Long term plan: Big Questions / Core Concepts

Oasis Sholing Science – Updated Curriculum

We are currently at the initial stages of the launch and implementation of our new science curriculum. In 2023-2024 students in year 7 & 8 will study this new curriculum. The curriculum will be developed over the coming years gradually replacing the old curriculum.

Big Questions

We have structured our curriculum around the most significant concepts in science and mapped students' development of these concepts through lesson sequences and topics. To give our curriculum a deeper structure when designing it we have thought about how students knowledge of those concepts enables them to answer our "big questions" in greater depth. This enables our teachers to think about both deepening students knowledge of concepts and developing meaningful connections between those key concepts. Our big questions have been developed from the ASE and Royal Societies project and are closely linked to the idea of the "big ideas" of science.

Biology	Chemistry (& Earth Science)	Physics
What are living things made of? Topics: B1, B3, B11, B15, B16, **How do organisms grow and reproduce?** Topics: B2, B6, B9, B20 **Why do organisms depend on each other and their environment?** Topics: B8, B10, B13, B18, B21 **Why are living things so diverse?** Topics B4, B7, B14, B20 **What keeps organisms healthy?** Topics: B5, B12, B17, B19	**What are substances?** Topics: C1, C2, C12, C14, C15, C21, C22 **What gives substances their properties?** Topics C2, C3, C16, C17, C21 **What is chemical change?** Topics C4, C6, C9, C10, C13, C18, C19, C20 **How does chemistry affect the Earth?** C7, C10, C11 **What is the Earth made of and how is it changing?** C5, C7, C8, C11, C23, C24	**What is matter?** Topics: (C1) P3, P17, P18 **Why do things move and change?** Topics: P1, P5, P7, P13, P14, P19, P20 **How does information and energy spread?** Topics: P2, P3, P6, P8, P10, P21 **What is electricity and magnetism?** Topics: P9, P11, P12, P15, P16, P22 **Where are we in space?** Topics: P4

The national curriculum, and AQA exam specifications, for science set out a body of target knowledge which is very broad. Our curriculum aims to help students scaffold this breadth of knowledge by structuring KS4 content around a firm foundational understanding of how our core concepts provide meaningful answers to our big questions. Our KS3 (Y7-Y9) establishes a deep understanding of each question and our KS4 enriches these answers using the breadth and detail of the AQA exam specification. We aim for students to leave school having retained the ability to explain and expand the following answers to our questions long after their GCSE exams have been passed. We have written end point answers to each big question, this is what we want all our students to be able to know and answer about that big question when they leave Oasis Sholing. For each unit end points are identified, this is what we want our students to have learnt about that big question by the end of that specific unit building upon their prior knowledge. End points and further information can be found in our departments statement of intent document.

Long term plan: Principles of Progression

Principles of Progression:

Our curriculum is designed to ensure that our students are knowledgeable. Our curriculum is well-sequenced around a series of big questions starting from students' own experience of the world and moving towards a more developed scientific understanding. Over their science education, students will build up their knowledge of the most significant concepts in biology, chemistry, and physics.

