



Curriculum Intent Science



PRIORITIES IN WHOLE SCHOOL CURRICULUM INTENT

- **Love of Learning:** relevance, purpose, interest, study habits
- **Knowledge:** acquisition of knowledge, understanding of key concepts, development of cultural capital
- **Effective communication:** vocabulary, reading, writing, speaking & listening

VISION FOR YOUR SUBJECT

To capture the students' inherent enthusiasm for the world around them.

To prepare them to make a positive impact on society by giving them the knowledge to understand key concepts, along with the skills to question published data and conclusions.

To do this we base our teaching on the content of the National Curriculum, to enable students to achieve at the highest level they can, giving them wider choice in their future.

We want the learning in our curriculum to stimulate curiosity and inquisitiveness so that learners immerse themselves in the content. We build on this by engaging with their questions so that students both further develop their understanding and grow a lasting love for the subject.

We use scientific models to explain phenomena and creative thinking to develop these models to generate and test theories.

We critically analyse and evaluate data from experimentation and observations.

We give examples of the applications and implications of science, including technological development and the ethical implications of applying scientific discoveries.

We develop cultural understanding and the collaborative approach to the work of scientists. We build the cultural capital of science through the use of lunchtime clubs, STEM competitions, trips and the monthly science reader challenge.

In order to meet the needs of our students, we have adapted our curriculum to include more activities to develop the key vocabulary to be successful in science. We place particular emphasis on some essential knowledge – our 'Golden words' that allow students to build other vocabulary upon.

YEAR 7 – Term 1 (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT,
Cells and Movement	Organisation (cells, tissues, organs, organ systems) Cell structure. Microscope practical. Specialised cells and diffusion. Skeleton, bones, muscles, antagonistic pairs, forces in muscles. Heart, blood and circulation.	Practical skills – using a microscope – similar to the GCSE required practical. Research skills – researching how technology can improve movement. Labelling human body – research task. Heart, chicken leg dissection. Using models (antagonistic muscles, make model cells). Literacy skills throughout.	This topic is the essential knowledge for biology. All aspects of biology are underpinned by cells. Students struggle to grasp other biology topics without the basics of cell structure.(Respiration and photosynthesis) This is linked with organisation and a deeper understanding of the circulatory and skeletal system. This topic provides the fundamental knowledge to build upon.	Linking issues with 'movement' to careers in the NHS and veterinary/zoology medicine. Using the microscopes – linked to microbiology careers. Transplants – science and ethics. History of science using microscope/circulatory system.
Particle Model	The particle model. Changing state. Particles and density. Diffusion. Gas pressure.	Being able to draw particle diagrams to represent states of matter. Safely heat a substance – recording the temperature and changes of state. Plot a line graph and analyse the results. Understand how the work of scientists such as Robert Brown – Brownian motion – provided evidence for the existence of particles.	This topic is the essential knowledge for chemistry. An understanding of particle theory is essential as a basis for all 3 sciences. It explains the behaviour of matter. This topic is fundamental for other learning to be built upon. Students begin to make observations that build on KS2 (circus of solids, liquids and gases) and link these to the properties. Students have the opportunity to develop their practical skills in the lab.	Students start to learn about the work of scientists historically in this topic.
Energy Transfer	Energy stores Energy transfers Conservation of energy Dissipation of energy Wasted energy Fossil fuels Renewable fuels	Practical – Burning food samples safely, measuring and recording data. Graph drawing. Planning a balanced meal.	This topic is the essential knowledge for physics and underpins the physics syllabus at KS3 and 4. This is taught early and revisited throughout the course. It builds on KS2 but we find that Energy Stores and Transfer Pathways need to be clearly taught as misconceptions abound when students arrive with us.	Balanced diets and links to obesity help students learn to make sensible choices with their food. Links to engineering and renewable energy resource.



YEAR 7 ENRICHED LEARNING EXPERIENCES:



Many practical activities to develop skills, numeracy and collaboration. E.g, looking at cells under a microscope, making a model cell homework, heart/ chicken leg dissection. Trips/virtual trips.

YEAR 7 – Term 2 (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Separating Mixtures	Making a mixture. Define solutions, solvent, solute etc. Create a solubility curve. What is purity? Filtering. Evaporation. Distillation. Chromatography. Separating an unknown mixture.	Class practical's: Dissolving a solute, creating a solubility curve. <ul style="list-style-type: none"> - Filtering and evaporating. - Distillation demo – linking to real life. - Chromatography class practical - Using all of their experiences to separate an unknown mixture. 	This is a very enjoyable topic that builds a love of science. Lots of practical work to develop safe laboratory skills early in year 7. Limited background knowledge is needed so this builds upon the learning from KS2 and the particles topic.	
Speed and Gravity	Speed Effect of force. Speed calculation. Distance-time graphs. Average speed. Relative speed. Gravity Mass, weight, differences, units. Calculation of weight from mass on planets. Types of forces. Free body diagrams.	<ul style="list-style-type: none"> • Speed Collecting data for d-t graph. Drawing graphs. Calculate speed from graph. • Gravity Use of an equation to find a solution. Drawing free body diagrams for different situations. 	<ul style="list-style-type: none"> • Speed This topic comes early on with a simple equation that students can relate to real life situations. • Gravity This topic is useful early as a good introduction to forces, but also to clarify mass v weight that can then be reinforced later 	Average speed and actual speed link to speed cameras, relative speed links to crashes.
Sound	How sound travels Absorbing sound Sound reflection Human hearing range Damage to hearing Longitudinal waves Transverse waves	<ul style="list-style-type: none"> • Visualising sound as a longitudinal wave • Being able to draw and label this. • Labelling the ear • Understanding how frequency relates to hearing range, and how this is for other animals • Understanding the difference in speed of light and sound and how this is apparent in thunder and fireworks. 	<ul style="list-style-type: none"> • Sound and light fit well together, however being taught a term apart allows for reinforcement of the key language of waves, and stresses the similarities. 	Links to audiology, family deafness, personal use of earphones. RSHE links: Health and Prevention (deafness)






