

Deyes High School Curriculum Rationale



Science

Overarching curriculum, intent for SCIENCE KS3

- For all pupils to understand and develop a breadth of in-depth knowledge in biology, chemistry and physics, that challenges pupils' thinking and is ambitious for all.
- For all pupils to experience practical science, that allows substantive knowledge to link with disciplinary knowledge. Enhancing scientific enquiry, employability and a love of science.
- For all pupils to develop their scientific literacy, numeracy and autonomy to apply scientific knowledge to solve modern problems in the world around us.
- For all pupils to have a culturally rich experience that allows limitless futures no matter their background.

Key Stage 3 Science

Key stage 3 science offers an ambitious curriculum across year 7-9 and embeds the essential knowledge of the national curriculum and beyond so that all students are challenged no matter their background. We base our sequence around big ideas from the Best Evidence Science Teaching (BEST) and adapt this method to match our own intent. Our topics develop in challenge so that prior knowledge is built upon whilst interlinking with each other so essential knowledge is reinforced and developed as pupils progress from year 7 to year 11.

	Content Taught	NC Ref	Essential Knowledge	Assessment	Rationale and sequence
Year 9					
In year 9, students are taught by specialist teachers in biology, chemistry and physics. Pupils further develop their essential knowledge of the key stage 3 topics, building on prior learning from year 7 and 8. Year 9 gives pupils the opportunity to relate multiple topics which will allow them to apply essential knowledge in a new and more ambitious way. The content allows for a further step up in challenge, bringing together essential knowledge from all of key stage 3 and links the substantive and disciplinary knowledge to develop mastery in preparation for moving to future topics in key stage 4. As such, the sequence is set to specialise in each separate science.					
Biology					

<p>HT1 & HT2</p>	<p>Bioenergetics 2: Respiration</p> <p>Cross connectivity: PE curriculum: Study of respiration and energy systems in YR10.</p>		<p>Aerobic respiration Anaerobic respiration Fermentation</p> <p>Reading for breadth. Antoine Lavoisier Antoine Lavoisier Facts for Kids (kiddle.co)</p>	<p>Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p>Bioenergetics 2 Summative: End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>This learning leads from content studied in Yr7 Cells 1 cell structure relating to diffusion and YR7 Human Health 1 Health and Exercise unit focusing upon gas exchange In this section we explore how both animals and plants use oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue.</p>
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<p>HT3 & HT4</p>	<p>Human Health 3: Digestion</p> <p>Cross connectivity: Food Technology curriculum: Study of the Eat Well Plate Yr7. Study of diet/nutrition Yr9. PE curriculum: study of diet/nutrition YR11. Study of energy/respiration Yr10.</p>		<p>Enzymes Digestion Food Tests</p> <p>Reading for breadth. Ivan Pavlov Ivan Pavlov Facts for Kids (kiddle.co)</p>	<p>Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p>Summative Assessment: End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>This unit leads on from YR8 Human Health 2 Nutrition topic which focused upon the structure, function and adaptations of the digestive system alongside nutrition and diet. In this section pupils will be introduced to the idea of examples of biological enzymes within the digestive system, enzyme action and factors which affect the rate of enzyme controlled reactions.</p>
<p>HT5</p>	<p>Inheritance 2: DNA and Natural Selection</p>		<p>Variation – continuous/discontinuous Inheritance DNA – Watson/Crick Difference between species</p>	<p>Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p>	<p>This unit leads from Yr7 Inheritance 1 Reproduction unit. Pupils have studied variation, fertilisation and plant reproduction. This unit develops pupils understanding of variation further by exploring the structure and role of DNA and its importance in variation.</p>

			<p>Natural selection Extinction and environmental change Maintaining biodiversity Gene banks</p> <p>Wider reading: Reading for consolidation. Inheritance and genetics - KS3 Biology - BBC Bitesize</p> <p>Reading for depth. James Watson Francis Crick Rosalin Franklin Francis Crick Facts for Kids (kiddle.co) James D. Watson Facts for Kids (kiddle.co) Rosalind Franklin Facts for Kids (kiddle.co)</p>	<p>Summative Assessment: End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>Natural Selection and extinction are explored and the need to maintain and protect biodiversity through modern day techniques I.e. gene banks.</p>
HT6	Ecology 2: Community		<p>Communities Biotic/abiotic factors Adaptations Trophic levels</p>	<p>Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge.</p>	<p>This unit leads from prior learning in Yr8 Ecology 1 Interdependence unit where pupils study food webs/chains, bioaccumulation and food security.</p>

