

# PHYSICS CURRICULUM OVERVIEW



Physics is a mixture of highly conceptual thinking and very practical applications. Students have the opportunity to be able to think about abstract ideas such as fields, then to look at the world around them and see how those ideas can be applied to advance science, engineering and understanding.

Learning to think like a physicist will help students develop the skills to get to the root of any problem and draw connections that are not obvious to others. Physics won't give all the answers, but it will teach students how to ask the right questions.

If you have an enquiring mind, an ability to solve problems in a creative way and a desire to find out more about the Universe we inhabit, then Physics would be an excellent choice for you.

**KS3** - In year 8 we aim to build on the scientific skills and attitude taught in the Year 7 Science course but also introduce all of the key Physics concepts that students will need such as motion, forces, electricity, fields, moments and pressure. These topics are taught through a variety of means including engaging videos, practical work, and computer simulations, and delivered using peer instruction which is a research based pedagogy developed by Eric Mazur. At this early stage we do not cover topics in great depth but just focus on building conceptual models which will provide a strong framework later on to attach facts and contexts that students will visit in years 9 10 and 11

**GCSE** - In year 9 we start to follow the AQA GCSE Physics Trilogy course. With core concepts already in place, we start to develop the students' mathematical skills by introducing simple equations such as power and work. It is important at this stage that students learn about energy which is one of science's 'big ideas'. This leads to energy production and world energy resources. We also look at waves, lenses and then red shift in year 9. In year 10 we introduce tougher equations that require more skill to rearrange and alongside these, we tackle core GCSE topics such as motion, forces and electricity. Year 11 contains mostly synoptic topics where students can review learning from all the previous years and solve problems that bring all of those previous topics together. For example within the topic of energy changes there might be a transfer from electrical energy to kinetic energy. Radioactivity is also covered in year 11 and this ties in to their previous learning in Chemistry. Also at the end of year 11 student tackle the hardest, most abstract concepts and these are pressure and electromagnetism.

**A-level:** In year 12 and 13 students follow the AQA GCE Physics course with the Astrophysics option. Topics covered in the first year include Mechanics, Quantum Physics, Particle physics, Waves, Electricity, Capacitors and Materials. In the second year students tackle the most difficult topics. The topics are the most abstract with some mathematical demand: Further mechanics, Gravitational and Electric Fields, Magnetism, Thermodynamics, Nuclear and Astrophysics.

# KS3 PHYSICS CURRICULUM



	Year 7	Year 8	Year 9
Autumn Term 1		Forces: <ul style="list-style-type: none"> <li>• Newton's First and second Laws</li> <li>• Friction</li> <li>• Gravity</li> <li>• Terminal velocity</li> </ul>	Energy: <ul style="list-style-type: none"> <li>• Energy stores and transfers</li> <li>• Power definition and calculations</li> <li>• Efficiency</li> </ul>
Autumn Term 2		Forces: <ul style="list-style-type: none"> <li>• Density and Upthrust</li> <li>• Newton's Third Law</li> </ul> Motion: <ul style="list-style-type: none"> <li>• Average and instantaneous speed</li> <li>• Distance Vs Time graphs</li> </ul>	Energy: <ul style="list-style-type: none"> <li>• Power stations</li> <li>• Renewable and non-renewable sources</li> <li>• National Grid</li> </ul>
Spring Term 1		Moments: <ul style="list-style-type: none"> <li>• See saw balancing</li> <li>• Asymmetrical pivot</li> </ul> Pressure: <ul style="list-style-type: none"> <li>• Pressure definition and calculations</li> <li>• Pressure in liquids</li> </ul>	Waves: <ul style="list-style-type: none"> <li>• Transverse and longitudinal waves</li> <li>• Amplitude, wavelength, period, frequency</li> <li>• Waves equation</li> </ul>
Spring Term 2		Current: <ul style="list-style-type: none"> <li>• Electric Current in circuits</li> <li>• Series and parallel circuits</li> <li>• Switches</li> </ul>	Waves: <ul style="list-style-type: none"> <li>• Reflection</li> <li>• Ray diagrams</li> <li>• Refraction</li> <li>• Earthquakes</li> <li>• Electromagnetic Spectrum</li> </ul>
Summer Term 1		Fields: <ul style="list-style-type: none"> <li>• Electric Fields</li> <li>• Magnetic Fields</li> <li>• Gravitational Fields</li> </ul> Space: <ul style="list-style-type: none"> <li>• Seasons</li> <li>• Tides</li> <li>• Eclipses</li> </ul>	Lenses: <ul style="list-style-type: none"> <li>• Converging and diverging lenses</li> <li>• Ray diagrams</li> <li>• Magnification, real and virtual images</li> </ul> Red shift: <ul style="list-style-type: none"> <li>• Doppler effect</li> <li>• Hubble's Law</li> </ul>
Summer Term 2		Space: <ul style="list-style-type: none"> <li>• Solar System</li> </ul> Proportionality: <ul style="list-style-type: none"> <li>• Hooke's Law</li> <li>• Electromagnets</li> <li>• Ohm's Law</li> </ul>	Colour: <ul style="list-style-type: none"> <li>• Filters</li> <li>• Colour addition</li> </ul> Projects

