Subject Curriculum Map

Intent – what does your curriculum aim to achieve? What knowledge and understanding will students have by the time they leave in Y11? What is the structure and narrative underpinning the curriculum?

- At The Elms Academy, our mission is to provide an exceptional education that brings out the best in every student, preparing them for success in life. Our science curriculum is meticulously designed to inspire and cultivate a profound understanding of the natural world, fostering lifelong curiosity and passion for science. We aim to equip students with the core knowledge essential for success in both education and life, maximizing their cognitive development, nurturing the whole person, and recognizing the unique talents of each individual. Ultimately, our goal is to empower all children to become active, economically self-sufficient citizens.
- The science curriculum at The Elms Academy aims to develop students who are well-versed in the scientific knowledge necessary to comprehend the applications and implications of science today and in the future. This is achieved by enhancing students' scientific knowledge and conceptual understanding through the distinct disciplines of biology, chemistry, and physics. By fostering an understanding of the nature, processes, and methods of science through various types of scientific enquiries, we enable students to answer scientific questions about the world around them effectively.

Implementation - How is the curriculum being delivered? How are ideas, concepts and knowledge sequenced and revisited to ensure that learning is committed to long-term memory? How is knowledge of vocabulary embedded and taught explicitly? How do you ensure that Key Stage 3 serves as a preparation for further study but also provides an secure understanding of the world for students who don't continue with individual subjects beyond KS3?

Term	1	2	3	4	5	6
Year 7	At The Elms Academy, we dedicate the first two terms to discovering and embedding the foundations of science. In chemistry, students begin by learning about particles and the particle model. Students are introduced to the concept of matter and particles. They are not yet introduced to atoms/ molecules but use the simple particle model. Students learn how the particulate model of matter – and the arrangement, movement and forces of attraction between particles – can explain changes of state, and other physical changes. In fundamentals of physics Students are taught about resultant forces when forces are balanced (zero resultant force) and unbalanced (non-zero) forces. They revisit contact and non-contact forces (KS2) and name air resistance, friction, lift, normal contact force, thrust, upthrust, water resistance (contact) and gravity force and magnetic force (non-contact). Moving on to biology, Students review relevant knowledge from KS2. They are then introduced to cells as the building blocks within tissues, organs and organ systems. They are taught the components of animal and plant cells and examine some specialised cells		Having understood the fundamentals of particles (7.01), students are introduced to atoms, molecules and elements, and then compounds. They are taught how to represent these in diagrams and with symbols and chemical formulae. They are then introduced to chemical changes as a rearrangement of these atoms. They represent these in diagrams, word equations and symbol equations (though they do not balance equations). For 7.05 students build on knowledge of what cells need for respiration (7.03), students are taught about the gas exchange system and revisit the digestive system and circulatory		 7.07. Students build on understanding of properties of materials and how these relate to their use (KS2) by considering the properties and use of composite materials. They are introduced to polymers and ceramics and compare these to metals. 7.08. Students are introduced to variation, including continuous and discontinuous variation and genetic and environmental variation. They consider the importance of variation within a species. At this stage, the not explicitly link variation with adaptations. Separately, they revisit 	
			system in humans (KS2). Students also revisit specialised cells (7.03), For 7.06 Students build on their knowledge of	the idea of adaptation in the context of f sound being caused by vibrations and what	adaptations of specialised cells (7.03, 7.05) in male and female a	
			changes its loudness and pitch (KS2), to under particles (7.01). Students also develop their ke to illuminate objects, which is how we see the travelling in straight lines (KS2) to understand surfaces affect the reflection of light.	nowledge of light emanating from a source em, and how shadows are evidence for light	Chemistry – Materials (7.07) Biology – Life cycles (7.08) <u>Key recurring themes</u>	argy and materials for which they
	Topics covered Chemistry - Particles substances and mixture Physics –Fundamentals of physics (7.02) Biology – Cells and organisation (7.03)	es (7.01)	<u>Topics covered</u> Chemistry - Chemical changes (7.04) Biology - Organ systems (7.05) Physics – Sound and light (7.06)		 Organisms require a supply of energy and materials for w often depend on, or compete with, other organisms. The diversity of organisms, living and extinct, is the result All matter in the Universe is made of very small particles 	
	 <u>Key recurring themes</u> All matter in the Universe is made of very small particles The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event Organisms are organised on a cellular basis and have a finite life span 		 Key recurring themes Genetic information is passed down from All matter in the Universe is made of very Organisms are organised on a cellular base 	/ small particles		