	Geography curriculum: Study of ecosystems in YR10.		Biomass/pyramids Cycling materials Reading for breadth. Jane Goodhall Jane Goodall Facts for Kids (kiddle.co)	Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Summative Assessment: End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.	This unit explores all species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. Pupils will be introduced to the idea of biomass and how nutrients are cycled within the ecosystem.
Chemistry					
HT1	Rates of reaction 1: developing practical fluency Students undertake a range of practicals with emphasis on a variety of skills, looking first at research before an experiment, then the procedures in carrying	NC: Working scientifically WS1.a WS1.b WS2.a WS2.b WS2.c WS2.d WS2.e WS3.a WS3.b	Scientific research: rates of reaction Scientific methods: effect of concentration Collecting and recording data: analysis of concentration	Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Rates of reaction 1 Summative Assessment:	During year 9, the students focus on fundamental concepts of Chemistry which will form a springboard to allow them to begin KS4 with a good foundation of knowledge. It encompasses a combination of the disciplinary knowledge along with the substantive knowledge described in the KS3 national curriculum.

	<p>out an experiment. Following this, data analysis is the focus using rates as a background substantive understanding on which to base the disciplinary understanding.</p>	<p>WS3.c WS3.f WS4.a WS4.c</p>	<p>Drawing graphs: effect of temperature</p> <p>Data analysis: effect of temperature</p> <p>Wider reading: https://www.twinkl.co.uk/teaching-wiki/parts-of-a-science-experiment</p>	<p>End of Topic “Bring it All Together” task with application and culmination of understanding of the topic.</p> <p>Homework: Knowledge questions on the key knowledge required for this unit of work.</p> <p>Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>The students start by undertaking a unit designed to focus on working scientifically. This will provide an opportunity to focus on the disciplinary understanding of the process of gathering, presenting and analysing data, as a precursor to future experimental tasks.</p>
<p>HT2</p>	<p>Atoms 3: Introduction to atomic structure and the periodic table</p> <p>Students look in depth at the development of understanding of atomic structure, looking at developing models. Following this, how the periodic table was put together by various</p>	<p>NC: Chemistry C2.a C2.b C2.c C6.b C6.c</p>	<p>Periodic table</p> <p>History of the modelling of the atom</p> <p>How the periodic table is arranged</p> <p>Drawing atoms</p> <p>Wider reading:</p>	<p>Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p>Atoms 3 Summative Assessment: End of Topic “Bring it All Together” task with application and</p>	<p>Following this, the students are introduced to the structure of the atom and the periodic table to understand the development of models and understanding of fundamental concepts for chemistry.</p>

	<p>scientists, finally looking at how atoms are now drawn using the Bohr model.</p>		<p>https://www.lenntech.com/periodic/history/history-periodic-table.htm</p>	<p>culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	
HT3	<p>Matter 2: Properties of everyday materials</p> <p>Students look at traditional and modern uses of ceramics, polymers and composites, considering their production and properties.</p> <p>Energy changes 1</p> <p>Students see what happens during a chemical reaction at an atomic level, understanding bond making and breaking.</p>	<p>NC: Working scientifically WS1.a</p> <p>NC: Chemistry C7.c</p> <p>NC: Working scientifically WS2.e WS3.c</p>	<p>Properties of ceramics</p> <p>Properties of polymers</p> <p>Properties of composites</p> <p>Making and breaking bonds</p>	<p><u>Formative Assessment:</u> Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p><u>Matter 2: Summative Assessment:</u> End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during</p>	<p>Then the students consider properties of materials and their role in their uses, looking specifically at ceramics, polymers and composites, relevant in the KS3 national curriculum.</p> <p>Following this, the students are introduced to the idea of what happens during a chemical reaction in terms of exothermic bond making and endothermic bond making. This provides them with the fundamental understanding of what happens</p>

	Students then look to evaluate practical methods used to measure energy changes in reactions.	NC: Chemistry C4.a C4.b C5.a C5.b	Endothermic reactions and measuring temperature decrease Exothermic reactions and measuring temperature increase Wider reading: https://www.strouse.com/blog/6-hydrogel-uses	school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.	during a chemical reaction on an atomic scale. The students then consider their procedures experimentally to apply and bring together this knowledge from year 8 and this topic.
HT4	Separating substances 2 Students gain a clear understanding of elements, compounds and mixtures and how mixtures are separated. Firstly with insoluble solids, then soluble, two immiscible liquids and ink.	NC: Working scientifically WS2.a WS2.b WS2.c WS2.d WS2.e WS3.d NC: Chemistry C3.d C3.e	Filtration Crystallisation Distillation Chromatography Wider reading: https://edu.rsc.org/resources/chromatography/11333.article	Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Separating substances 2 Summative Assessment: End of Topic "Bring it All Together" task with application and culmination of understanding of the topic.	Students then focus on the activity of the particles in separating substances, classifying them to enable them to explain the properties which allow them to be separated.

