

Curriculum Intent

It is important to view knowledge as sort of a semantic tree – make sure you understand the fundamental principles, i.e. the trunk and big branches, before you get into the leaves/details or there is nothing for them to hang on to.’ Elon Musk

The Science department at St Cuthbert's aims to foster a passion for science amongst the students. We believe that all students should learn to appreciate that science is all around us and we aim to provide an enriching science education across the disciplines of biology, chemistry and physics. Our curriculum is designed so that it meets the needs of all learners and creates an aspirational and high-achieving culture and we have designed our curriculum to enable full social equality and mobility. Our curriculum takes the improving local economy and labour market into account. Students will be encouraged to think analytically and critically and will develop skills that will allow them to adapt and contribute to an ever-changing world of science; fostering our vision that students are prepared for life in modern Britain. We believe students should develop practical based skills to supplement their theoretical knowledge and that this should promote an intellectual curiosity and passion for science. Therefore, we embed engaging practical activities throughout our curriculum.

Science curriculum - How the schemes of learning sequence together

At the start of year 7, students will begin their science learning by using a transition knowledge organiser to identify prior learning. This will be kept by the class teacher to refer to throughout the year when teaching different topics so they can plan accordingly for all students to make progress from their starting points.

Key stage 3

At KS3, there are 6 units taught in each year group. Across years 7, 8 and 9, students build knowledge by learning about topics across all three subject disciplines. The curriculum has been sequenced to ensure equal learning of Biology, Chemistry and Physics in each year. The model is based on a spiral curriculum with knowledge in each subject discipline built upon in the following year. For example, in year 7 the topic of 'energy and electricity' will be built upon in more detail in year 8. More details can be found below with specific examples. Please also see the detailed document 'Science department curriculum intent and progression' document, which explains what students learn within each unit of work and which skills they will have already acquired to support them in their learning prior to each unit.

Assessment

Within each unit of work at KS3, there are three formative assessment tasks. This means that students will have the opportunity to demonstrate the skills they have mastered 3 times per half term. There is a literacy themed task (this will be the 'Big Write' task for that half term), a numeracy themed task and a scientific skills task (based on the WS strands of the NC).

Year 7

There are six units of work in year 7, with the opportunity for students to learn equal units of Biology, Chemistry and Physics over the year. The units are taught in the following order:

1. Introduction to a lab & acids and alkalis (Chemistry)
2. Energy & Electricity (Physics)
3. Cells to systems (Biology)
4. Particle theory (chemistry)
5. Forces and magnetism (Physics)
6. Ecosystems and Feeding Relationships (Biology) equipment-outside

In year 7, Chemistry is first, because it promotes a passion for the subject as it lends itself to lots of engaging practical work (as explained below). The Biology unit 3 requires the use of plants and promoting curiosity for the outside world and so is left until after Christmas, when there is more light available and better weather. This leaves the first Physics unit to naturally fall in between the two- this is why the units are taught in this order. Particle theory is the next fundamental scientific principle that students need to understand before moving on to learn about how objects interact in the forces topic. Ecosystems is left until the end as it ties in with an SMSC opportunity for students to expand their cultural capital on a visit to Chester zoo in the summer term.

In year 7, students have the opportunity to develop all of the key skills across Biology, Chemistry and Physics for the first time. The units are taught in a way so that students are inspired by Science from the very beginning, with opportunities to develop practical skills right from the offset in unit 1. This is why acids and alkalis is the first unit- it gives lots of opportunities to use a variety of scientific equipment, allowing students to develop confidence working in a lab quickly. In unit 2, students will be able to practice skills they have learnt in unit 1 whilst applying them to theory. For example, developing their practical skills and evaluation skills for more complex practical activities. This links to the work they started with acids and alkalis in unit 1 because they'll rely on their foundation practical skills to use more complex equipment in unit 2. In unit 3, students will study Biology for the first time, so by the end of the first three units, they have had the opportunity to acquire knowledge across all three subject disciplines in science. Students will use their developed practical skills from units 1 and 2 to be introduced to using a microscope for the first time correctly. In unit 4, students revisit a Chemistry topic again, they will use their skills and knowledge from unit 1 and apply them to develop their practical skills in work that is more intricate than before (e.g.- making accurate measurements to produce a compound- this is theory that they learnt in unit 1). In Unit 5, students will build upon their Physics knowledge with their second Physics unit. They will be developing maths in science skills in this unit, whilst continuing to embed practical skills and learning how to apply their knowledge to new and unfamiliar situations. They will need their understanding of the particle model to consider how forces cause interactions between objects. (For example, they will learn about how magnets work and explore their applications in our world). In unit 6, students study their second Biology unit. Whilst using their knowledge from the first biology unit (unit 3) earlier in the year, they will use their understanding of plants and photosynthesis to learn how energy is transferred through food chains.

Year 8

There are six units of work in year 8, taught in the following order:

1. Chemical Reactions (Chemistry)
2. Organ Systems (Biology)
3. Energy (Physics)
4. Health, Fitness and Disease (Biology)
5. Atoms, elements and the periodic table (Chemistry)

6. Earth, Space and Cycles (Physics/Chemistry)

The subject disciplines are taught in this order based on a variety of reasons. Although the sequence in year 7 was Chemistry, Physics, Biology- it is slightly different in year 8. There isn't a reliance on the use of plants and the outdoors so much in 'Organ systems', so it doesn't need to be saved until later in the year (as was the case in year 7). Also, units 1 and 3 are practical heavy subjects, with more theory focus in unit 2, so it lends itself to interleave practical based units with more theory based units to keep students engaged throughout their learning, rather than having all practical work weighted towards one end of the year. Unit 5 is also practical heavy, and so is taught after the second biology unit. Unit 6 again relies on exploring the world around us and so is best taught in the summer term where use of outdoors can be relied on.