YEAR 7 – Term 3 (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Acids and alkalis	Hazards. Indicators. Making a natural indicator, Litmus and Universal indicator. Examples of acids and alkalis. pH scale. Neutralisation. Neutralisation investigation.	Identifying hazards in a lab and labels that can be linked to household products. Class practical's: Making a natural indicator from red cabbage. Using indicators see colour changes with different chemicals. Carry out a neutralisation reaction. Plan and carry out an investigation using different indigestion tablets.	This is another very enjoyable topic. Lots of practical's building upon the skills from the separating mixtures topic. Students have not learned about elements or word equations yet –they are making qualitative observations and noticing patterns about different chemicals (household products) and the colour change with indicators. This topic will be built upon and links will be made to other topics such as climate (acid rain) and metal and non metal reactions.	Lots of links to science careers here. Also linked to testing medications e.g. indigestion tablets. 
<ul style="list-style-type: none"> Plant and animal reproduction 	Structure of a flower, Seed dispersal, Pollination and food security. The human reproduction system, becoming pregnant, Pregnancy, menstrual cycle, fertility, IVF and contraception.	Practical skills: dissecting a flower. Discussion of ethics of IVF and contraception. Seed dispersal investigation – full investigation with write up – numeracy skills. Research – pregnancy and contraception.	Now that students are aware of cell structure this is linked to sperm and egg cells and how they are adapted for their role. It is important that students are aware of puberty at this stage of their education. We are teaching plant and animal reproduction so students can make links. The plant structure background will prepare them for photosynthesis including CROPS, and plant transport (e.g transpiration). Food security – lack of pollinators means lack of biodiversity.	IVF, contraception (ethics) , Reproduction and puberty – relevant knowledge of their own bodies. NHS careers. Food security - biodiversity. Seed banks. Genetic engineering. RSHE links: Intimate and sexual relationships. 
Magnetism and electromagnets	<ul style="list-style-type: none"> Magnetism <ul style="list-style-type: none"> Magnetic field Magnetic poles Magnetic field of the Earth Electromagnets <ul style="list-style-type: none"> Uses Investigation 	<ul style="list-style-type: none"> Magnetism <ul style="list-style-type: none"> Careful use of plotting compass to plot magnetic field lines Investigating how to make an electromagnet and change its strength 	Magnetism is an easy topic that should be taught in KS2 at quite some depth (however when staff check the prior knowledge of students, the <i>majority</i> claim to have never touched a magnet and cannot name the poles). Students enjoy this topic and it 'hooks' them into science. Investigative skills are developed during the electromagnet investigation.	This links well to things they see around them – fridge magnets and mag-lock doors.


YEAR 7 ENRICHED LEARNING EXPERIENCES:

Many practical activities to develop skills.

YEAR 8 – Term 1 2022-23 only (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Periodic table and elements.	Identifying elements of the periodic table. (Metals, non-metals, groups and periods) -Metals – properties and uses. Group 1 patterns in reactivity (observations not equations) Group 7 and group 0. Define element, mixture, compound and represent using particle pictures. Making a compound. Naming reactants and products. Naming compounds.	To become familiar with the periodic table. Carry out practical work to discover the properties of metals and non-metals. Notice trends in the properties of the elements of groups 1, 7 and 0. Safely carry out a practical to make a compound.	This topic provides the building blocks to prepare students for writing equations using the elements of the periodic table. Without studying this topic first, then students will be unable to make links with the 'Types of reaction' topic in term 3 – and any GCSE Chemistry topics in year 10.	Many career links with chemical engineering. 
Digestion	Balanced diet. Deficiency diseases. Food testing practical. Calculating the energy in food. Organs of the digestive system and their function. Role of enzymes in the digestive system.	Food testing – using reagents as a qualitative method. Energy in food calculations. Modelling the role of enzymes in the digestive system. Enzyme practical – amylase.	Students have learned about organ systems in the year 7 cells topic (including the circulatory system, blood and heart) Students need to be aware of how starch is digested into glucose before learning aerobic respiration. This links to the organisation topic at GCSE.	Balanced diets and deficiency diseases prepares students for an understanding of a healthy diet and lifestyle. NHS careers. Sports science (nutrition etc) RSHE links: Healthy Eating 
Sound	How sound travels Absorbing sound Sound reflection Human hearing range Damage to hearing Longitudinal waves Transverse waves	<ul style="list-style-type: none"> • Visualising sound as a longitudinal wave • Being able to draw and label this. • Labelling the ear • Understanding how frequency relates to hearing range, and how this is for other animals • Understanding the difference in speed of light and sound and how this is apparent in thunder and fireworks. 	<ul style="list-style-type: none"> • Sound and light fit well together, however being taught a term apart allows for reinforcement of the key language of waves, and stresses the similarities. 	Links to audiology, family deafness, personal use of earphones. RSHE links: Health and Prevention (deafness) 
Energy Transfer	Energy stores Energy transfers Conservation of energy Dissipation of energy	Practical – Burning food samples safely, measuring and recording data. Graph drawing	Fundamental concept that underpins lots of the physics syllabus at KS4. This can be taught early and revisited throughout the course easily.	Balanced diets and links to obesity help students learn to make sensible choices with their food.

