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ETHOS COLLEGE

Ethos College

Curriculum Planning

GCSE Science - Trilogy

"Science and everyday life cannot and should not be separated"

Rosalind Franklin

Intent:

We believe that our pupils deserve a broad and aspirational science curriculum rich in skills and knowledge preparing them for further education and employment. The science curriculum has been designed to provide pupils with a deep understanding of the scientific knowledge and ideas that impact them as individuals within a local and global context. As they move through the curriculum, pupils will be increasingly encouraged to develop their curiosity, work scientifically and appreciate the value of science in their everyday lives to improve their social and moral understanding of the world, and be able to form reasoned opinions around 'big' scientific questions.

Implementation:

The curriculum is designed to build and expand on previous skills and understanding over a 1 or 2 year period dependent on the course being studied. This is determined through use of appropriate baseline assessments and an understanding of the pupils SEND / SEMMH needs. We offer both Entry Level and GCSE qualifications at Ethos depending upon a pupil's identified pathway through Key Stage 4. Pupils follow the appropriate AQA science specification meeting both the rigour of the national curriculum and building a greater understanding of science moving forward into the wider world.

Delivery of the curriculum is underpinned by quality first teaching, informed by frequent 'low stakes' retrieval testing. Marking and feedback addresses misconceptions promptly and enables interventions that are timely and effective. Pupils are encouraged to develop their own scientific ideas and have opportunities to interact with scientists in the 'real world' to deepen their understanding.

Impact:

The majority of pupils meet or exceed their targets in Science and required grades are attained to enable pupils to follow their chosen Post 16 pathways.

Pupils leave ETHOS with an understanding of the natural world and are scientifically literate.

Year 1

Time	Key Subject Content	Sequencing	Rationale	Careers, Industry Links and Cultural Capital	Reading	SEMH
Half Term 1: Sep – Oct	Biology 1: Cells and Organisation	Animal and plant cells, looking at onion and cheek cells, prokaryotes, specialised cells, light and electron microscopes, magnification, cell division, stem cells, diffusion, exchanging materials, osmosis, osmosis required practical, active transport, organisation in the human body, food tests, enzymes, digestive enzymes, enzymes required practical, the circulatory system, the heart, the breathing system, the blood, heart valves and coronary heart disease.	Cells are the building blocks of all living organisms. Knowledge of cell structure is needed to understand life processes. Basic knowledge of cell structure and function is needed to access the rest of the content. The topics are taught in this sequence as it builds on knowledge and leads to the higher level content. Once cell structure, function and transport processes are understood, we start to look at how the different systems work. We look at the functions of the systems and how cell function complements each one	Science careers displayed around the science laboratory and throughout school. Pupils are introduced to the idea of scientific research and how this impacts our knowledge of the world around us	Pupils are provided with opportunities to learn through comprehension and DARTS exercises. Pupils are encouraged to participate in active reading throughout the course. Keywords and Root words displayed prominently in the classroom .	Lesson plans take into account individual and group needs as determined by BOXALL profiles. Activities to support this include: Encouraging pupils to be respectful while others are giving an opinion in the form of debates. Encouraging interest in the

					Pupils are given regular opportunities to practice exam style questions with a focus on understanding command words and using science specific language in their answers	natural world through engaging and relevant activities.
Half Term 2: Oct – Dec	Biology 1: Infection and Response, Biodiversity	Health, non communicable diseases, cancer, plant tissues, plant organs, transpiration, communicable diseases, human defence systems, vaccination, painkillers, antibiotics, drug development, plant defences, photosynthesis, controlling photosynthesis, respiration and responding to exercise	Basic knowledge of bacteria and viruses and how they cause illness (again links back to cells). This then leads on to different diseases and what causes them. We then look at how the body fights against diseases and how we vaccinate against diseases and treat diseases. We also look at plant diseases and defences which links back to plant cells. Again, we build on basic knowledge and understanding to working on applying the knowledge to different contexts. Knowledge of cells and enzymes needed for photosynthesis. Knowledge needed of the	Visit by Medical Mavericks Pupils are introduced to healthcare careers through introduction of activities in which they are asked to take the role of ….	Pupils are encouraged to take part in shared reading of texts with consideration given to pupil reading age and ability.	Boxall Strands A – Giving purposeful attention B – Participating Constructively C - Connecting up experiences D – Showing Insightful Involvement