	4. Genetic information is passed down from one generation of organisms to another		
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.	During Terms 3 and 4, students will delve into the rock cycle and the dynamic processes shaping our planet. They learn that below the surface heat from the Earth's interior causes movement in the molten rock. This in turn leads to movement of the plates which form the Earth's crust, creating volcanoes and earthquakes. The solid surface is constantly changing through the formation and weathering of rock .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 looks at electricity and magnetism and see the link between 7PF and 8PE e.g. All objects have an effect on other objects without being in contact with them. Magnetism and electrostatic forces being examples of non-contact forces. Students will learn the content but also build on their practical skills	Students will topic of the ye the particle m Students und and will be as have already Following this the particle m temperature particle mode density of diff year 10.
	Finally students study 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.	<u>Topics covered</u> Chemistry – Materials (8CM) Physics – Electricity and magnetism (8PE)	<u>Topics covere</u> Biology – Eco Chemistry – E Physics – Mat
	 <u>Topics covered</u> Biology – Digestion and nutrition (8BD) Chemistry – The periodic table (8CP) Physics – Space and Light (8PE) <u>Key recurring themes</u> 1. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event 2. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms 3. Organisms are organised on a cellular basis and have a finite life span 4. All matter in the Universe is made of very small particles 5. Our solar system is a very small part of one of billions of galaxies in the Universe 6. Objects can affect other objects at a distance 	 Key recurring themes 1. The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate. 2. Objects can affect other objects at a distance 3. Changing the movement of an object requires a net force to be acting on it 	 Key recurring All matte Changing on it The total be transf Organism often dep The diver

vill then move onto Ecological relationships and then the final e year is on matter, which builds on their work on particles and e model.

ndertake more practical work when studying energetics and rate asked to plan investigations and improve investigations that dy been done.

this, students study a unit on Matter. This builds on knowledge of e model developed in year 7, as students learn to explain irre changes during changes of state. Students also link the odel to the idea of density and write methods for investigating different objects. This provides a platform for studying Matter in

<u>ered</u> cological relationships (8BE) – Energetics and rate (9CE) 1atter (9PM)

ing themes

tter in the Universe is made of very small particles ing the movement of an object requires a net force to be acting

tal amount of energy in the universe is always the same but can insferred from one energy store to another during an event isms require a supply of energy and materials for which they depend on, or compete with, other organisms.

versity of organisms, living and extinct, is the result of evolution

Term	1	2	3	4	
			 Key recurring themes All matter in the Universe is made of very small particles Organisms are organised on a cellular basis and have a finite life span Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms Objects can affect other objects at a distance 		cancer and We will als environme water and <u>Key recurr</u> 1. All ma 2. The to be tra 3. Organ
	 Chemistry – Energetics (9CE) <u>Key recurring themes</u> 1. All matter in the Universe is made of ve 2. Objects can affect other objects at a dis 3. Changing the movement of an object response of the second second	tance quires a net force to be acting on it erse is always the same but can be transferred	 In term 4 of year 9, students begin their Science GCSE course starting with B1 cell biology <u>4.1 Cell biology (B1)</u> 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. <u>Topics covered</u> Physics – Matter (9PM) Biology – Plant and photosynthesis (9BP) Physics – Sound (9PS) 		4.2 Organisa Students wil body with n out food tes Students wil body with o which move either for ab vessels will a Students wil such as sten alcohol on t
	Finally, students study a short unit on Energetics. This provides an opportunity for practical work and provides the foundation for learning about endothermic and exothermic reactions in year 10. Topics covered Chemistry – Reactivity (9CR) Physics - Forces in action (9PF)		In the Sound unit, students build on ideas from year 7 and 8 about the transfer of energy between different stores. They learn about sound waves as an example of longitudinal waves, which constitute one way energy can be transferred. Students use the speed equation from year 7 to calculate the speed of sound and apply this to the use of sonar in different situations. In doing so, they learn about a range of different contexts in which they can apply basic scientific principles.		energy - en energy stor including th Students w equation fo students w a metal blo
redi 7	chemical reactions, which is first covered in conclusions from experimental results and le the real-life extraction of pure metals from t In the Forces unit, students look at the effect moments – and on materials, by looking at s	year 7. Students also practise drawing earn about how principles can be applied in their ores. It of forces on motion – by looking at springs. In both topics, they practise units. In the latter, they have the opportunity	during changes of state. Students also link the write methods for investigating density of diff studying Matter in year 10, when students de about specific heat capacity / specific latent h Students will then move onto Plants and phot knowledge from Y7 – cells, Y8 – Ecological rela organs within plants work together to carry of factors that can limit the rate of this reaction.	e particle model to the idea of density and ferent objects. This provides a platform for velop these concepts further (e.g. learning eat). cosynthesis, where they will build upon their ationships to explain how the different ut the photosynthesis reaction and look at	5.1 Atomic The period known che physical an periodic ta how scient emerges. 6.1 <u>Energy</u> In this sect
Year 9	At the beginning of Year 9, students study a more examples to support their understand	-	Students start the term studying a unit on Ma particle model developed in year 7, as studen	•	Topics co