# KS4 PHYSICS CURRICULUM



	Year 10	Year 11
Autumn Term 1	<p>Space Physics:</p> <ul style="list-style-type: none"> <li>• Black body radiation</li> <li>• Life cycle of stars</li> <li>• Planets</li> </ul> <p>Static electricity:</p> <ul style="list-style-type: none"> <li>• Creating static electricity</li> <li>• Uses and dangers</li> <li>• Induced charge and electric Fields</li> </ul>	<p>Advanced mechanics:</p> <ul style="list-style-type: none"> <li>• Moments</li> <li>• Levers and gears</li> <li>• Circular motion</li> </ul> <p>Fission and Fusion:</p> <ul style="list-style-type: none"> <li>• Isotopes</li> <li>• Fission</li> <li>• Nuclear power</li> <li>• Fusion</li> </ul>
Autumn Term 2	<p>Circuits:</p> <ul style="list-style-type: none"> <li>• Current and potential difference</li> <li>• Ohm's Law</li> <li>• IV characteristics</li> <li>• Resistance</li> <li>• Thermistors and LDRs</li> </ul>	<p>Elasticity:</p> <ul style="list-style-type: none"> <li>• Spring Constant and Hooke's Law</li> <li>• Elastic Potential Energy</li> </ul> <p>Energy, Work, and Power:</p> <ul style="list-style-type: none"> <li>• Kinetic Energy</li> <li>• Gravitational Potential energy</li> <li>• Work Done</li> <li>• Energy transfers calculations</li> </ul>
Spring Term 1	<p>Circuits:</p> <ul style="list-style-type: none"> <li>• Series and parallel circuits</li> <li>• Power</li> <li>• Alternating Currents</li> </ul> <p>Motion:</p> <ul style="list-style-type: none"> <li>• Scalars and Vectors</li> <li>• Distance Vs Time graphs</li> </ul>	<p>Particles model of Matter:</p> <ul style="list-style-type: none"> <li>• Density</li> <li>• Internal Energy</li> <li>• Specific Heat Capacity</li> <li>• Pacific Latent Heat</li> <li>• Cooling Curves</li> </ul>
Spring Term 2	<p>Motion:</p> <ul style="list-style-type: none"> <li>• Velocity Vs Time Graphs</li> <li>• Equations of motion</li> </ul> <p>Forces:</p> <ul style="list-style-type: none"> <li>• Weight and Mass</li> <li>• Force diagrams and scale diagrams</li> </ul>	<p>Pressure:</p> <ul style="list-style-type: none"> <li>• Atmospheric Pressure</li> <li>• Hydrostatic Pressure</li> <li>• Hydraulics</li> <li>• Floating and sinking</li> </ul> <p>Electromagnetism:</p> <ul style="list-style-type: none"> <li>• Magnetic Fields and electromagnets</li> <li>• Motor effect</li> <li>• Induction and generators</li> <li>• Transformers</li> <li>• Loudspeakers and microphones</li> <li>• Lenz's Law</li> </ul>
Summer Term 1	<p>Forces:</p> <ul style="list-style-type: none"> <li>• Newton's Laws</li> <li>• Terminal Velocity</li> </ul>	Revision
Summer Term 2	<p>Forces:</p> <ul style="list-style-type: none"> <li>• Momentum</li> <li>• Collisions and explosions</li> <li>• Car safety</li> </ul>	

