Science Curriculum Map

Intent

Our aim is to provide an excellent education for all our students; an education which brings out the best in all of them and prepares them for success in life. Our curriculum is designed to provide children with the core knowledge they need for success in education and later life, to maximise their cognitive development, to develop the whole person and the talents of the individual and to allow all children to become active and economically self-sufficient citizens.
The Science curriculum aims to develop students who are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.
The curriculum aims to do this by developing the student's scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. Developing an understanding of the nature, processes and methods of science through different types of science enquiries helps students to answer scientific questions about the world around them.

Implementation

Term	1	2	3	4	5	6
Year 7	We use the first two terms to discover and embed the foundations of science. Starting with biology, students look closely at the human body focusing on cells, tissues and organs and different organ systems. In chemistry, they will learn about particles and the particle model and in physics, they look at energy and energy stores. Each of these topics builds on what they would have learnt from KS2 science but also sets the foundation for science throughout their years in the academy. They will look at cells in some format every year through to GCSE. Particles and energy are also key topics that will help students understand other areas of the science curriculum. Students will be assessed using a united learning end of unit test. Data from these assessments will be used to change teaching groups. Topics covered Biology - Cells, tissues and organs (7BC) Chemistry - Particles and the particle model (7CP) Physics -Energy (7PE)		The next two terms continue developing the foundations of science but more practically. We discover what we mean by forces by using practical science. They focus again on the body in biology and look at the reproductive systems in animals and plants. Each topic again links to GCSE but also to how the world works. From making things move (forces), to being able to fry an egg (chemical reactions). We use a variety of practicals and everyday activities that allow the students to fully understand what they are being taught. Topics covered Physics – Forces (7PF) Biology - Reproduction (7BR)		Students use the knowledge they learnt in particles and the particle model to think about reactions and what happens to atoms during reactions. We also start our outdoor work, which includes ecological relationships. So far, the students will have done a lot of work on biological systems and how they work. This term we focus on other organisms around us and the relationship they have with each other and with humans. When the weather is good, students will be able to take part in practical fieldwork such as using quadrats and different sampling techniques. Topics covered Chemistry - Chemical reactions (7CC) Biology – Ecological relationships (8BE)	
Year 8	Students will begin by looking at what a balanced diet is and why a balanced diet is important. Students will focus on the different food groups and explain why each food group is necessary. Students will learn about the process of digestion and think about the path food takes when it enters the mouth and what organs are needed for digestion to work effectively. Students use their knowledge of food groups and nutrients when moving on to the role of enzymes and why enzymes play an important role in digestion. Students will learn about how the periodic table is ordered including where metals and non-metals can be found. They will use this knowledge to explain how an elements position in the periodic table links to its properties and reactivity. Students will recap chemical reactions and write word and symbol equations for reactions using the terms reactants and products.		Students looks at electricity and magnetism. Students will learn the content but also build on their practical skills Students are introduced to photosynthesis as a chemical reaction that plants do to make their food. They will use their knowledge from the ecology section to link producers to doing photosynthesis and how photosynthesis is a way in which carbon dioxide is removed from the atmosphere. They will further develop their knowledge by discussing how plants use the glucose they have made for respiration and storage Topics covered Physics – Electricity and magnetism (8PE) Biology – Plants and photosynthesis (9BP)		Students undertake more practical work when studying energetics and rate and will be asked to plan investigations and improve investigations that have already been done. The final topic of the year is on matter, which builds on their work on particles and the particle model. Topics covered Chemistry – Energetics and rate (9CE) Physics – Matter (9PM)	