vered

c structure (C1)

dic table provides chemists with a structured organisation of the emical elements from which they can make sense of their nd chemical properties. The historical development of the able and models of atomic structure provide good examples of itific ideas and explanations develop over time as new evidence

gy (P1)

ction, students learn about energy stores and the conservation of energy is never created or destroyed but just transferred from one ore to another. They are introduced to several equations those for kinetic energy and gravitational potential energy. will learn what we mean by specific heat capacity and where the for it can be useful. To consolidate their understanding, all will carry out an investigation to find the specific heat capacity of lock.

isation (B2)

will learn about the human digestive system which provides the nutrients. They will also study the chemistry of food and carry sets to show which groups can be found in sample foods. will also learn about the respiratory system that provides the oxygen and removes carbon dioxide and the circulatory system, ves dissolved materials quickly around the body in the blood absorption or removal. The structure of the heart and blood Il also be studied.

will also explore medical advances to help keep the heart beating, ents and pacemakers. Students look at the impact of smoking and n the body. They also study non-communicable diseases such as d heart disease and their effects on the body.

so learn how the plant's transport system is dependent on ental conditions to ensure that leaf cells are provided with the I carbon dioxide that they need for photosynthesis.

ring themes

atter in the Universe is made of very small particles otal amount of energy in the Universe is always the same but can ansferred from one energy store to another during an event hisms are organised on a cellular basis and have a finite life span



