

Huntington School: Science Department


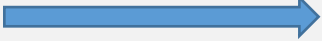

Curriculum Intent: Key Stage Five Physics

The science department at Huntington School will have a curriculum which creates learners who will thrive in a changing world by giving them the knowledge to:

- Confidently and accurately work scientifically and solve scientific problems;
- Think creatively to overcome and tackle problems with resilience and an open mind-set;
- Appreciate and enjoy the uniqueness of science as a discipline;
- Seek further knowledge and skills independently, based upon a fascination of learning;
- Achieve great exam results that allow our students to progress to the next steps in their lives as scientifically informed citizens.

We will develop this in our students by:

- Using purposeful practical activities with an emphasis on understanding scientific ideas rather than participation.
- Highlighting the relevancy of science to the modern world.
- Assessing pupils starting points and their progress by using effective questioning.
- Creating a true multi- disciplinary approach to science where scientific skills are deployed confidently across all three sciences.
- Using guided practice and modelling to scaffold student's problem solving abilities.
- Being reflective practitioners who constantly evaluate and improve our practice.

	Big Idea	Foundations of KS4 	Y12 	Y13 
	Mechanics	<p>Working as a physicist</p> <p>Students will have developed graph skills at KS4 and had experience using power prefixes</p>	<p>Working as a physicist</p> <p>Student will develop the skills required to analyse and manipulate data in Physics and consider uncertainties in experimental dataset. This will include: Base and derived units/power prefixes/calculating gradients/ and calculating uncertainties.</p>	<p>Links to this topic:</p> <p>This topic can be linked with every topic covered in the specification.</p>
		<p>Topic 2 – Mechanics</p> <p>Topic 6 - Further Mechanics</p> <p>At KS4 students have been introduced to analysing the motion of an object in 1 dimension, calculating resultant forces, energy transfers, moments, and momentum.</p>	<p>Topic 2 Mechanics</p> <p>Students will review concepts learnt at KS4 to analyse the motion of an object in 1 dimension, link energy transfers to work and power, calculate moments and apply the conservation of momentum to collisions between objects.</p> <p>In this topic students will be introduced to the kinematics equations or motion, resolving vectors and analysing projectile motion.</p> <p>Working scientifically Students will complete a practical to determine the acceleration of an object in freefall.</p>	<p>Links to this topic:</p> <p>This topic can be linked with topic 6 Further mechanics covered in Yr13.</p>
				<p>Topic 6 Further mechanics</p> <p>Building on what has been learnt at KS4 and in Yr12 regarding conservation of momentum in 1 dimension and energy, students will be introduced to conservation of momentum problems in 2 dimensions and elastic and inelastic collisions.</p> <p>Students will also be introduced to the concepts of analysing circular motion.</p> <p>Working scientifically Students will complete an Investigation to determine the relationship between the force exerted on an object and its change of momentum.</p> <p>Students will also use ICT to analyse collisions between small spheres, e.g. ball bearings on a table top</p>
				<p>Topic 13 – Oscillations</p> <p>Students will be introduced to Simple Harmonic Motion (SHM) and learn how to analyse the motion of an object undergoing SHM. Students will also learn about damping and how the conservation of energy relates to free and forced oscillations.</p> <p>Working scientifically Students will complete an Investigation to determine an unknown mass using the resonant frequencies of the oscillation of known masses</p>

	Electricity	<p>Topic 3 – Electric circuits.</p> <p>At KS4 students will have learnt about electric current, potential difference, resistance and electrical circuits.</p>	<p>Topic 3 – Electric circuits.</p> <p>Students will review concepts learnt at KS4 and will be introduced to ideas of conservation of charge and energy in relation to electric circuits. Students will also be introduced to the concepts of resistivity, potential divider circuits and electromotive force (e.m.f).</p> <p>Working scientifically Students will complete an Investigation to determine the electrical resistivity of a material.</p> <p>Students will also complete an investigate to determine the e.m.f. and internal resistance of an electrical cell.</p>	Students will review this topic at the end of Year 13 as revision in preparation for their terminal exams.
	Materials	<p>Topic 4 – Materials</p> <p>At KS4 students have learnt about density and the concepts of upthrust and terminal velocity.</p>	<p>Topic 4 – Materials</p> <p>Students will review what they learnt at KS4 and then be introduced to concepts of laminar and turbulent flow, how to calculate upthrust, viscosity and stokes law to calculate viscous drag.</p> <p>Working scientifically Students will complete an Investigation using a falling-ball method to determine the viscosity of a liquid.</p> <p>Students will also complete an investigation to determine the Young’s Modulus of a material.</p>	Students will review this topic at the end of Year 13 as revision in preparation for their terminal exams.
	Waves & Energy	<p>Topic 5 – Waves and the particle nature of light</p> <p>At KS4 students have learnt about types of waves and basic wave properties</p>	<p>Topic 5– Waves and the particle nature of light</p> <p>Students will review what they learnt at KS4 and then be introduced to concepts of how waves behave, e.g. superposition and interference, diffraction and stationary waves. Students will also learn about optics, e.g. lenses, total internal reflection and polarisation. Additionally students will be introduced to the concepts of quantum physics through an understanding of the photoelectric effect and wave-particle duality.</p> <p>Working scientifically Students will complete three investigations as part of this topics. Firstly, to determine the speed of sound in air using an oscilloscope, secondly to investigate the effects of length, tension and mass per unit length on the frequency of a vibrating string, and finally, to determine the wavelength of light from a laser using a diffraction grating.</p>	Students will review this topic at the end of Year 13 as revision in preparation for their terminal exams.
		<p>Topic 9 – Thermodynamics</p> <p>At KS4 students have learnt about the concepts of internal energy, heat transfer and temperature</p>		<p>Topic 9 – Thermodynamics</p> <p>Students will review what they learnt at KS4 and then be introduced to the concept of analysing the behaviour of an ideal gas and derive the kinetic theory equations.</p>