				<p>Homework: Knowledge questions on the key knowledge required for this unit of work.</p> <p>Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	
HT5	<p>Chemical analysis 1</p> <p>Students gain an understanding of how gases can be collected and identified using a range of tests, introducing an idea useful in Biology and later in Chemistry.</p>	<p>NC: Working scientifically WS2.a WS2.b WS2.c WS2.d WS2.e WS3.d</p> <p>NC: Chemistry C6.e</p>	<p>Chemical tests: Carbon dioxide</p> <p>Chemical tests: hydrogen</p> <p>Chemical tests: oxygen</p> <p>Chemical tests: flame tests</p> <p>Wider reading: https://edu.rsc.org/download?ac=137040</p>	<p><u>Formative Assessment:</u> Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p><u>Chemical analysis Summative Assessment:</u> End of Topic “Bring it All Together” task with application and culmination of understanding of the topic.</p> <p>Homework: Knowledge questions on the key knowledge required for this unit of work.</p> <p>Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror</p>	<p>Students look in greater detail at chemical tests for gases. This enables students to understand how chemicals are identified, particularly gases which appear invisible. This will support understanding with respiration and photosynthesis in biology, group 1 metals in chemistry, and reactions of acids in later learning.</p>

				structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.	
HT6	Earth chemistry 2: Carbon Students look at the idea of finite resources and what can be done to reduce impact on the environment. Following this, the carbon cycle allows students to consider where carbon dioxide comes from and ends up, ending by looking at our impact on the environment around us.	NC: Chemistry C8.d C8.e C8.f	Finite resources Reduce, reuse and recycle Carbon cycle Composition of the atmosphere Production of carbon dioxide Human effect on environment <i>Essential knowledge reading for greater breadth:</i> https://edu.rsc.org/download?ac=140434	<u>Formative Assessment:</u> Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. <u>Earth Chemistry 2: Summative Assessment:</u> End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.	Finally, students look at the effect of finite resources and the release of carbon on the atmosphere and ultimately the climate. This incorporates discussion and an opportunity to utilise items from the news and current affairs to engage students in topical ideas.
Physics					
HT1	Energy 2: Changing energy stores	NC: Physics P1.2a	Changes in systems Work done	<u>Formative Assessment:</u>	

	<p>During this unit, students will establish a deeper knowledge and understanding of variables, develop graph skills and the students ability to draw conclusions, whilst also starting to look at the deeper analysis of results, the planning of experiments and the evaluation of methods and performance in experiments.</p> <p>Students will learn about the types of energy in more depth and learn to calculate different types of energy and apply this to the law of conservation of energy, including efficiency.</p>	<p>P1.2c P1.3a P1.3b P1.3c</p>	<p>Energy in moving objects Gravitational potential energy Conservation of energy Efficiency</p> <p><i>Essential knowledge reading for greater breadth: Julius Robert von Mayer</i> Why Julius Robert von Mayer was one of the unluckiest men in science (gizmodo.com)</p>	<p>Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p><u>Energy 2 Summative Assessment:</u> End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>During this unit, pupils will build on their prior knowledge from Energy 1 and apply this to real life situations. Pupils will apply essential physics knowledge and link with maths knowledge to use and apply formula. Energy 2 provides the essential knowledge for Energy 3 in year 10 as well as linking to essential knowledge in electricity 2 (electrical work) and forces 3 (mechanical work) later in year 9.</p>
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<p>HT2</p>	<p>Particles and matter 2: Heating and cooling</p> <p>During this unit, pupils will learn how to calculate density and how a change in temperature affects the particle model of matter. They will apply their previous knowledge of kinetic energy to the particle model and apply this to a phenomena known as internal energy. Pupils will deepen their understanding of particles to learn about the structure of the atom, linking with the ideas introduced in chemistry.</p>	<p>P1.2b P5.1a P5.1b P5.1c P5.2a P5.2b P5.3a P5.3b P5.1d</p>	<p>Density Effect of temperature change on particles Heat transfer as changes in kinetic energy Internal energy The atom History of the structure of the atom</p> <p><i>Essential knowledge reading for greater breadth: Robert Boyle</i> https://mocomi.com/what-is-boyles-law/</p>	<p><u>Formative Assessment:</u> Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p><u>Particles and Matter 2 Summative Assessment:</u> End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>Particles and matter 2 builds on the essential knowledge from Particles and matter 1 in year 8 and links the the ideas of chemical and internal energy from energy 1 and 2. This topic also allows pupils to link together ideas from chemistry topics on atoms and matter and provides the essential knowledge for year 10 topics of Particles 3 and Atomic structure 3.</p>
<p>HT3 and HT4</p>	<p>Electricity and Magnetism 2: Using electrical current</p> <p>Electrical power is a vital part of modern life from the simple light bulb to</p>	<p>P4.1a P4.1b P4.1c P4.3d</p>	<p>Resistance Resistors Measuring current and potential difference Ohms law Generating electricity</p>	<p><u>Formative Assessment:</u> Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of</p>	<p>An understanding of how electricity and magnetism work is fundamental to future developments in communications, engineering and power systems. This unit, therefore, begins by consolidating</p>