	Topics covered	Topics covered	Topics covere
Year 10	5.2 Bonding (C2)	5.4 Chemical Change (C4)	
	In this section, students learn about why structure and bonding is so important and look	In this section, students recap their knowledge on displacement reactions and how we	4.7 Ecology (
	at the ways properties of substances have been used past and present. Students will also	decide on the reactivity of elements. Students investigate what scientists mean by salts	All species liv
	gain an appreciation for new materials that are in the research phase such as graphene	and will use practical science to develop salts. They link their knowledge on acids and	animals and
	and nanoparticles and their current applications.	alkalis from KS3 to look more closely at what makes something acidic or alkaline.	particular cor
		Students are also introduced to electrolysis and will employ skills from quantitative	essential serv
	6.3 Particle Model of Matter (P3)	chemistry to understand ionic equations and half-equations.	In order to co
	In this section, students learn about density and recap their knowledge from KS2 and KS3		with the envi
	on states of matter and changing states. This foundation knowledge forms the basis of	6.2 Electricity (P2)	explore how
	new concepts such as specific heat capacity and specific latent heat. Students will also	Students will study the difference in the microstructure of conductors, semiconductors	systems that
	study gases and the physical laws that govern them.	and insulators. They will also look at the various components involved in building electric	to ensure our
		circuits and how they work. Students will study how basic electric circuits work and the	
	4.3 Infection and Response (B3)	mathematical equations that govern them.	6.5 Forces (PS
	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	5.5 Energy changes (C5)	Students stud
	body defences, putting a large emphasis on the white blood cells and the role they play in	Energy changes are an important part of chemical reactions. The interaction of particles	concepts from
	protecting us from pathogens. Students look at what history as taught us in developing	often involves transfers of energy due to the breaking and formation of bonds. Reactions	motion of dif
	medicines and how new medicines now need a lot of testing before they can be licenced.	in which energy is released to the surroundings are exothermic reactions, while those	Higher studer
	Γ_{2} Overtitetive charging r (C2)	that take in thermal energy are endothermic. These interactions between particles can	
	5.3 Quantitative chemistry (C3)	produce heating or cooling effects that are used in a range of everyday applications.	<u>5.7 and 5.8 –</u> To finish the
	Students will study different reactions and employ mathematical skills to calculate quantities of reactants and products. The mathematical skills and learning they learn in	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	Analysis. Both
	this topic are essential to the remainder of the course and underpins our understanding	be used to decompose ionic substances and is a useful means of producing elements that	Analysis. Boti
	of chemistry.	are too expensive to extract any other way.	Key recurring
	or chemistry.	are too expensive to extract any other way.	1. All matte
	6.4 Atomic Model (P4)	Key recurring themes	2. Objects of
	Students will study radioactivity and why it occurs. They will study the history of the	1. All matter in the Universe is made of very small particles	3. The total
	atom, which builds on the knowledge from the chemistry units and how the nuclear	2. Objects can affect other objects at a distance	be transf
	model of the atom was established. Students when then study how radioactive decay	3. The total amount of energy in the Universe is always the same but can be transferred	4. The com
	occurs and then study how radioactive processes are used in industry today.	from one energy store to another during an event	occurring
		4. The composition of the Earth and its atmosphere and the processes occurring within	5. Organisn
	4.4 Bioenergetics (B4)	them shape the Earth's surface and its climate	6. Organisn
	In this section we will explore how plants harness the Sun's energy in photosynthesis in		often de
	order to make food. This process liberates oxygen which has built up over millions of		7. The diver
	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.		
	Key recurring themes		
	 All matter in the Universe is made of very small particles 		
	 Objects can affect other objects at a distance 		
	 The total amount of energy in the Universe is always the same but can be transferred 		
	from one energy store to another during an event		
	 Organisms are organised on a cellular basis and have a finite life span 		
	5. Genetic information is passed down from one generation of organisms to another		
	 The diversity of organisms, living and extinct, is the result of evolution 		
			1

ered

/ (B7)

live in ecosystems composed of complex communities of ad plants dependent on each other and that are adapted to conditions, both abiotic and biotic. These ecosystems provide ervices that support human life and continued development. In continue to benefit from these services humans need to engage invironment in a sustainable way. In this section students will now humans are threatening biodiversity as well as the natural nat support it. We will also consider some actions we need to take pour future health, prosperity and well-being.

<u>(P5) – motion</u>

tudy the 1st half of the P5 Forces topic. Here, students build on rom year 7, 9 and 10 to examine the effect of forces on the different objects. A variety of equations are introduced and dents look at multi-step problems.

8 – Organic chemistry and chemical analysis

ne year students, look at C7 Organic Chemistry and C8 Chemical oth topics involve looking at data and identifying patterns.

ing themes

tter in the Universe is made of very small particles ts can affect other objects at a distance

tal amount of energy in the Universe is always the same but can insferred from one energy store to another during an event imposition of the Earth and its atmosphere and the processes ing within them shape the Earth's surface and its climate isms are organised on a cellular basis and have a finite life span isms require a supply of energy and materials for which they