	Students look closely at the rock cycle. This is important as it allows the students to learn that in the environment around us most things flow in a cycle; Life cycle, carbon cycle and water cycle are a few examples. Students begin year 8 by looking at space and light. This is a fascinating topic that allows students to explore and learn about the universe that they live in. They develop an understanding of light and its different properties and why light is key to so many concepts such as reflection, refraction and total internal reflection. It is important for everyday living that students understand how shadows are formed, how we see colour, and the structure of the eye. Topics covered Biology – Digestion and nutrition (8BD) Chemistry – The periodic table (8CP) Physics – Space and Light (8PE) Chemistry – Materials (8CM)		
Year 9	The final topics before the KS4 curriculum are forces, reactivity and biological systems. Forces was introduced during year 7 but during year 9 students focus more on equations and using the correct terminology. We also begin to rearrange equations during this topic, which will be very important during GCSE physics. Students use knowledge from the periodic table topic to investigate reactivity. To prepare them for GCSE, students again will be asked to plan investigations, improve investigations and discuss results and data. Students look closely at systems in the body and build on their work from year 7 term 1 where they were introduced to body systems. In this topic, we look closely at how different systems interact such the circulatory, nervous and respiratory system. Topics covered Physics – Forces in action (9PF) Chemistry – Reactivity (9CR) Biology – Biological systems (9BB)	Topics covered 4.1 Cell biology (B1) Cells are the basic unit of all forms of life. In this section, we explore how structural differences between types of cells enables them to perform specific functions within the organism. 5.1 Atomic structure (C1) The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. 6.1 Energy (P1) In this section, students learn about energy stores and the conservation of energy - energy is never created or destroyed but just transferred from one energy store to another. They are introduced to several equations including those for kinetic energy and gravitational potential energy. Students will learn what we mean by specific heat capacity and where the equation for it can be useful. To consolidate their understanding, all students will carry out an investigation to find the specific heat capacity of a metal block.	Topics covered 5.2 Bonding (C2) In this section, students learn about why structure and bonding is so important and look at the ways properties of substances have been used past and present. Students will also gain an appreciation for new materials that are in the research phase such as graphene and nanoparticles and their current applications. 4.2 Organisation (B2) Students will learn about the human digestive system which provides the body with nutrients. They will also study the chemistry of food and carry out food tests to show which groups can be found in sample foods. Students will also learn about the respiratory system that provides the body with oxygen and removes carbon dioxide and the circulatory system, which moves dissolved materials quickly around the body in the blood either for absorption or removal. The structure of the heart and blood vessels will also be studied. Students will also explore medical advances to help keep the heart beating, such as stents and pacemakers. Students look at the impact of smoking and alcohol on the body. They also study non-communicable diseases such as cancer and heart disease and their effects on the body. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis.

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Year 10	Topics covered 6.2 Electricity (P2) Students will study the difference in the microstructure of conductors, semiconductors and insulators. They will also look at the various components involved in building electric circuits and how they work. Students will study how basic electric circuits work and the mathematical equations that govern them. 5.3 Quantitative chemistry (C3) Students will study different reactions and employ mathematical skills to calculate quantities of reactants and products. The mathematical skills and learning they learn in this topic are essential to the remainder of the course and underpins our understanding of chemistry. 4.3 Infection and Response (B3) Students will look at what it means to be healthy and the differences between bacterial, viral and fungal diseases including how they are treated. They continue to look at our body defences, putting a large emphasis on the white blood cells and the role they play in protecting us from pathogens. Students look at what history as taught us in developing medicines and how new medicines now need a lot of testing before they can be licenced. 6.3 Particle Model of Matter (P3) In this section, students learn about density and recap their knowledge from KS2 and KS3 on states of matter and changing states. This foundation knowledge is forms the basis of new concepts such as specific heat capacity and specific latent heat. Students will also study gases and the physical laws that govern them.		Topics covered 5.4 Chemical Change (C4) In this section, students recap their knowledge on displacement reactions and how we decide on the reactivity of elements. Students investigate what scientists mean by salts and will use practical science to develop salts. They link their knowledge on acids and alkalis from KS3 to look more closely at what makes something acidic or alkaline. Students are also introduced to electrolysis and will employ skills from quantitative chemistry to understand ionic equations and half-equations. 4.4 Bioenergetics (B4) In this section we will explore how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this 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. 6.4 Atomic Model (P4) Students will study radioactivity and why it occurs. They will study the history of the atom, which builds on the knowledge from the chemistry units and how the nuclear model of the atom was established. Students when then study how radioactive decay occurs and then study how radioactive processes are used in industry today. 5.5 Energy changes (C5) Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way.	Topics covered 5.7 Organic chemistry (C7) The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. Students will study the structure of the basic organic molecules and will look at the processes involved in obtaining these molecules from crude oil. Students will also study the reactions that occur will organic molecules and how these can be put to use. 5.8 Chemical analysis (C8) Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work. 4.7 Ecology (B7) 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. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section students will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider some actions we need to take to ensure our future health, prosperity and well-being.	