	Fields	<p>Topic 7 – Electric and magnetic fields</p> <p>At KS4 students have been introduced to the concepts of electric and magnetic fields and electromagnetism</p>		<p>Topic 7 – Electric and magnetic fields</p> <p>Students will review what they learnt at KS4 and then will develop and deepen their understanding of fields, field strengths and the forces experienced by objects in fields. Students will also develop and more detailed understanding of electromagnetism through applying Faraday's and Lenz's laws. Finally, students will also learn about capacitors.</p> <p>Working scientifically Students will complete an investigation to analyse the potential difference across a capacitor as it charges and discharges through a resistor.</p>
		<p>Topic 12 – Gravitational fields</p> <p>At KS4 students will be introduced to the concept of gravity, gravitational field strength and weight.</p>		<p>Topic 11 – Gravitational fields</p> <p>Students will develop their understanding of what gravitational fields are and will learn to apply Newton's Law of gravitation between two objects to calculate the gravitational force.</p>
	Nuclear and particle physics	<p>Topic 8 – Nuclear and particle physics</p> <p>At KS4 students have learnt about the nuclear model of the atom.</p>		<p>Topic 8 – Nuclear and particle physics</p> <p>Student will develop their understanding of the nuclear model and then be introduced to the fundamental particles in the standard model. Students will also learn about particle accelerators and detectors.</p>
		<p>Topic 11 – Nuclear radiation</p> <p>At KS4 students have learnt about nuclear decay and the types of nuclear radiation. Separate science students have also been introduced to nuclear fission and fusion.</p>		<p>Topic 11– Nuclear radiation</p> <p>Students will develop and deepen their understanding from KS4 and be introduced to the concepts of nuclear binding energy and mass/energy equivalence.</p> <p>Working scientifically Students will complete an investigation to investigate the absorption of gamma radiation by lead.</p>
	Space	<p>Topic 10 – Space</p> <p>At KS4, separate science students will have learnt about the solar system, life cycles of stars and evidence for the big bang.</p>		<p>Topic 10 – Space</p> <p>Students will learn about stellar classification and how measure distances to stars. They will also be introduced to differing theories for the age and fate of the universe.</p>