- **Secure Substantive Knowledge**: we believe that if they have secure substantive knowledge, they will feel confident in explaining the key scientific principles that govern everything that occurs within our universe. Concepts are revisited throughout their curriculum to ensure that students engage with the most important concepts in a range of applications and contexts.
- **Experience of phenomena**: we feel it is important that students experience many of the phenomena they are studying. The tacit knowledge they gain strengthens and reinforces their declarative knowledge as they move through the curriculum. Experiencing phenomena also provides opportunities for students to challenge the existing models by making and justifying predictions.
- **Develop Disciplinary Knowledge**: we also want to ensure that students have mastered the disciplinary knowledge – they understand and have some experience of what it means to be 'a scientist'. We feel it is important that this is taught alongside the substantive knowledge so that students understand how substantive scientific knowledge has been developed over time.
- **Investigative and practical skills**: structured into our units are opportunities for students to carry out investigative work into the concepts they are studying. Students complete work accurately and precisely in order to develop their procedural knowledge of the scientific method, giving deeper meaning to their understanding and providing students with the foundations to study science at a higher level.
- **Secure subject specific literacy**: We want to ensure that students are equipped with a wide range of scientific vocabulary, an understanding of how scientific ideas are presented and communicated and an opportunity to engage in discussions within the curriculum and at home so that they are able to communicate their ideas effectively.
- **Link the 'Big Questions' in science**: over their science education, students will build on this knowledge in order to gain a deeper understanding of the big, overarching ideas in biology, chemistry and physics. From understanding that all material in the universe is made of very small particles, to the concept that energy cannot be created or destroyed to the key ethical arguments governing science; knowledge is constructed and deepened from the foundations up.
- **Concrete examples and real life contexts**: students have the opportunity to practise application of knowledge to meaningful real life contexts so that we ensure it is flexible and that they can apply it to a range of different situations & scenarios both within the classroom and more importantly, their real lives.

Long term plan: Disciplinary Knowledge

Disciplinary Knowledge

Embedded into our curriculum plans are explicit opportunities for students to develop their disciplinary knowledge of science. We have sequenced how students develop their sense of how the three disciplines of science work around discipline specific concepts. These concepts and end points are based upon those suggested by the royal society of chemistry, royal society of biology and IOP's work on developing curriculum frameworks. We have also referenced relevant procedures and techniques in our sequencing as set out in the national curriculum and GCSE specifications. Disciplinary knowledge end points for each of the three sciences and 'how science works' can be found in our statement of intent.

Our curriculum is designed to ensure students have the disciplinary knowledge to be 'good scientists'. This includes:

- **Knowledge of methods for answering scientific questions**: a secure knowledge of the different ways that scientists investigate scientific questions so that students will be able to decide on appropriate methods of investigation that will enable them to test predictions and evaluate scientific theories for themselves.
- **Knowledge of apparatus and techniques**: students will have experience of using a range of different pieces of apparatus and techniques so that they can decide on the most appropriate and evaluate their use in different scenarios in terms of safety, accuracy, precision, and errors.
- **Analyse data**: students should be able to analyse data gathered or shared with them using a range of mathematical techniques, tables, and graphs. They should be able to discuss repeatability and reproducibility of findings and potential sources of error and bias so that they are able to discern between fact and error and justify and communicate their conclusions effectively.
- **Apply mathematical concepts**: students will be able to apply mathematical concepts, conventions, and skills to identify patterns and describe phenomenon quantitatively.
- **Use standardised units**: students will be able to use standardised units effectively and perform appropriate calculations.
- **Respectful conversation**: the curriculum will create a space for students to engage in respectful conversation around challenging topics which enables them to develop their understanding of the complexity of decisions made within the field of science and how scientific advances have had an impact on the future of our planet.
- **Continuously evolving**: students will understand that scientific theories, laws, models and methods change over time to take into account new evidence.
- **Impact of science on us, our local and global communities**: students should be able to explain the contribution of science to our past and it's role in our future. They should be able to use their knowledge of science to make well-informed decisions that impact themselves and their local and global community and be able to communicate and justify these to those around them.

Long term plan: Topic overview

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year seven					
C1 C2 C3 C4	B1 B2 B3 B4	P1 P2 P3 M1			
Year eight					
P4 P5 P6 P7	C5a C6 C7 C8 C9 C5b	B5 B6 B7 B8 B9			

Year 7 Long term plan: Chemistry

Brief overview
Year 7 begins by giving students a observable characteristic used to identify a substance (melting point behaviour) and an experience of observing the difference between a substance and a mixture. This distinction is built up by working through separation techniques first encountered in KS2. Students will learn that substances (not materials) can exist in all three states of matter and how this relates to the particle model. Once students have built a sense of concept for "substance" we look at some different ways substances are classified by their structure and properties. C2 also introduces the representation of substances using formula. C3 develops the idea that substances have distinct properties by looking at solubility and introducing students to how properties can be quantified and represented on graphs to explore trends and make predictions. C4 builds up students concept of "chemical change" giving students experience of thinking using the chemistry "triplet" – observations, representations and sub microscopic models.