YEAR 8 – Term 22022-23 only (taught on a rotation)




CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Contact forces and pressure	Friction Streamlining Force Arrows Squashing and Stretching Hooke's Law Springs Levers Simple Machines What is pressure Pressure in liquids Floating and sinking Hydraulics	<ul style="list-style-type: none"> Practical –use of equipment for Hooke's Law then using this to draw a graph and use the graph to find the weight of an object. Practical to try to get across the idea of upthrust and why things float. 	<ul style="list-style-type: none"> Although this is a fundamental topic, it has been left to Y8 to allow the idea of scientific models to develop a little more – understanding the concept of balanced and unbalanced forces and that fact that a balanced force (or zero force) can mean that an object continues to move forever in the same direction at the same speed can be difficult to understand. 	Reducing friction links to oil on bike chains and in car engines, The Hooke's Law prac links to how we measure weight and how scales are made. Pressure in liquids links to diving deep under water and flying high in a plane, and the affects on our ears.
Types of reaction	Combustion. Exothermic reactions. Thermal decomposition. Endothermic reactions. Word and balanced symbol equations. Conservation of mass.	To carry out a series of chemical reactions safely. To make observations and write equations using the words and symbols of elements from the periodic table.	The level of complexity is increasing as the students build upon their chemistry knowledge. They have had an introduction to word equations in term one and they are now able to consolidate and extend this. This topic is needed before students can learn the effects of combustion in the climate topic during year 9.	Chemistry careers. Combustion reactions and the environment – this will be built upon. <div style="text-align: right;">  </div>
Breathing and respiration	Aerobic respiration (reactants, products) in relation to cell structure. How we breathe (ventilation). Structure of respiratory system. Gas exchange adaptations. Effects of exercise on the body. Smoking, asthma and the respiratory system. Anaerobic respiration in humans and other organisms. Transplants.	Modelling ventilation and looking at the problems with this model. Opportunity to see lung dissection and link the reality to the theory. Exercise and the body investigation – data analysis and graph skills. Research skills – smoking.. Evaluating data – correlation and causation. Investigating anaerobic respiration (yeast).	Transfer of energy – relating to the physics energy topic. Students needed to learn cell and organ systems before respiration. Links to digestion and glucose emphasised here. Teaching respiration and photosynthesis in year 8 is a firm foundation when linking these concepts to the carbon cycle/deforestation in year 9. This links to the bioenergetics and organisation topics at GCSE.	Exercise and the body (sports science). PE. NHS careers. Effects of diseases such as Covid 19. Effects of smoking upon health. Understanding of alcohol and bread making processes using anaerobic respiration. Ethics of transplants for smokers. RSHE links: Physical Health and Fitness

YEAR 8 ENRICHED LEARNING EXPERIENCES:


Many practical activities to develop skills.




