe covering:

- Uniform and Radial fields
- Gravitational field strength
- Gravitational Potential
- Newtons law of Gravitation

18 SHM

A continuation of motion concepts, covering:

- Oscillations of springs
- Oscillations of Pendulums
- Links to circular motion
- Energy
- Resonance

22 Electric fields

A fundamental field of the universe covering:

- Uniform and Radial fields
- Electrical field strength
- Electrical Potential
- Coulomb's law
- Comparing electric and gravitational fields

24 Magnetic fields

A fundamental field of the universe covering:

- Current carrying conductors in a magnetic field
- The Motor effect
- Moving charges in a magnetic field
- Charged Particles in circular orbits

25 Electromagnetic induction

Bringing Electric fields and Magnetic fields together, covering:

- Generating electricity
- The Generator effect
- Lenz's Law
- Faraday's Law
- Transformers

19 Thermal Physics

A recap of key GCSE curriculum and an introduction into the topic of temperature and heat, covering:

- Temperature
- Internal energy and changes of state
- Specific heat capacity
- Specific latent heat

20 Gas Laws

A continuation of thermal concepts, covering:

- The experimental gas laws
- Ideal gas
- Kinetic theory of gases

Astro 1 Telescopes

The first part of the "option" unit looking at telescopes, covering:

- Lenses
- Refracting and reflecting telescopes
- Resolving power and Collecting power
- CCD's
- None-visible light astronomy

Astro 2 Stars

The second part of the "option" unit looking at star classification, covering:

- Magnitudes and distances
- Classification
- Life cycle and Hertzsprung-Russell diagrams
- Supernova
- Neutron stars
- Blackholes

Astro 3 Cosmology

The third part of the "option" unit looking at the expanding universe:

- Redshift
- The Big Bang
- Quasars

23 Capacitors

A topic that revise and links to ideas from electricity and fields but really frames skills needed in radioactive decay, covering:

- Capacitance
- Charging and discharging
- Dielectrics

26 Radioactivity

A recap of key GCSE curriculum and an introduction into the topic of radioactivity, covering:

- The discovery of the nucleus
- Alpha, beta and gamma radiation
- Radioactive decay
- Half life
- The nuclear radius

27 Nuclear energy

A continuation of nuclear concepts, covering:

- Energy and mass
- Fission and Fusion
- Thermal nuclear reactor design

CURRICULUM MAP YEAR 13

Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
17 Circular motion 21 Gravitational fields 18 SHM 22 Electric fields	24 Magnetic fields 25 Electromagnetic induction 19 Thermal Physics 20 Gas Laws	23 Capacitors 26 Radioactivity 27 Nuclear energy	Astro 1 Telescopes Astro 2 Starts Astro 3 Cosmology	Revision	
CPAC					
7. SHM	8 gas Laws 9Capacitors 10 BIL 11 Magnetic flux density	12 inverse square law			