Unit	C1	C2	C3	C4
Unit title	Substances and mixtures	**Substances**	Solubility	Introducing chemical change
Big question/ core concept	What are substances? Core concept: Substance	What are substances? Core concept: substance What gives substances their properties? Core concept: Bonding (holding power)	What are substances? Core concept; substance What gives substances their properties? Core concept: bonding (holding power)	What is chemical change? Core concept: chemical change
Relevant end points	• Most materials are mixtures. • Materials made of single substance start and finish melting at the same temperature. • Every substance has a melting point	• Substances can be classified into different groups by their properties and structure • Substances are made of atoms • Substances melting points depend on their sub-microscopic structure	• Every substance has a measurable solubility in water. (This is distinct property of a substance)	• Atoms are rearranged to form new substances. • New substances formed in a chemical change have new properties
Core substantive knowledge	• Substances can exist in three states of matter. • Mixtures can be separated into substances. • Different techniques separate different types of mixture • Solutions are clear mixtures of a solvent and solute • Particle model for liquids solids and gases • Brownian motion	• Substances are made of atoms. • Elements can be metals of non-metals • Metals have giant substances so have high melting points • Non metals have molecular structures so have low mpts. • Substances can be compounds or elements • Chemical reactions can rearrange atoms to form new substances	• Properties can be measured and given numerical values. • Solubility of a substance depends on temperature. • Dissolving happens without stirring. • Dissolving is the result of the intrinsic motion of particles in the liquid state.	• Word equations. • Symbol equations. • Particle representations of symbol equations • Multipliers (molecular substances) • State symbols. • Conservation of atoms/mass in a chemical change. • Precipitation (if insoluble products formed)
Core disciplinary knowledge	• Simple procedural processes for separation **techniques**. • Particle **model** (as model of the sub macroscopic) • **Investigation:** Brownian motion as observational evidence of particle model	• Chemicals use symbols and formula to **represent** substances • Chemists **classify** substances into groups based on properties and structure. • Chemists **classify** changes as physical or chemical	• Chemists quantify solubility **mathematically** to show trends. • Graphs are used to analyse trends mathematically and make predictions • How to interpret and **analyse** graphs • That chemists make use measurement **techniques**	• Chemists link the representational, sub microscopic model and observations. Reinforcing: • **Representational** • Sub microscopic **Models** • **Observations (**qualitative)

Year 7 Long term plan: Biology

Brief overview
Year 7 biology begins by revisiting students knoweldge of organisms as "living things" which show the "characteristics of living organisms" before using extensive microscope work to establish a more meaningful criteria for life – being made of cells. Students look at classification of animal cells and plant cells (including why this can be challenging) and the basic structures of these cell types. They idea of the cytoplasm and cell membrane are developed by linking to students knoweldge of the particle model to build an explanation for diffusion into and out of cells. Unit B3 develops these ideas to look at how organ systems in the human body work together to provide the substances needed for respiration to every cell. Units B2 uses the family to build a concept of genetic inheritance and the genome, including how genetics and the environment shape similarities and differences in the family. B4 looks are variation within species and how species has changed over time – including how biologists gather and interpret evidence. B4 includes students first longer form investigation at KS3.