In year 8, the students will move their learning on from year 7 and the spiral nature of the science curriculum becomes more apparent. There are still 2 units from each subject discipline. In unit 1, students consolidate their knowledge from unit 4 in year 7 and build upon their knowledge of the particle model from year 7 to collect data to further prove the theories they have learnt in year 7 (for example, collecting changing state data). In unit 2, students learn about organ systems in detail, relying on their knowledge of cells from year 7. They will develop explanation skills of how organ systems work, whereas in year 7 they could describe the parts of general animal and plant cells, they will now learn to explain the function of specialised cells within organ systems. In unit 3, students will apply their understanding of energy stores in year 7 to explain different forms of heat transfer (conduction, convection and radiation). They will then use their knowledge of energy transfer from year 7 to learn about energy efficiency. In unit 4, students will use their knowledge and understanding of cells from year 7 to learn about different pathogens and the effects they have on the body. They will further develop their investigation skills of using a microscope from the cells to system unit in year 7 too. In unit 5, students will build upon their chemistry knowledge on elements from year 7 to learn about the periodic table in more detail and to identify patterns and trends from data based on this. They will also build upon their knowledge of properties of materials from KS2 to investigate more complicated properties (eg thermal conductivity). In unit 6, students will build upon their knowledge of Earth and Space from KS2 to learn about the structure of the Earth. They will use their knowledge about energy from year 7 and 8 to learn about how the Earth cycles its resources. They will also build upon their evaluation skills as they evaluate models.

Year 9

In year 9, there are six units. The 4th unit is a scientific skills unit, which assimilates all of the scientific skills that students have built throughout their KS3 studies in Science. Units 5 and 6 are units for extending knowledge and broadening students cultural capital beyond the scope of the KS3 NC, whilst instilling intellectual curiosity and passion for science.

The units are:

1. Inheritance, Genetics and evolution (Biology)
2. Reactivity Series (Chemistry)
3. Waves (Physics)
4. Scientific Skills
5. Extending knowledge-Earth's resources
6. Extending knowledge- Transport in animals and plants (Biology)

In unit 1, students will use their knowledge from the Biology units they have learnt in years 7 and 8 to learn about what is inside the nucleus of our cells and how this information is used for inheritance and genetics. They will also build upon their current Biology knowledge further to explain how adaptations affect organisms in the process of natural selection. In unit 2, students will consolidate and build upon all of their chemistry knowledge from years 7 and 8 on particle theory, atoms, elements and the periodic table. They will start to explain the properties and relationships in certain groups of the periodic table in more detail. They will also build upon their knowledge of properties of materials from year 8 to explain how metals react to form metal compounds. In unit 3, students will consolidate their physics learning from years 7 and 8 to learn about waves. They need their knowledge of energy transfer to explain the properties of different waves and then learn about their applications to every day uses. In unit 4, students will begin to bridge the gap between KS3 and GCSE. They will develop their scientific enquiry skills to support them in preparation for required practical activities that will come in year 10. They will fine tune all of their skills thus far throughout all of the units they have learnt in KS3 to consolidate knowledge of units and measurements and will begin to learn the importance of converting between units in more detail. They will practice measuring values accurately in smaller increments. They will master their skills in analysing data and consider errors in investigations. They will master describing trends in results from graph data and will demonstrate mastery in following and constructing methods for scientific experiments. In unit 5, students will build upon their KS3 knowledge to deepen their understanding of the world around them. They will develop problem solving skills as they use their science knowledge to consider how scientists address challenges on how we might use our resources effectively (for example how we can extract metals efficiently, how we can utilise carbon resources on earth, how scientists can operate sustainably to minimise the use of the Earth's limited resources and how manufacturing processes are made more efficient in industry). In unit 6, students will deepen their understanding from year 7 and 8 on cells and organ systems to further learn about and master transport systems for multicellular organisms. They will use their knowledge of the function of organ systems (in both plants and animals) to explain and evaluate their effectiveness.

Year 10 and 11

Students will then formally begin their GCSE learning, relying on skills that they have developed in units 4, 5 and 6 of year 9. They will begin learning AQA Combined Science Synergy, following the recommended sequence of learning suggested by AQA. This benefits the students of St Cuthbert's because each unit sequentially links to a range of different applications of science within the outside world and helps to continually broaden student horizons and develop their cultural capital as they learn. The nature of this specification is that each unit incorporates skills across all three subject disciplines, so that students can make links across the three disciplines, rather than seeing them as three separate entities. Since students are continually learning a range of Biology, Chemistry and Physics within each unit, their curriculum at KS4 is varied and engaging and gives our students a sense of how scientists work in the real world, utilising skills and knowledge from all three subject disciplines. Detailed explanation of each unit and how they link together to build upon knowledge from KS3 can be found in the document 'Science department curriculum intent and progression'. There are 8 units:

1. Building Blocks
2. Transport over larger distances
3. Interactions with the environment
4. Explaining change



5. Building blocks for understanding
6. Interactions over small and large distances
7. Movement and Interactions
8. Guiding spaceship Earth towards a sustainable future.

In year 10, students will study:

- Unit 1- Building blocks.
- Unit 5- Building blocks for understanding
- Unit 7- movement and interactions
- Unit 3- Interactions with the environment

In year 11, students will study:

- Unit 6- Interactions over small and large distances
- Unit 4- Explaining change
- Unit 2- Transport over larger distances
- Unit 8- Guiding spaceship Earth towards a sustainable future
- In their final half term, students have the opportunity to revise content from their GCSE course in tailored revision lessons with their teacher.