depend on, or compete with, other organisms

versity of organisms, living and extinct, is the result of evolution

11	Topics covered	Topics covered	Rev
	4.5 Homeostasis (B5)	4.6 inheritance (B6)	
	Cells in the body can only survive within narrow physical and chemical limits. They	In this section students will learn about the different types of reproduction and what we	
	require a constant temperature and pH as well as a constant supply of dissolved food and	mean by genetic disorders. They debate whether parents should use genetic screening	
	water. In order to do this the body requires control systems that constantly monitor and	and the implications this could have on children born with disabilities.	
	adjust the composition of the blood and tissues.	Students many an to study Charles Damis/s the sum of a study local stick and how some	
	In this section, students will explore the structure and function of the nervous system and	Students move on to study Charles Darwin's theory of natural selection and how genes	
	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	are inherited. An understanding of these processes has allowed scientists to intervene	
	important in reproduction since it controls the menstrual cycle. An understanding of the	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	
	role of hormones in reproduction has allowed scientists to develop not only	produce larger numbers of identical individuals all carrying the favourable characteristic.	
	contraceptive drugs but also drugs which can increase fertility. Students will learn about		
	the various contraceptive methods available and evaluate them.	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	
	6.5 Forces (P5) – in action	implications of these technologies when considering humans.	
	Students study the 2 nd half of the P5 Forces topic. Here, students build on concepts from	5.9 Chemistry of the atmosphere (C9)	
	year 7, 9 and 10 to examine the effect of forces on the motion of different objects. A		
	variety of equations are introduced and Higher students look at multi-step problems.	The Earth's atmosphere is dynamic and forever changing. The causes of these changes	
	Students also learn about more practical techniques, e.g. datalogging in the investigation	are sometimes man-made and sometimes part of many natural cycles. Scientists use very	
	of Newton's second law.	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	
	5.6 Rates of Reaction (C6)	scientists and engineers to develop solutions that help to reduce the impact of human	
	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	activity.	
	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.	5.10 Using resources (C10)	
	Students will look at catalysts again and be introduced to the term reversible reaction		
	and where they are used in industry.	Industries use the Earth's natural resources to manufacture useful products. In order to	
	<u>4.5 Homeostasis (B5)</u>	operate sustainably, chemists seek to minimise the use of limited resources, use of	
	Cells in the body can only survive within narrow physical and chemical limits. They	energy, waste and environmental impact in the manufacture of these products. Chemists	
	require a constant temperature and pH as well as a constant supply of dissolved food and	also aim to develop ways of disposing of products at the end of their useful life in ways	
	water. In order to do this the body requires control systems that constantly monitor and	that ensure that materials and stored energy are utilised. Pollution, disposal of waste	
	adjust the composition of the blood and tissues. In this section, students will explore the structure and function of the nervous system and	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,	
	how it can bring about fast responses. We will also explore the hormonal system which	and how damaging effects can be minimised.	
	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	Key recurring themes	
	contraceptive drugs but also drugs which can increase fertility. Students will learn about	1. All matter in the Universe is made of very small particles	
	the various contraceptive methods available and evaluate them.	2. Changing the movement of an object requires a net force to be acting on it	
		3. The composition of the Earth and its atmosphere and the processes occurring within	
	6.7 Magnetism and Electromagnetism (P7)	them shape the Earth's surface and its climate	
	Electromagnetic effects are used in a wide variety of devices. Engineers make use of the	4. Our solar system is a very small part of one of billions of galaxies in the Universe	
	fact that a magnet moving in a coil can produce electric current and also that when	5. Organisms are organised on a cellular basis and have a finite life span	
	current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this.	 Genetic information is passed down from one generation of organisms to another The diversity of organisms, living and extinct, is the result of evolution 	
	Students will study how electromagnets works and how they can be used to generate	7. The diversity of organisms, name and extinct, is the result of evolution	
	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		1
	understanding electromagnetic waves.		1

or GCSE exams

Term	 The diversity of organisms, living and ex 1 	ttinct, is the result of evolution 2	3	4	
	 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. <u>Key recurring themes</u> All matter in the Universe is made of very small particles Objects can affect other objects at a distance Changing the movement of an object requires a net force to be acting on it Organisms are organised on a cellular basis and have a finite life span 				
	In this section, students recap their knowled				

Impact:

- In science, we use teacher assessed activities to measure the progress of our KS3/4 students. Students will be given an activity that they do in silence, which links to what they have been learning. . 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 be assessed at least twice within an academic year via mid-year and end of year assessments. These assessments will be provided by UL. End of year assessment data is sent to UL for trust wide analysis and we use the data received to measure the effectiveness of the KS3 curriculum.
- 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 Sparx Science. The SL or teacher with responsibility for a KS will be responsible for creating the homework curriculum for each year group. This involves setting work that has been taught in lessons over several weeks. This is to help students embed knowledge in their long-term memory. Again, completion and success rates are monitored closely, and interventions are put in place where this needs to be improved. Teachers will also have the ability modify this slightly based on the needs of their class.
- We also review the annual pupil survey and have begun using pupil voice and exit interviews to monitor students' perception of the curriculum within science.
- Our overall aim is to increase the number of students taking a science or STEM related subjects at L3 within the Elms and at undergraduate level post KS5.