Unit	B1	B2	B3	B4
Unit title	Cells the unit of life	Inheritance and the genome	From cells to organ systems	Variation through time
Big question/ core concept	What are living things made of Core concept: cells	How do organisms grow and reproduce? Core concept: inheritance	What are living things made of Core concept: cells	Why are living things so diverse? Core concept: evolution
Relevant end points	• All life is made of cells • Microscopes can be used to observe cells • Cells are dynamic and exchange substances with their surroundings	• All organisms in a species show variation • Variation can be caused by genetic information, the environment or both • Our genome is inherited from our parents (50% from each)	• Multicellular organisms contain organ systems. • Organ systems have a specific function • Organ systems work together to maintain the conditions of life for all cells	• Members of a species can reproduce to fertile young • Genetic inheritance only occurs across generations within a species • Species have gradually changed over billions of years
Core substantive knowledge	• Seven characteristics of living organisms • Typical structures of animal and plant cells. • Basic functions of sub-cellular structures. • Cytoplasm is a dynamic fluid (particle model) • Diffusion – particle model explanation • Structure of cell membrane enables transport of small molecles.	• Genome is all the genetic information in an organism. • Role of environment and genetic inheritance in explaining similarity and difference in families. • Genome is stored on DNA in the nucleus of (most) body cells. • DNA is organised into chromosomes • DNA is a class of chemical and can be extracted	• Levels of organisation in animals and plants. • Mechanism of breathing and adaptions for gas exchange • Structure of digestive system and function of small intestine • Role of enzymes in producing small nutrients which can be absorbed • Role of circulatory system • Role of muscular skeletal system	• Variation can be continuous or discrete. • Definition of a species • Scientists use fossil evidence to study the past • Most fossils are mineralised remains of hard body parts • The fossil record is incomplete
Core disciplinary knowledge	• **Procedures** for preparing and viewing tissue slides. • **classification** into animal and plant cells. • **Models** can be used to explain processes (diffusion) • Biologists study life at the level of cells and biological molecules	• **Investigation:** how to follow a written method. • How evidence was used to establish a **model** of DNA. • There is a cross over between the study of chemistry and biology when looking at biological molecules.	• Dissection provides **qualitative** evidence of the internal structure of organisms. • **Models** can help us explain the functioning of biological systems. • Biologists have to source organisms for dissection **ethnically**. • Biologists can study live at different levels of organisation	• Collection of large scale **quantitative** data for **analysis.** • Difference between correlation and cause • **Analysis:** Conventions for producing scatter graphs. • Collection of data (fossils) to look for **qualitative** changes.

Year 7 Long term plan: Physics

Brief overview
Year 7 Physics begins by studying two of our most important core concepts – force and energy. The unit starts by checking KS2 knoweldge and distinguishing force from other concepts related to motion. The early lessons on force are designed to displace commons around force and motion. This is done by exploring equilibrium situations between weight and the normal contact force before studying the effect of friction in some depth. The second half of P1 develops students concept of energy as the "cost" of getting things done before exploring the different energy stores and simple transfers qualitatively. P2 gives students a deeper understanding of two "waves" (term not introduced) that they will have encountered at KS2 – sound and light. The unit explores how both transmit information from source to observer and dissipate (spread out) with distance from a source. Our final unit of Y7 looks at temperature through students knowledge of the particle model (from C1) and use it to explain the idea of heating and thermal stores of energy.