YEAR 8 – Term 3 2022-23 only (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Photosynthesis	How plants make their own food (reactants, products), plant cell structure in relation to photosynthesis. Importance of plants as producers. What plants do with the glucose produced (crops). Testing a leaf for starch. Investigating the rate of photosynthesis. How plants are adapted for photosynthesis. What is needed for photosynthesis (limiting factors and minerals including fertilisers).	Relating plant structure and plant cell structure to photosynthesis. Practical: testing a leaf for starch. Full investigation (elodea): Write a method, identify the apparatus, identify variables, complete practical work and analyse results. Stomata investigation using microscopes. Numeracy skills during analysis.	Students have learned cell structure and plant reproduction (structure) in year 7 – these skills are embedded in this topic and without learning those first students would not be able to grasp the bigger picture. Year 7 chemistry topics have prepared students for the terms reactants and products as well as the use of apparatus. Students are aware that plants are producers – this leads on from KS2 and provides a foundation for year 9 interdependence topic. This discussion of farming links with biodiversity in year 9. This links to the Bioenergetics topic at GCSE.	Careers – agriculture, botany. Environmental issues relating to food security and biodiversity. Research careers – GM crops etc. <div style="text-align: center;">  CAREERS <small>BEDFORD HIGH SCHOOL</small> </div>
Current and voltage	Series and Parallel Circuits Current as the flow of charge Changes to current in series and parallel circuits Limitations and advantages of series and parallel circuits Static electricity Voltage as the electrical push from the battery or amount of energy transferred through the electrical pathway and how to measure it Changes to voltage in a series and parallel circuit Resistance in a circuit and how to calculate it Conductors and Insulators	Practical: Building circuits using components Practical: Measuring current in circuits Modelling circuits to be able to understand and apply knowledge Practical: Measuring voltage in circuits Numeracy skills: Using equations to calculate resistance from current and voltage	Students have built circuits and looked at components in KS2. The Energy Stores topic earlier in the year has introduced pupils to the energy stores of the battery and motors/heaters with the idea of the electrical pathway where energy is carried from one store to the other allowing them to build on these ideas. Heating and Cooling topic introduced thermal conductors and insulators, and allows them to build in the idea of electrical conductors and insulators. The recent Periodic Table and elements topic has also looked at the properties of metals and non-metals with respect to conduction. This leads onto the electricity topic in GCSE where pupils will have a model to base ideas on and can build circuits to test principles.	Careers – electrical and plumbing Real life – how circuits within houses and components work <div style="text-align: center;">  CAREERS <small>BEDFORD HIGH SCHOOL</small> </div>
Earth Structure	Earth structure. Sedimentary rocks. Igneous rocks. Metamorphic rocks. Rock cycle. Weathering and erosion. Ceramics (in relation to rocks) Polymers, ceramics and composites.	To describe the structure of the Earth (and how scientists know this). Practical work: to model how the 3 types of rocks are formed. Investigating how acid rain affects rocks. Discovering the properties and uses of polymers, ceramics and composites.	This topic is short so fits well during this term. It is also practical rich to engage the students. This topic is needed before students learn about how metals are extracted from the Earths crust – Earths resources topic year 9.	Careers in environmental management, construction, geology etc <div style="text-align: center;">  CAREERS <small>BEDFORD HIGH SCHOOL</small> </div>


YEAR 9 – Term 1 (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Metal and non-metal reactions.	<ul style="list-style-type: none"> - Metal and oxygen reactions (form bases) - Non-metal and oxygen reactions (form acids) - Metals and acids - Properties of metals and non-metals (recap) - Reactivity series - Displacement reactions. 	Safely carry out a series of reactions – observe trends and start to consider the reactivity series in relation to the use of the metal. Writing word and balanced symbol equations for these reactions. Link the products of non-metal and oxygen reactions to the environment. Make predictions about displacement reactions based upon reactivity.	This topic builds on prior knowledge from years 7 and 8 – many links to be made (acid and alkalis topic for example) Link the products of non-metal and oxygen reactions to the environment in preparation for the climate topic in term 3. This topic is taught in term 1 before students learn about metal extraction in term 2.	Environment considerations.
Useful Energy	Work and Power Making Work easier Efficiency Electricity Costs	Numeracy – using and rearranging work, power and efficiency equations. Calculating energy bills. Taking measurements and applying equations to work out the speed, energy and power of a wind-up toy.	This builds on prior knowledge of energy from year 7 & 8, reminds students of the law of energy and makes real-world links that demonstrate why the knowledge is important. These are some of the trickier parts of energy, that younger pupils could struggle with.	Links to energy bills and saving money.
Independence and evolution	Food chains and food webs. Toxic substances in food chains. Predator and prey relationships. Factors affecting populations. Biodiversity. Extinction. Natural selection.	Draw and interpret food chains. Understand the implications of toxic substances getting into the ecosystem. Give examples of biotic and abiotic factors and how they affect populations. Understanding the need for high biodiversity. Give examples of extinction and the reasons for preserving biodiversity. Explain how natural selection provides evidence for the theory of evolution.	Students have learned that plants are producers and begin food chains during the photosynthesis topic. This unit has a number of complex concepts that link in to the climate topic and to the AQA GCSE units.	Clips and advice given to link to ecology related careers 
Wave properties and effects	Wave definitions Wave comparisons Wave diagrams for absorption, reflection, transmission Water waves and Superposition Similarities of sound and light waves	Draw both wave forms and label them. Relate this to what they can see in the lab. Relate frequency to hearing and ultrasound – real world linking	Much more at GCSE level, turning the concept from what they can directly experience into diagrams and labels, and using these to then explain ultrasound and superposition.	Links to pregnancy, medical uses, industrial cleaning, generation of electricity (and where we get it from and the decisions the country needs to make)