			circulatory system, enzymes cells and the digestive system to access this topic.	Diversity of science careers is introduced with the inclusion of plant science. Again pupils are asked to complete work in a given role – Journalist , gardener, farmer.		E - Engages cognitively with peers
Half Term 3: Jan – Feb	Chemistry 1: Atomic structure	The periodic table, atomic structure, electronic structure, the development of the periodic table, alkali metals, halogens, chemical reactions, ionic bonding, covalent bonding, structures and bonding, graphite, graphene, fullerenes, polymers, alloys, relative formula mass, conservation of mass, balancing equations, limiting reactants and solutions.	The periodic table is the building block of all knowledge needed for Chemistry. Without this, the rest of the course would not make sense. Knowledge of atoms, electrons and bonding is needed to access the rest of the content. The topics are taught in this sequence as it builds on knowledge and leads to the higher-level content.	Pupils are introduced to careers in the chemical industry through discussion of development of new materials and their impact on the modern world.	Pupils are provided with opportunities to learn through comprehension and DARTS exercises. Pupils are encouraged to participate in active reading throughout the course.	Boxall Strands: A – Giving purposeful attention B – Participating Constructively C - Connecting up experiences

						D – Showing Insightful Involvement E - Engages cognitively with peers
Half Term 4: Feb – April	Chemistry 1: Chemical changes and Energy changes	Metal oxides, metals and acids, extracting metals, naming ionic compounds, acids and alkalis, making salts (soluble and insoluble), making salts required practical, electrolysis, electrolysis to extract metals, electrolysis of aqueous solutions, endothermic and exothermic reactions, filtration, evaporation and distillation.	Once the periodic table and bonding is understood, we start to look at how reactions occur including finding masses of elements and how mass is conserved in reactions. We look at how efficient reactions are and where products can be lost and what companies can do to maximise yields whilst saving cost. The basic knowledge of bonding and chemical reactions will be explored in this topic where we look at what chemical reactions take place in industry and why, what conditions are needed to maximise yields building on the knowledge of atoms, structures and bonding. This part of the course really links the knowledge to how the knowledge is applied to industrial processes to make products for us as consumers. This topic uses knowledge of electrolysis from the previous topic	Pupils will learn about how metal extraction takes place in industry and the careers involved.	Pupils are provided with opportunities to learn through comprehension and DARTS exercises. Pupils are encouraged to participate in active reading throughout the course.	Boxall Strands: A – Giving purposeful attention B – Participating Constructively C - Connecting up experiences D – Showing Insightful Involvement E - Engages cognitively with peers

			to look at what products can be made from end and exothermic reactions. It also looks at the application of electrolysis to cells, batteries and fuel cells.			
Half Term 5: April – May	Physics 1: Energy and Electricity	Energy stores, elastic potential energy, gravitational potential energy, kinetic energy, specific heat capacity, work done, power, efficiency, insulating the home, improving efficiency, Sankey diagrams, energy resources, circuits, resistors, non ohmic resistors, series and parallel circuits, mains electricity, fuses and residual circuit breakers, power in electrical circuits, transfer of electrical energy, the national grid and static electricity.	Physics is the last unit to study in year 10 as it is the most challenging. We start by looking at energy as this is the fundamental of Physics on which all other knowledge is built. We then move onto electricity as it is a type of energy that we look at in more detail.	Pupils learn about roles in the energy sector and new roles opening up due to renewable energy sources Pupils are asked to consider impacts on environment from a number of different viewpoints	Pupils are exposed to a number of different texts for example newspaper articles, letters from the public and informational leaflets	Pupils are encouraged to take part in debates which encourages listening to others views and developing empathy for others situations.
Half Term 6: June – July	Physics 1: Particle model and matter	Density, states of matter, gas pressure, atomic structure, history of the atom, alpha, beta and gamma radiation, half-life, nuclear equations, hazards of radiation, nuclear fission and nuclear fusion.	Lastly in year 10 we look at radiation which is a very challenging topic and requires maturity to be able to access it.	Pupils learn about the key work of scientists.	Pupils are provided with opportunities to learn through comprehension	Boxall Strands: A – Giving purposeful attention

					and DARTS exercises. Pupils are encouraged to participate in active reading throughout the course.	B – Participating Constructively C - Connecting up experiences D – Showing Insightful Involvement E - Engages cognitively with peers