<p>CPAC</p>	<p>The assessment of practical skills is a compulsory requirement of the A-Level Chemistry course. Students will complete a minimum of 12 required practical activities covering all the required practical techniques and apparatus as outlined by the specification. Teachers will assess these practical activities using the Common Practical Assessment Criteria (CPAC).</p> <p>Students will be assessed on the following;</p> <p>1a – following written procedures 2a – Correctly uses appropriate instrumentation, apparatus and materials (including ICT) to carry out investigative activities, experimental techniques and procedures with minimal assistance or prompting.</p> <p>2b - Carries out techniques or procedures methodically, in sequence and in combination, identifying practical issues and making adjustments where necessary. 2c - Identifies and controls significant quantitative variables where applicable, and plans approaches to take account of variables that cannot readily be controlled. 2d - Selects appropriate equipment and measurement strategies in order to ensure suitably accurate results. 3a - Identifies hazards and assesses risks associated with those hazards, making safety adjustments as necessary, when carrying out experimental techniques and procedures in the lab or field. 3b - Uses appropriate safety equipment and approaches to minimise risks with minimal prompting. 4a - Makes accurate observations relevant to the experimental or investigative procedure. 4b - Obtains accurate, precise and sufficient data for experimental and investigative procedures and records this methodically using appropriate units and conventions. 5. Researches, references and reports 5a - Uses appropriate software and/or tools to process data, carry out research and report findings. 5b - Cites sources of information demonstrating that research has taken place, supporting planning and conclusions.</p> <p>Students will have to keep their own record of the practical activities completed and students who demonstrate the required standard will be awarded a “pass” grade for their practical work. Practical work is also assessed in the three written exams.</p>
<p>Assessment</p>	<p>Students will experience a variety of different assessment techniques during the A-Level. They range from formative assessment during lessons – making use of whiteboards, quick quizzes, questioning and other written activities. Summative assessment will take the form of end of topic tests and practice mock papers.</p>
<p>Feedback</p>	<p>Verbal feedback is recognised as having the greatest impact on student progress and will be at the core of our everyday teaching in Science at all key stages. Students will usually receive immediate verbal feedback on their contributions, ideas and questions in class. Verbal feedback is often given <i>whilst</i> students are completing tasks, students will usually act on this feedback and improve their work immediately, therefore there is no need for it to be recorded. Students may also receive immediate verbal feedback on their performance on short formative tasks such as mini-quizzes. Verbal feedback can be given on an individual, small group or whole-class basis.</p> <p>Other in-lesson feedback. In science, students will receive feedback on short activities/tasks/quizzes/their Extended Learning (homework) frequently from lesson to lesson. Frequent use will be made of self- or peer- marking as an efficient method of students receiving immediate feedback and improving their work/knowledge/understanding.</p> <p>Teacher feedback on specific tasks. Students will be provided with feedback from their teacher on their performance on specific tasks. This feedback could take many forms, again including (but not limited to) this list. This feedback will <u>always</u> provide guidance on how students’ work, knowledge or understanding can be improved and/or what students need to do next to make more progress. This feedback may also identify strengths/weaknesses in students’ work, if appropriate to the task.</p> <p><u>Y12/Y13</u> At least 3 formal tests/mock exams per year in each Science A-level</p> <p>Student responses. Students are expected to act on all feedback. DIRT (Dedicated Improvement and Reflection Time) may be given in lessons for students to improve/correct/re-attempt their work or to complete tasks set in response to their identified areas of need. It should be clear that students’ work, knowledge or understanding has improved as a result of the feedback given. Automatic feedback on Teams will also be used to ensure that students receive effective and timely feedback.</p> <p>Teacher feedback on tests/exams. Students will be provided with detailed feedback on formal tests, end of year exams and mock exams. This feedback could take many forms, including (but not limited to):</p> <ol style="list-style-type: none"> marking and annotations on test papers written feedback addressed to individuals, small groups or on a whole-class basis verbal feedback addressed to individuals, small groups or on a whole-class basis re-teaching of specific science content, in response to areas of need identified during the marking process use of mark schemes or other written resources (e.g. model answers) which provide feedback on how to improve specific answers and/or describe common mistakes/misconceptions feedback grids to identify areas of strength and weakness and/or guide students to reflect on their performance <p>Test feedback in science will <u>always</u> (i) identify (or allow students themselves to identify) areas of strength and weakness, and (ii) provide guidance on how students’ exam responses can be improved and/or what students need to do next to improve their exam responses/performance in the future.</p>
<p>Homework</p>	<p><i>Frequency:</i> Homework tasks will be set on a weekly basis. Students are encouraged if they find a task challenging to seek support from their teacher.</p> <p><i>Types of tasks:</i></p> <ul style="list-style-type: none"> ▪ Reinforce and extend learning in class e.g. to practise examination questions.

	<ul style="list-style-type: none"> ▪ Research in preparation for future tasks e.g. research properties of chemical elements, the applications and implications of using stem cells. ▪ Embed key subject content in long term memory, e.g. the formulae for calculations. ▪ Practise and develop skills e.g. review and annotation of class notes, graph plotting, identifying patterns, drawing conclusions, answering past exam questions. ▪ Extension of learning from the lesson e.g. comprehension questions related to key learning. ▪ Review learning by producing mind maps, revision cards etc. ▪ Learning and revision for class tests and examinations. ▪ Improvement and use of DIRT time to improve or develop set tasks. ▪ Wider/topical reading & summarise - around the subject.
<p>How can I support my child at home?</p>	<ul style="list-style-type: none"> ▪ Asking them about what they are learning ▪ Encouraging them to consolidate their notes as they go along ▪ Encouraging them to complete extended learning using their classwork ▪ Encouraging them to ask for help when they are stuck ▪ Encouraging them to produce revision resources as each topic is completed. ▪ CGP Revision resources; revision guide, workbook, pre-made flashcards. These can be purchased from the department. ▪ Helping them with homework tasks, especially quizzing them during revision extended learning. ▪ Encourage them to watch the news and discuss real-life applications –medicines, industrial applications.