Unit	P1	P2	P3
Unit title	Force and energy	Sound and Light	Heating and cooling
Big question/ core concept	Why do things move and change? Core concepts: force and energy	How does information and energy spread? Core concept: waves (term not introduced in unit)	What is matter? Core concept(s): matter and energy
Relevant end points	• Objects at "equilibrium" the forces on it are balanced • Unbalanced forces cause a change in motion • Friction is a force that acts against motion. • Energy stores can be used to predict how much a system can change.	• Sound and light transfer information from source to observer. • Both sound and light radiate from a source and become more spread out with distance.	• (Particle model of) temperature • (Particle model of) Thermal stores of energy
Core substantive knowledge	• Forces are represented with arrows and measured in newtons • Difference between force and (momentum) • Weight is a force that is pulling down • The normal contact force keeps objects in equilibrium if they are resting on a solid surface. • An object at equilibrium can be moving or stationary • The force of friction acts against motion • Fuels are "used up" but energy is transferred • Key energy stores and describing transfers	• Vibrating sources produce sound. • Sound travels through a medium as vibrations • Sound travels best through mediums in their solid or liquid states. • Light can reflect or "scatter" off surfaces. • The passive eye model of sight • Sun light as "white light" and how colours of light combine. • Why objects appear coloured under different sources of light.	• What temperature is. • Thermal expansion (and how a thermometer works) • Heating as an energy transfer • Dissipation of heat • Thermal conduction • Insulators
Core disciplinary knowledge	• Representation in physics (force diagrams) • **Investigations**: controlling variables • **Analysis** of data to draw conclusions. • Physics uses **mathematical** models to explain changes. • Forces are an explanation which applies to a very wide range of situations • Energy is a **model** not an explanation.	• **Measurement**: using a prism to observe the spectrum of light (evidence of "white" light). • **Procedures:** how to use a ray box to investigate light • **Measurement:** observations of objects under different colours as evidence of how we perceive colour using information from light.	• How a thermometer **measures** temperature. • **Measurement**: how to measure temperature. • **Analysis**: and interpretation of line graphs

Year 7 Long term plan: “Materials science”

Brief overview
After their end of year 7 exams students study a short unit on materials science. This aims to reinforce students knoweldge of our big question “what are substances” by using the concept of “substance” to inform students understanding of what a “material” is. It also gives students an opportunity to study the uses science is put to

Unit	M1
Unit title	Substances and mixtures
Big question/ core concept	What are substances? Core concept: Substance
Relevant end points	• Most materials are mixtures. • Materials made of single substance start and finish melting at the same temperature. • Substances rather than materials have clearly defined “states of matter”
Core substantive knowledge	• Materials are classified based on their properties. • Materials are usually made of more then one substance. • Composite materials are made of more than one material. • Properties of ceramics, metals and polymers • Gels and pastes are a mixture of substances in solid and liquid states.
Core disciplinary knowledge	• Materials science is an “inter-disciplinary” field of science. • Chemists **classification** of states of matter applies to substances rather than materials • Materials scientists have their own forms of **classification** based on what they are studying