# KS5 PHYSICS CURRICULUM



	Year 12		Year 13	
Autumn Term 1	<p>TEACHER 1 Measurement:</p> <ul style="list-style-type: none"> <li>Types of uncertainty</li> <li>Reading Vs Measurements</li> <li>Non linear graphs</li> <li>Power laws and exponentials</li> </ul> <p>Mechanics:</p> <ul style="list-style-type: none"> <li>Vectors</li> <li>Force Equilibrium</li> <li>Moments</li> <li>Equations of motion</li> </ul>	<p>TEACHER 2 Measurement:</p> <ul style="list-style-type: none"> <li>Lines of best fit, gradients, y-intercept</li> <li>Gradient uncertainty</li> </ul> <p>Particles:</p> <ul style="list-style-type: none"> <li>Specific Charge</li> <li>Antimatter</li> <li>Quarks</li> <li>Exchange Bosons and Feynman's Diagrams</li> <li>Conservation Laws and quantum numbers</li> <li>Beta decays</li> </ul>	<p>TEACHER 1 Electric and Gravitational Fields:</p> <ul style="list-style-type: none"> <li>Coulomb's Law</li> <li>Newton's law</li> <li>Field strength</li> <li>Potential Energy and potential</li> <li>Uniform and radial fields</li> </ul>	<p>TEACHER 2 Further mechanics:</p> <ul style="list-style-type: none"> <li>Circular Motion</li> <li>Angular Speed</li> <li>Forces in circular motion</li> </ul>
Autumn Term 2	<p>TEACHER 1 Mechanics:</p> <ul style="list-style-type: none"> <li>Projectile motion</li> <li>Newton's three laws of dynamics</li> <li>Energy transfers</li> </ul>	<p>TEACHER 2 Quantum Physics:</p> <ul style="list-style-type: none"> <li>Photons</li> <li>Quantum Jumps</li> <li>Photoelectric Effect</li> <li>Wave-particle duality</li> </ul>	<p>TEACHER 1 Electric and Gravitational Fields:</p> <ul style="list-style-type: none"> <li>Kepler's laws</li> <li>Types of orbits and energy</li> <li>Escape velocity</li> </ul> <p>Magnetic Fields:</p> <ul style="list-style-type: none"> <li>Force on electric charges</li> <li>Cyclotrons</li> <li>Motors and commutators</li> <li>Magnetic Flux density, Faraday's law</li> <li>Transformers</li> </ul>	<p>TEACHER 2 Further mechanics:</p> <ul style="list-style-type: none"> <li>Simple harmonic motion</li> <li>Pendulum and mass spring system</li> <li>Resonance</li> </ul>
Spring Term 1	<p>TEACHER 1 Mechanics:</p> <ul style="list-style-type: none"> <li>Conservation of momentum</li> </ul> <p>Waves:</p> <ul style="list-style-type: none"> <li>GCSE Revision</li> <li>Polarisation</li> <li>Refraction</li> </ul>	<p>TEACHER 2 Electricity:</p> <ul style="list-style-type: none"> <li>Current and potential difference</li> <li>Ohm's Law</li> <li>Resistance in series and parallel</li> <li>Potential dividers</li> <li>Emf and internal resistance of a battery</li> <li>IV characteristics</li> <li>Resistivity</li> </ul>	<p>TEACHER 1 Astrophysics:</p> <p>Optics and instruments:</p> <ul style="list-style-type: none"> <li>Ray diagrams</li> <li>Refracting and reflecting telescopes</li> <li>Non optical telescopes</li> <li>Resolution, Airy disk</li> <li>CCDs</li> </ul> <p>Classification of Stars:</p> <ul style="list-style-type: none"> <li>Magnitude, brightness, Luminosity</li> <li>Distance, parsec, light year</li> <li>Black Body radiation</li> <li>Spectral Classes</li> </ul>	<p>TEACHER 2 Thermal Physics:</p> <ul style="list-style-type: none"> <li>Temperature, Internal Energy, Heat</li> <li>Specific Heat Capacity</li> <li>Specific Latent Heat</li> <li>Boyle's and Charles's Laws</li> <li>Ideal Gas law</li> <li>Kinetic Theory</li> </ul>
Spring Term 2	<p>TEACHER 1 Waves:</p> <ul style="list-style-type: none"> <li>Refraction</li> <li>Critical angle</li> <li>Phase and superposition</li> </ul>	<p>TEACHER 2 Electricity:</p> <ul style="list-style-type: none"> <li>Electrical power</li> <li>Alternating current and rms voltage</li> </ul> <p>Capacitors:</p> <ul style="list-style-type: none"> <li>Capacitance and energy</li> <li>Capacitors in series and parallel</li> <li>Charging and discharging capacitors, time constant</li> <li>Dielectrics</li> </ul>	<p>TEACHER 1 Astrophysics</p> <p>Classification of Stars:</p> <ul style="list-style-type: none"> <li>HR diagram and stellar life cycle</li> <li>Death of stars, White dwarfs, neutron stars</li> <li>Black holes, quasars, pulsars</li> </ul> <p>Cosmology:</p> <ul style="list-style-type: none"> <li>Supernovae as standard candles</li> <li>Doppler effect, redshift</li> <li>Binary stars, Exoplanets</li> <li>Hubble's Law, CMBR, dark matter, dark energy</li> <li>Quasars, age of the universe</li> </ul>	<p>TEACHER 2 Nuclear Physics:</p> <ul style="list-style-type: none"> <li>Alpha scattering</li> <li>Nucleus, radius and density</li> <li>Nuclear stability and decay</li> <li>Properties and uses of nuclear radiation</li> <li>Mass and energy in nuclear reactions</li> <li>Nuclear reactors and waste treatment</li> </ul>
Summer Term 1	<p>TEACHER 1 Waves:</p> <ul style="list-style-type: none"> <li>Stationary waves, harmonics and strings</li> </ul>	<p>TEACHER 2 Materials:</p> <ul style="list-style-type: none"> <li>Force and extension</li> <li>Stress and strain</li> </ul>	Revision	Revision
Summer			Enrichment and progression activities Extended projects	

Term 2				
--------	--	--	--	--