	remote sensing satellite systems. The initial lessons accumulate essential knowledge before bringing it together in lessons that require students to link prior learning and applying it to a practical situation. The topic concludes with linking magnetism and electricity together and raises the levels of challenge for students to write about how motors work in everyday life.		<p>Electromagnets</p> <p>Essential knowledge reading for greater breadth: Georg Ohm https://www.famousScientists.org/georg-ohm/</p>	<p>essential knowledge during each lesson.</p> <p>Electricity and Magnetism 2 Summative Assessment: End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.</p>	<p>understanding of the essential concepts of current and potential difference in year 7, by relating it to resistance and applying it to examples of resistors. The topic forms an essential grounding for electricity 3 and magnetism 3, which are GCSE topics.</p>
HT5	<p>Forces and Motion 2: Newton’s laws of motion</p> <p>Forces govern everything we do and the understanding of them dates back to the 16th century when Isaac Newton developed his 3 laws of motion. This unit will look in to Newton’s laws as well as looking at</p>	<p>P2.2b P2.2c P2.3c P2.4a P2.5a P2.5b</p>	<p>What do forces do Resultant force Forces effect on motion Moments Pressure Pressure in liquids</p> <p>Essential knowledge reading for greater breadth: Isaac Newton</p>	<p>Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson.</p> <p>Forces and Motion 2 Summative Assessment: End of Topic “Bring it All Together” task with application and</p>	<p>Students initially study forces in year 7, looking in to the types of forces and their applications. This provides the essential knowledge for this topic as pupils further develop ideas on how forces affect motion. The motion topic in year 8 also provides prior knowledge of speed, which is discussed in greater depth during this topic. The forces and motion 3 topic provides essential knowledge for the Forces 4 topic in year 10 and</p>

	more complex phenomena of moments and pressure, both essential knowledge for wider applications in technology.		https://kids.kiddle.co/Isaac Newton	culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.	mechanics topic in year 11. The topic also develops mathematical skills addressed in maths when they study graphs and equations of motion. Students will also use transferable essential knowledge in technology when they study levers and gears.
HT6	Waves and Space 2: Applications of Light Light and sound are both examples of types of waves (transverse and longitudinal) and understanding them is vital in many applications such as communications and sound engineering. This unit covers the essential knowledge surrounding sound and light waves including the mathematical relationship using the wave equation. Pupils will go on to apply their essential knowledge in	P3.3a P3.4b P3.4c P3.4d P3.4e P3.4f	Properties of waves relationship between wavelength and frequency Ray diagrams Lenses Speed of light Visible spectrum prisms and colour <i>Essential knowledge reading for greater breadth: Olaus Roemer</i> https://www.physlink.com/education/askexperts/ae22.cfm	Formative Assessment: Daily, Weekly and Monthly Reviews focussing on reviewing material on Essential Knowledge. Use of TLaC techniques in lessons to check pupil understanding of essential knowledge during each lesson. Waves and Space 2 Summative Assessment: End of Topic “Bring it All Together” task with application and culmination of understanding of the topic. Homework: Knowledge questions on the key knowledge required for this unit of work. Understanding of the curriculum assessed in cumulative test during	Waves and space 2 builds on prior knowledge from year 8 waves 1 when students first encounter the phenomena ‘waves.’ This topic develops their essential knowledge and applies this to real life situations and uses. The topic also builds on space 1 in year 7 by applying their knowledge of lenses and the speed of light in space (vacuum). This unit uses equation skills encountered in maths and the differences in colour learned in art. The topic is fundamental prior knowledge for the year 10 topic Waves 3 as well as space 3 in year 11 for those students who take separate science.

	colour to look in to the visible and invisible spectrum to further deepen their knowledge of uses of waves.			school assessment points, using questions written to mirror structure and command words for exam boards, using KS3 Testbase SATs questions as a basis.	
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