YEAR 9 – Term 2 (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Earth resources	<ul style="list-style-type: none"> - Earths resources - Metal ores - Extraction using carbon - Electrolysis - Recycling 	Students to safely carry out reactions to extract metals. Writing word and balanced symbol equations for these reactions. Students to realise that the Earths crust will run out of metal ores – students need to understand that resources need to be conserved – recycling.	This topic follows on perfectly from the previous topic – linking reactivity to the extraction method. This topic has some complex concepts – therefore it is a useful transition topic towards GCSE.	Environmental considerations of using resources to extract metals. Citizenship links: Recycling as a responsible member of society.
Climate	Greenhouse gases. Global warming (linked to combustion reactions etc) Acidic gases Carbon cycle.	Understand and evaluate global warming – causes and effects. Data analysis and critique.	Students have now been taught the chemistry of various reactions that release polluting gases. Students are also learning the carbon cycle from a biological point of view this year – links between the sciences. This is a relevant transition topic towards GCSE.	Environment and the careers involved with this. Citizenship links: Reducing use of fossil fuels as a responsible member of society 
Variation and inheritance	Variation. Variation data analysis. DNA. Discovery of DNA. How genes are inherited. Genetic modification. Human genome.	Defining variation. Collecting class data, creating tables and graphs. Evaluating the data. Extracting DNA. Evaluating skills. Punnett square analysis and ratios. Evaluating the advantages and disadvantages of genetic modification.	Inheritance is an enjoyable but complex topic. It links perfectly between the earlier cells topics and those studying ecology and variation in earlier years. Students are provided with extension opportunities to develop their GCSE skills, with links to the AQA Inheritance topic.	Evaluate genetic modification.
Universe	Changing ideas about Earth and Space Day month year Moon phases Seasons Planets Vast distances	Using models to visualise. Using models to explain. Understanding (awe?) at the work that some scientists do to make observations, then come up with models which they can make predictions from - some of which may never be proven until after their lifetime.	Covered well in KS2, but revisited after a 2 year break here before GCSE as for most students this will not be covered at GCSE yet it links to “life”, and a lot of things they see in the media.	Links to weather patterns (we do live in the UK), seasons, what they see in the sky (gets rid of the astrologers??) How do satellites work – Elon Musk, future communication and why space travel is difficult.

YEAR 9 – Term 3 (taught on a rotation)

CONCEPTS	KNOWLEDGE	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Ecology	Communities/interdependence. Biotic and abiotic factors. Adaptations. Organisation (food chains) Required practical: measuring population size. Cycling materials (carbon, water and decay cycle) Biodiversity, waste management, land use, deforestation, global warming. Triple only content: decomposition, trophic levels, pyramids of biomass and transfer of biomass. Food production (food security, farming, fisheries and biotechnology.)	Measuring population required practical – investigative skills as part of field work. Discussion and evaluation skills of issues such as global warming, deforestation, biodiversity and conservation.	This topic builds on from the interdependence topic in term 1 and the climate topic in term 3. This is a transition into AQA GCSE topic.	Video clips shown to students to give them ideas about environmental science and STEM careers. Ethical discussions about deforestation, biodiversity and conservation. <div style="text-align: center; margin-top: 20px;">  <p>CAREERS BEAFORD HIGH SCHOOL</p> </div>
Periodic table and atomic structure.	Structure of the atom- location, relative masses and charges of subatomic particles. Isotopes and relative atomic mass of atoms Structure of the modern periodic table	Using the periodic table to work out numbers of protons, electrons and neutrons of any atom. To be able to configure the electrons of any atom and explain how this relates to its location on the periodic table. To calculate RAM from data on isotopes	This topic builds on the concepts of matter from year 7 and 8 and prepares students for the transition to GCSE Chemistry, providing them with the fundamental concepts which underpin how all matter behaves in chemical reactions	STEM careers links shown pictorially and with video clips

YEAR 10 - Biology Cells, Organisation, Infection, Bioenergetics and Homeostasis.

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 1	Biology – cells.	Cell structure. Define Eukaryote and prokaryote. Functions of cell organelles. Microscopes and required practical. Specialised cells and differentiation. Cell division (mitosis) Cell cycle. Stem cells. Cell transport: diffusion, active transport and osmosis. Osmosis required practical.	Make a slide specimen, observe using microscopes. Calculations. Ethical discussions regarding the use of stem cells. Investigative skills during the osmosis required practical. Examination practice skills to develop the learner and to build confidence.	In term 1 the students are taught cells. Bioenergetics always follows cells. Bioenergetics needs to follow cells due to the need to recognise, label a cell and the explain the function of the organelles. Bioenergetics builds on cell knowledge by looking deeply into the chemical reactions that take place within cells. More importantly these modules are engaging as well as practical rich to develop skills. They build nicely onto the KS3 topics whilst providing the fundamental concepts necessary for later Biology topics.	RSHE links: Stem cells
Term 1	Biology - Bioenergetics	Photosynthesis. Rate of photosynthesis. Photosynthesis required practical. Uses of glucose from photosynthesis. Aerobic and anaerobic respiration. Exercise. Metabolism.	Investigating the effect of light on the rate of photosynthesis. Investigative skills – risk assessing, method writing, graph drawing and analysis.		

YEAR 10 ENRICHED LEARNING EXPERIENCES

The use of tassomai to embed their knowledge in a fun, competitive way. Use of practical work such as: food testing and linking into food groups and diet. Investigate the effect of pH on enzyme action. Heart dissection. Lung dissection demonstration. Growing bacteria.

YEAR 10 - Biology Cells, Organisation, Infection, Bioenergetics and Homeostasis.