Explicit vocabulary

Field Gravitational field Gravitational field strength Small test mass Radial Uniform Gravitational potential Equipotential Potential gradient Newtons law of gravitation Universal gravitational constant Radius, height, and radius of body Electric field Electric field strength Small positive test charge Electric potential Coulomb's law Angular displacement Angular speed Radians Centripetal Free vibrations Phase difference Simple harmonic motion Displacement Acceleration Velocity Damped Light damping Critical damping Heavy damping Periodic force Forced vibrations Resonance	Magnetic field line North seeking South seeking Motor effect Dynamo Flux Flux density Flux linkage Cyclotron Mass Spectrometer Electromagnetic induction Induced emf Lenz's Law Faraday's Law Root mean square Transformer Laminated Thermal energy Internal energy Thermal equilibrium Absolute scale Absolute zero Specific heat capacity Specific latent heat of fusion Specific latent heat of vaporisation Boyle's law Charles' law The pressure law Brownian motion The Avogadro constant Mole Molarity Molar mass Ideal gas Molar gas constant Ideal gas equation Boltzmann constant	Alpha Beta Gamma Rutherford scattering Half-life Activity Becquerel Decay constant Cyclotron Converging Diverging Focal point Focal length Real Virtual Magnified Inverted Objective Eye piece Normal adjustment Reflecting Refracting Cassegrain Newtonian Chromatic aberration Spherical aberration Aperture Resolving power Collecting power Rayleigh Criterion Charge-couple device Quantum efficiency	Binding energy Mass defect Fission Fusion Thermal neutron Moderator Control rod Chain reaction Coolant Reactor core Critical mass High level waste Medium level waste Low level waste Light year Parsec Parallax Astronomical unit Intensity Absolute Magnitude Apparent magnitude Log Black body Wien's law Stefan's law Stellar spectral class Hertzsprung-Russell diagram Dwarf star Giant star Main sequence Supergiant star White dwarf Cepheid variable Red giant Supernovae Neutron stars Black holes Event horizon Schwarzschild radius		
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			Doppler shifts Red shift Blue shift Hubble's law Big Bang theory Cosmic microwave background radiation (CMBR) Dark energy Quasars		
ILC: Isaac Physics (see MHW/ILC checklist)					
ILC Half Term 1	ILC Half Term 2	ILC Half Term 3	ILC Half Term 4	ILC Half Term 5	ILC Half Term 6
F3 Units of Rotary Motion — Isaac Physics F6 Gravity and Orbits — Isaac Physics F4 Centripetal Acceleration — Isaac Physics F5 Newtonian Gravity — Isaac Physics H1 Uniform Electric Fields — Isaac Physics					
ILC: KEY SKILLS					
Formative Assessment Materials					
<ul style="list-style-type: none"> ○ Weekly Monday Homework ○ DO NOW tasks/ questions that arise from them ○ Summary Question book ○ Isaac Physics ○ Seneca 					
Summative Assessment					
HT1	HT2	HT3	HT4	HT5	HT6
Bridging material benchmark assessment (week2) Based on practical skills 21and 22 Gravitational fields and Electric fields +circular motion from 17 +practical work from14 +maths skills from 16 17&18 motion in a circle &SHM	24 and 25 magnetic fields and electromagnetic induction + circular motion from 17 + $s=ut+1/2at^2$ from 7 +Density from 11 +nuclear radiation from 1 +gravitational field strength from 21 +CRO from 4 +practical work from14 +maths skills from 16	Synoptic mock on all content so far first week back in Jan Astro 1 +optics from 5 +practical work from14 +maths skills from 16	Mock exams first 2 weeks after half term Synoptic tests on all work so far Astro 2 and 3 +practical work from14 +maths skills from 16 +Astro 1 27 Nuclear Energy		

+newtons laws from 8 +practical work from14 +maths skills from 16	19 and 20 Thermal Physics and gases +practical work from14 +maths skills from 16	26 and 23 Radioactivity and capacitors +practical work from14 +maths skills from 16	+matter from 1 +practical work from14 +maths skills from 16		
Assessment Week Resit (as applicable)					
Super curricular opportunities					
CIAG					

Year 13 Assessment Outline	
Formative	
Topic Booklets / work sheets / PowerPoints	Structured topic notes/questions exam practice linked to AQA Specification
Text book summary questions in exercise book	Structured topic notes/questions exam practice linked to AQA Specification
Monday Homework	Multiple choice questions Topic based remote learning activities – Electronically marked allows bespoke student spaced learning & retrieval activities.
Isaac Physics (ILC activities)	Topic based remote learning activities – Electronically marked allows bespoke student spaced learning & retrieval activities.
Seneca	Topic based remote learning activities – Electronically marked allows bespoke student spaced learning & retrieval activities.
DO NOW	Topic based knowledge Organisers (Complete/Student completes)
Summative	
Bridging Material Assessment (BMA)	Baseline Assessment based on Year 11 summer bridging material & initial learning first 3 weeks
End of Topic Test <ul style="list-style-type: none"> • 2 per half term 	Exam past paper questions linked to relevant topic area
Termly Synoptic Assessment (SA)	Start of term assessment – New learning + ILC interleaved topics
Finals	