Year 2

Time	Key Subject Content	Sequencing	Rationale	Careers, Industry Links and Cultural Capital	Reading	SEMH
Half Term 1 Sep – Oct	Biology 2: Homeostasis and Inheritance	Homeostasis, senses and stimuli, the nervous system, the reflex arc, reflex actions required practical, the endocrine system, diabetes, menstrual cycle, contraception, sexual and asexual reproduction, meiosis, DNA and the genome, inheritance, punnet squares, inherited diseases, selective breeding, genetic engineering, evolution, natural selection, fossils, extinction, antibiotic resistant bacteria and classification.	Builds on knowledge of cells, and organisation. A basic understanding of reproduction and meiosis is needed to understand how characteristics are inherited and how genetic diseases are passed on. We then look at how we can use that knowledge for selective breeding and genetic engineering. Students will need to know the structure of DNA to understand evolutionary theory. They also need basic knowledge of how humans impact the Earth to understand the reasons for extinction.	Pupils will learn about various different careers in this topic, including, doctors, genetic councillors and careers in the environmental sector.	Pupils are provided with opportunities to learn through comprehension and DARTS exercises. Pupils are encouraged to participate in active reading throughout the course.	Boxall Strands: A – Giving purposeful attention B – Participating Constructively C - Connecting up experiences D – Showing Insightful Involvement

						E - Engages cognitively with peers
Half Term 2: Oct - Dec	Biology 2 and Chemistry 2: Ecology and rate and extent of chemical changes	Communities and competition, abiotic and biotic factors, adaptations, sampling techniques, producers, consumers, feeding relationships, carbon cycle, water cycle and biodiversity. Rates of reaction, increasing the rate of a reaction, rates of reaction required practical, and reversible reactions.	Knowledge of classification and the factors affecting where organisms are found is needed to understand adaptations, decay, sampling techniques, the cycles and biodiversity. This topic brings all knowledge of reactions learnt so far so that we can look at how to make reactions more efficient, maximising product and profit. STEM Project ran by EDT where students gain the bronze industry cadet award. The project looked at sustainability and renewable energy	Pupils learn about the work of environmental experts and about industries that carry out reactions.	Pupils are provided with opportunities to learn through comprehension and DARTS exercises. Pupils are encouraged to participate in active reading throughout the course.	
Half Term 3: Jan – Feb	Chemistry 2: Organic chemistry, chemical analysis, the atmosphere and using resources	Crude oil, fractional distillation, burning hydrocarbons, cracking and alkenes. Purity and formulations, chromatography and identifying common gases.	Now we start to look at more difficult chemical concepts. Organic chemistry is complicated and so we leave it until this point in the year. Knowledge of structure and bonding is required to access this topic. This topic looks at chemical analysis versus instrumental analysis.	Visit from Suez to explain what the company does, the various job roles in the company and what	Pupils are provided with opportunities to learn through comprehension and DARTS exercises.	Boxall Strands: A – Giving purposeful attention B – Participating Constructively

		The Earth's atmosphere, greenhouse gases, carbon footprint and atmospheric pollutants. The Earth's resources and uses, life cycle assessments, potable and waste water and extracting copper.	Students carry out various chemical analysis techniques with a view to find out that they take a long time and are not very accurate. Then we look at instrumental analysis as a quick and accurate process. Again here, knowledge of structures and bonding is needed to understand how the tests work. This final topic looks at the impact of chemistry on the Earth. We look at the changes in the atmosphere and why these changes have happened followed by what we are doing to the atmosphere today. We look at the impact of making products like polymers, we look at reusing resources, recycling resources and landfill sites. Then we look at how water is treated to make it safe and finally what we are doing to copper reserves and how we can extract more copper using environmentally friendly reactions.	qualifications are needed for the roles.	Pupils are encouraged to participate in active reading throughout the course.	C - Connecting up experiences D – Showing Insightful Involvement E - Engages cognitively with peers
Half Term 4: Feb – April	Physics 2: Forces, waves, magnets and electromagnets.	Forces and gravity, resultant forces, work done, Hooke's law, moments, gears and moments, pressure, distance time graphs, velocity time graphs, acceleration, terminal velocity, Newton's Laws, stopping distances, momentum, waves,	We start unit 2 Physics, again towards the end of the year as it has the most difficult concepts in it. We start with forces which is the basic knowledge pupils need to access knowledge of waves and magnetism.	Pupils will be exposed to a number of different careers within these topics	Pupils are given regular opportunities to practice exam style questions with a focus on	Boxall Strands: A – Giving purposeful attention

		measuring wave speeds, detection and exploration, electromagnetic waves, infra-red radiation, magnets, magnetic fields and electromagnetism.			understanding command words and using science specific language in their answers	B – Participating Constructively C - Connecting up experiences D – Showing Insightful Involvement E - Engages cognitively with peers
Half Term 5: April – May	Revision	Revision of key topics and external exams				
Half Term 6: June - July	Revision	Revision of key topics and external exams				