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 2	Biology – Organisation.	<p>Organisation (cells, tissues, systems and organisms)</p> <p>The digestive system. Enzymes in the digestive system. Required practical: Using reagents in food tests. Required practical: Investigate the effect of pH of enzyme action. The heart and blood vessels. Blood. Coronary heart disease and other non-communicable diseases. Treatment of CHD. Lifestyle and non-communicable diseases. Cancer. Plant tissues. Plant organ systems including the processes of transpiration and translocation.</p>	<p>Required practical: Using reagents to test for food groups.</p> <p>Required practical: Investigate the effect of pH on enzyme action. Opportunities to learn about and analyse the cause and effects of non-communicable diseases.</p>	In term 2 the students are taught organisation. This large topic leads on from the cells and bioenergetics topics and looks at the human and plant organism as a whole. Infection follows as the students are now aware of the human body before learning about the effect of communicable diseases on the body (both animals and plants)	RSHE links: The way our cells link up Physical Health and Fitness
Term 3	Biology – Infection and response. Homeostasis.	<p>Communicable diseases. (what are pathogens and why do they make us ill?) Viral diseases, bacterial diseases, fungal diseases, protist diseases. Human defence systems both external and internal (white blood cell immune response) Vaccination. Antibiotics and painkillers. Discovery and development of drugs. Plant defence responses. Triple only: monoclonal antibodies – production and uses. Plant diseases. Required practical: growing bacteria</p> <p>Homeostasis – Nervous system. Endocrine system, blood glucose levels. Hormones in human reproduction. Contraception. Fertility treatment and IVF. Negative feedback. Triple only concepts: The brain, the eye, thermoregulation, water and nitrogen levels in the body. Plant hormones.</p>	<p>Analysis of data from given results. Opportunities to be aware of communicable diseases including malaria. Evaluation of vaccination. Students are aware of the stages of drug testing and the issues surrounding this. Aseptic techniques when growing bacteria. Homeostasis required practical – investigating reaction time.</p> <p>Triple only required practical: Investigating the effect of light or gravity on the growth of seedlings.</p>	All paper 1 topics (and ecology from paper 2) are recapped throughout this year through interleaving of activities (such as K.O quizzes and other ‘do now’ activities and the use of tassomai.)	RSHE links: Health and Prevention

YEAR 9 ENRICHED LEARNING EXPERIENCES

The use of tassomai to embed their knowledge in a fun, competitive way. Use of practical work such as: food testing and linking into food groups and diet. Investigate the effect of pH on enzyme action. Heart dissection. Lung dissection demonstration. Growing bacteria.

YEAR 10 - Chemistry

Term 1

KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
<ul style="list-style-type: none"> Structure and bonding Chemical changes 	Chemical reactions Making salts Where metals come from	Showcase prior knowledge by being able to show how chemical react and reform with different properties More practical skills with more opportunities to experiment to obtain an outcome.	<p>to review year 9 first term work which were the key foundations to chemistry. Making sure student have the basics embedded before moving forward and building on knowledge.</p> <p>This topic builds on their practical skills and knowledge of chemicals from year 9. it allows students to form equations for reactions using the bonding and structure topic.</p> <p>Students visited separation techniques in year 9 , now they are able to combine elements and see how the initial product came from. Students are able to develop their ideas further by understanding how atoms rearrange and have different properties after a chemical reaction</p> <p>Students have looked at the earths resources in year 9, now they have the opportunity to know how we extract the materials and make them useable. Developing key chemical processes involved and linking back to their first topics about the atom and the subatomic particles.</p>	<p>Note that... <u>THESE TOPICS HAVE BEEN CHOSEN AS THEY CAN BE TAUGHT IN ANY ORDER AND THEY NEED TO BE TAUGHT ON A ROTATION TO AVOID EQUIPMENT CLASHES.</u> Therefore, these <u>topics appear in Terms 1, 2, 3 for different classes.</u></p>

YEAR 10 - Chemistry

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCP, PSHE, Careers
Term 1	• Quantitative	Calculating quantities of chemicals Using formula and rearranging formulas Substituting numbers into equations. Using chemical equations to make quantitative calculations	Maths skills- addition subtraction, multiplication and division.	Students have better maths skills which allows them to be able to make simple calculations throughout this topic.	<p>Note that... <u>THESE TOPICS HAVE BEEN CHOSEN AS THEY CAN BE TAUGHT IN ANY ORDER AND THEY NEED TO BE TAUGHT ON A ROTATION TO AVOID EQUIPMENT CLASHES</u> Therefore, these topics appear in Terms 1, 2, 3 for different classes.</p> <p>Citizenship links: Reducing use of fossil fuels as a responsible member of society.</p>
	Energy changes	Endothermic and exothermic reactions Energy profiles Enthalpy change calculations	Showing how energy is used or released in a chemical reaction Using data to calculate the energy change Graphing and labelling energy change	Clear links between this topic and chemical changes and uses maths skills again	
	Chemistry on the atmosphere	How the Earth's atmosphere has evolved and is evolving Greenhouse gases and global warming Pollution in the atmosphere			