Year 11	Topics covered 5.6 Rates of Reaction (C6) Chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. In this section, students recap what we mean by rate of reaction and compete a practical that looks at how rate is affected by concentration of a substance and temperature. Students will look at catalysts again and be introduced to the term reversible reaction and where they are used in industry. 4.5 Homeostasis (B5) Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. In this section, students will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility. Students will learn about the various contraceptive methods available and evaluate them. 6.5 Forces (P5) Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.	Topics covered 4.6 inheritance (B6) In this section students will learn about the different types of reproduction and what we mean by genetic disorders. They debate whether parents should use genetic screening and the implications this could have on children born with disabilities. Students move on to study Charles Darwin's theory of natural selection and how genes are inherited. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics. Once new varieties of plants or animals have been produced it is possible to clone individuals to produce larger numbers of identical individuals all carrying the favourable characteristic. Students will study how scientists have developed new ways of producing crops through genetic engineering and selective breeding. They will also discuss the moral and ethical implications of these technologies when considering humans. 5.9 Chemistry of the atmosphere (C9) The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity. 5.10 Using resources (C10) Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised. 6.7 Magnetism and Electromagnetism (P7) Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this. Students will study how electromagnets works and how they can be used to generate electricity. They will also study the rules and laws that govern how they work.	

		6.6 Waves (P6) Waves carry energy from one place to another and can carry information. Modern technologies such as imaging and communication systems are reliant on us understanding electromagnetic waves. In this section, students recap their knowledge of waves from KS3 and develop this further to look at the properties of waves. Students will investigate how the speed of waves can be measured and will also investigate how the surface and the colour of an object affects how well it affects its absorption of infrared radiation. Students will also study the many modern applications of electromagnetic waves.	

Impact:

- In science, we use KPI activities and end of module tests to measure the progress of our KS3 students. Students will be given an activity that they do in silence, which links to what they have been learning. Each activity comes with a success criteria that teachers OR the students themselves will use to mark their work. A whole class feedback sheet with common mistakes/misconceptions and feed forward tasks for the students will be given to the students in line with the school policy. Students will also sit summative test at the end of each unit. The students will be allowed to produce a page of revision notes which they will be allowed to use within the module tests but not within the mid-year and EOY assessments.
- KS4 students will use marked activities at the end of a topic, this will be in the form of exams. Students will be expected to answer the exam question using information they have learnt, and the teacher will mark it. Data for each assessment will be added to a tracker that the HOD can monitor to check the progress of classes or individual students.
- Analysis of assessment and mock data will help teachers decide which topics may need to be taught again; teachers will make a decision on whether to teach topics again that students have performed badly on or challenge students by looking on topics from a different perspective. Time has been made available for this within the LTP. In KS3 data will be used to make changes to class sets, those students that consistently perform well in assessments and KPI activities will be able to move up to a higher set where the work is more challenging.
- Analysis of the EOY assessments at KS3/4 will be carried out in the autumn term. Analysis meetings will be held with the Science LM and Head with action plans put in place for the following year to ensure that as a department we are constantly improving.
- Homework will primarily be set using Seneca. KS3 and KS4 leads will set up a class for the whole year group and ensure that retrieval practise is set weekly and monitoring of homework completion is more streamlined.
- Increasing the number of students taking A-level science courses.