YEAR 10 - Physics

KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Physics <ul style="list-style-type: none"> • Energy • Electricity 	Energy stores and energy transfers. Lots of calculations – efficiency, ke, gpe, changes in thermal energy (plus req prac on this and a second on insulators for Triple), power. This is followed by the methods we use for generation of electricity and the pros and cons of each. Electricity starts with circuit symbols, then develops into how these are used in a circuit, including the properties and related graphs for some. Six equations contained in this topic. This is then followed by mains electricity (linking with the energy “Electricity Generation” section, including plugs. Static is also included for Triple students.	Building circuits. Problem solving by checking of, then replacement of components. Working in groups to achieve a goal. Use of ESCU (for the command word “Calculate” and BUG on all questions.	Stores and transfers taught via the “Mrs Morris bucket model” The two topics fit nicely together due to the crossover of Electricity Generation (in “Energy” topic) and Distribution of electricity including National grid and plugs (in the “Electricity” topic). Circuits and the concept of V and A are introduced via the M&M model, and a lot of the learning on circuits can be linked to this lesson. The six Elec equations are taught in a kinaesthetic manner where possible (drive your VAN, WAV at JWs (shark), WANA play some music, so put your CASsette into your JVC stereo).	Rationale – extra... Half of the classes cover Energy first, the other Electricity. This is done to minimise the clashing of requests for equipment, but keeping topics in the order that we wish to teach them. They are also taught in blocks so that re-setting can take place easily at certain times in the year, without students being disadvantaged due to missed knowledge.

Term 1

YEAR 10 - Physics

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 2	Physics <ul style="list-style-type: none"> Particle model of matter 	All matter from particles, arrangement in SLG, density plus required prac x 2, then internal energy ($ke + pe$) and how this relates to the cooling/heating graph and changes of state, plus the relevant two equations.	Introduction on ESCU for equations (Equation, Substitution, Calculation, Units) and BUG the question (Box the command word, Underline the key points, Glance over the question and answer repeatedly to check that all points are covered). Introduction to reading exam questions with finger trace, so that key points are not missed.		

YEAR 10 - Physics

KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Physics <ul style="list-style-type: none"> Atomic Structure 	<ul style="list-style-type: none"> Review of the crossover topic with Chemistry – pen the atom (faculty method), then history of the atom. Follow this with radioactivity – alpha, beta, gamma radiation, teacher demo (safety) moving on to half life (relate to microwave popcorn), uses. 	<ul style="list-style-type: none"> Continue reading exam questions with finger trace, so that key points are not missed. 	<ul style="list-style-type: none"> This topic is held back to term three because it is taught in Chemistry in term one – decided that this was better than teaching side by side or better than only covering it in one subject, thinking that the delay and repeat would benefit the students in both subjects. We try to complete it before the Y10 mock exams, which move between Summer and just before Easter each year. 	

Term 2

YEAR 10 - Physics

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 2	Physics <ul style="list-style-type: none"> • Revision/intervention • Y10 mock exams 	<ul style="list-style-type: none"> • As above plus intervention after these in-class exams, to prepare for the Y10 paper one mocks prior to the Easter holiday. 		<ul style="list-style-type: none"> • Prepare students for a paper 1 mock so that they and we can gain a good idea of a starting point for how they will achieve on a “real” unseen GCSE paper.. 	<ul style="list-style-type: none"> • Revision skills, personal accountability.

YEAR 10

- Physics – topics on rotation

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 3	Physics <ul style="list-style-type: none"> • Waves • Final intervention 	<ul style="list-style-type: none"> • Transverse, longitudinal, definitions, examples. • Wave labels • Equation – wave speed (plus two required practicals to find this value in water and a string) • Electromagnetic spectrum, key facts, uses. • Refraction including wave front diagrams • Triple also cover reflection, refraction,, sound waves in more detail, detection and exploration, seismic waves. Also lenses and diagrams for converging or diverging with object at varying distances, describing the image with 3 key words. Finishing 	<ul style="list-style-type: none"> • Lots of opportunities to practise precise drawing and measuring in wavelength, amplitude, reflection, refraction, lens diagrams. • Limited ESCU practise. • Some difficult practical use of the wave equation – how would a scientist really work to do this? 	On moving back to a 2 year KS4 (not a good idea for our students and science – a 3 year KS4 seemed to work well and allowed us to embed knowledge) we are covering Paper 1 topics in Y10 (plus Waves) and Paper 2 topics in Y11. In previous years (pre-2020), we used to teach the large Forces topic last, but it became squashed to allow time for revision; this is not a good idea as Forces tends to be heavily examined.	

YEAR 10 - Physics

KNOWLEDGE

CONCEPTS


SKILLS

RATIONALE

PERSONAL
DEVELOPMENT, SNCMP,
PSHE, Careers

YEAR 10 ENRICHED LEARNING EXPERIENCES

YEAR 11 - Biology

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 1	Inheritance, variation and evolution.	Sexual and asexual reproduction. Meiosis. DNA and the genome. Genetic inheritance, inherited disorders and the inheritance of sex. Variation. Evolution and evidence for it. Selective breeding. Genetic engineering. Fossils. Extinction. Resistant bacteria. Classification of living organisms. Triple only: DNA structure. Cloning. Theory of evolution. Speciation. Mendel.	Many mathematical skills, exam question practice. A lot of literacy here too. Students have the opportunity to debate and evaluate concepts such as: 'Should embryo screening be used to screen for genetic disorders?'	This large topic is quite challenging and very engaging in terms of some mature concepts. We wanted to keep the students engaged by 'saving' a taught module until year 11 rather than rushing through the course for revision purposes.	RSHE links: Links to Intimate and Sexual Relationships in that the inheritance of sex, genetic disorders are discussed 
Term 2	Ecology	Communities/interdependence. Biotic and abiotic factors. Adaptations. Organisation (food chains) Required practical: measuring population size. Cycling materials (carbon, water and decay cycle) Biodiversity, waste management, land use, deforestation, global warming. Triple only content: decomposition, trophic levels, pyramids of biomass and transfer of biomass. Food production (food security, farming, fisheries and biotechnology.)	Measuring population required practical – investigative skills as part of field work. Discussion and evaluation skills of issues such as global warming, deforestation, biodiversity and conservation.		
3	Biology • Intervention on paper 1			As well as interleaving throughout the course we have now allowed the time	

YEAR 11 - Chemistry

YEAR 11 - Chemistry					
KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers	
Term 1	Rate and extent of chemical change	<p>How factors can affect the rate of a chemical reaction</p> <p>Reversible reactions</p>	<p>Practical skills and using equipment to collate data</p> <p>Understanding graphs and using them to give explanations and make predictions</p> <p>Maths skills- plotting graphs Using the graphs to calculate Drawing tangents Calculating gradients</p>	<p>Short topics with some complex ideas students have visited in year 9&10 and gained some foundation knowledge. Applying knowledge about chemical reactions and energy changes to explain how reactions can be changed</p> <p>Have a more mature approach and developed their maths skills therefore allowing them to draw graphs and use graphs for calculations effectively</p>	
	Organic chemistry	<p>Crude oil – how it is used to make more useful products, linking to chemicals students have heard of in everyday life.</p> <p>Explaining how important crude oil is in everyday life and how its properties</p>	<p>Understanding how things are made and used. Using the ideas from year 9 about carbon and its uses. Looking at how different structure affect their properties and how the bonding changes to give the chemicals different properties</p>		

YEAR 11 - Physics

KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 1 Physics <ul style="list-style-type: none"> • Forces • Space Physics (Triple students only) • Y11 Mock exams 	Scalar/vector including measurement of non linear vector resultant forces Contact, non-contact Equations – weight, work done, spring force, spring energy, (moments, pressure on a surface, pressure with depth for triple), speed, acceleration, velocity ² equation, F=ma,	Practical skills as mentioned previously ESCU and BUG Learning to link concepts eg energy (and maths) across for other topics and subject areas.	Forces. Students find these concepts hard to master (Newton's laws in particular) and so it seems to work best late on and even benefits from a strong student trust of the teacher (since some concepts need to be explained as "mind experiments"). Space. This is not too difficult a topic, though the section on Orbital Motion lends itself to being taught after Forces. The other reason this topic is last is so that set 1 (Triple) and set 2 (Combined) are taught at a similar pace, in case any late changes need to be made to a student's entry.	

YEAR 11 - Physics

KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Physics <ul style="list-style-type: none"> • Forces • Space Physics (Triple students only) • Y11 Mock exams 	Distance-time graphs Velocity-time graphs Resultant forces and terminal velocity explanation Newton's first, second and third law (plus required prac on N2) Stopping, thinking and braking distances and influences on them Reaction times and prac to measure them Explanation of braking with energy stores Momentum (and calculation), conservation of momentum (and calculation of the resulting velocities after collision, plus rate of change of momentum and car safety for Triple) Solar system Life cycle of a star Orbital motion Red shift Big Bang theory	Practical skills as mentioned previously ESCU and BUG Learning to link concepts eg energy (and maths) across for other topics and subject areas.	Forces. Students find these concepts hard to master (Newton's laws in particular) and so it seems to work best late on and even benefits from a strong student trust of the teacher (since some concepts need to be explained as "mind experiments"). Space. This is not too difficult a topic, though the section on Orbital Motion lends itself to being taught after Forces. The other reason this topic is last is so that set 1 (Triple) and set 2 (Combined) are taught at a similar pace, in case any late changes need to be made to a student's entry.	

Term 1

YEAR 11 - Physics – topics on rotation

Term 1 (perhaps drifting into term 2)

KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE Why has this learning been selected? Why has it been sequenced in this way?	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Physics <ul style="list-style-type: none"> Magnetism and electromagnetism 	<ul style="list-style-type: none"> Magnets, poles, mag field, permanent/induced. Field around wire, solenoid, then electromagnets, motors (plus transformers, microphones, loudspeakers for Triple) 		In our previous 3 year KS4 we could teach this simple topic early but are now trying to teach paper two topics after paper one, which can only be started in Y10.	

YEAR 11 - Physics

	KNOWLEDGE	CONCEPTS	SKILLS	RATIONALE	PERSONAL DEVELOPMENT, SNCMP, PSHE, Careers
Term 2	Physics <ul style="list-style-type: none"> • Intervention on paper 1 • Intervention on paper 2 • Revision 				
Term 3	Physics <ul style="list-style-type: none"> • Revision • Examination season 				

YEAR 11 ENRICHED LEARNING EXPERIENCES

We decided to...	Rationale...	Impact...
Move the teaching of the basics of Energy to Term 1 in Y7	After a review of the intent and a curriculum review involving another school, it was agreed that the teaching of energy can best be used as a fundamental concept on which to build the other topics.	To see.
Move Light from Y7 to Y8	Students do not develop their use of protractors in Maths until the end of Y7	
Move Heating and Cooling from Y7 to Y8	There are some more difficult concepts so moved to when students are a year more mature.	