Long term plan: Year 7 breakdown by lesson

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
L1. Introduction to science L2. KS2 Chemistry & pre-request knoweldge test. (optional) **Topic C1: What are substances and mixtures** L1. What are substances? L2 Are all materials pure substances? L3. Do things disappear when they dissolve? L4. Can we prove if an ink is pure? L5. What is melting? L6. What is boiling? L7. How does a filter work? L8. Can we prove gases are made of particles? L9. Can we separate the salt from the sea? L10. Can we separate the cherry from the cherry coke? L11. Cherry coke practical (optional) L12. End of topic test C1 L13 Master and feedback **Topic C2: What are substances?** L1. What are elements? L2. Why do metals have high melting points? L3. Why are there so many substances? L4. What is the difference between a compound and a mixture? L5. How do chemists represent substances?	***C2 continued*** L6. What do chemical formulas represent? L7. How is chemical change different from physical change? L8. How do chemical changes form new substances? L9. EOTT What are substances. L10. Feedback and mastery **Topic C3: Solubility** L1. Why do some substances dissolve L2. How can we increase solubility? L3. How do we use graphs of solubility (optional) **Topic C4: What are chemical reactions** L1. How do we represent chemical change? L2. How can equations help us observe reactions? L3. What do symbol equations represent? L4. What happens to mass in a chemical equation? (optional) L5. How does the solubility of substances effect our observations? L6. What happens to mass in a reaction (Pt2 if complete option lesson). L7. EOTT C4 (or optional OCL assessment point). L8. Feedback and mastery **Topic B1: Cells – the unit of life** L1. What makes something alive L2. What are all living things made of? L3. What are animals made of? L4. What are plants made of? L5. Why can we not see cells?	Mid year OCL assessment (optional) B***1 continued.*** L6. How many types of cell are there? L7. How does a cell get what it needs to stay alive? L8. How do substances move in and out of a cell? **Topic B2: Inheritance and the genome** L1. What makes us all unique? L2. What characteristics can be inherited L3. Where is our genome stored? L4. Can we see the DNA in fruit? L5. EOTT B1 & B2 L6. Mastery and feedback **Topic B3: From cells to organ systems** L1. What are we made of? L2. What are other organisms made of? L3. How does our digestive system work? L4. How does our digestive system keep us alive? L5. How do our lungs work? L6. Why do we need to breathe? L7. How do substances get around the body?	**Topic B3 continued.** L8. Why do we need a circulatory system? L9 Are our bones made of cells? L10 How do we move? L11 (Optional) Rat dissection L11. EOTT B3 L12. Mastery and feedback **Topic B4: variation.** L1. What is a species? L2. Investigating variation Pt 1 L3. Investigating variation Pt 2 L4. What are fossils? L5 What can the fossil record show us? L6. EOTT Variation L7. Mastery and feedback **Topic P1: Forces & energy** L1. What are forces? L2. How do we represent forces? L3. Why are some objects stationary? L4. When do objects change their motion? L5. Can we predict how an objects motion will change?	***P1 continued*** L6. Why do things stop moving? L7. Can we reduce friction? L8. Investigating friction Pt 1 L9 Investigating friction Pt 2 L10. What is the cost of moving? L11. What are the different stores of energy? L12. What happens to energy when forces move an object L13. Why do moving objects heat up? L14. Describing energy transfers (optional) L15. EOTT P1 L16. Mastery and feedback **Topic P2: Sound and light** L1. What is sound L2. Why can we hear better under water? L3. Why do we get shadows? L4. How does light fill a room? L5. Why are some objects reflective? L6. How do we “see” objects	***P2 continued*** L7. How do we get different colours of light? L8. What colour is sun light? L9. Why do some objects appear black? L10. Why do some objects appear coloured? L11. EOTT Sound and Light L12 Mastery & feedback End of year OCL assessment **Topic P3: Heating and cooling** L1. What is temperature? L2. How do thermometers work? L3. How do objects cool? L4. Why are some materials good conductors? L5. What is the difference between temperature and energy? L6. (optional) Are some materials better at storing energy. **Topic: Material science** L1. (optional) materials and substances L2. Composite materials L3. Polymers, ceramics and metals L4 (optional) Gels and paste L5 (optional) investigating properties of polymers L6 (optional) investigating properties of polymers pt2

Year 8 Long term plan: Physics

Brief overview				
We start by introducing one of our big questions (space) that students will not have covered since KS3. This first topic uses prerequisite knowledge of forces and radiation to build a sense of where we are in the universe and how the motion of bodies in space shapes our perspective. The remaining topics develop big questions that were first encountered in Y7. "Why do things move and change" l being covered in both P5 and P7. P5 looking first at ideas around motion and distance time graphs before P7 looks at explaining common scenarios using force such a surface supporting a weight; extension of a springy material and levers. Unit P6 returns to the idea of the ray model of light deepening students understanding of how light radiates and exploring the different ways "images" can be produced. Students also learn how to use ray boxes and lasers to investigate images, reflection and refraction.				
Unit	**P4**	**P5**	**P6**	**P7**
Unit title	Where are we in space?	Moving by Force	How do we make images	More on Forces
Big question/ core concept	Where are we in space? Core concepts: Space	Why do things move and change? Core concepts: force and energy	How does information and energy spread? Core concept: waves	Why do things move and change? Core concepts: force and energy
Relevant end points	• The Earth is a sphere and we live on its surface • Gravity exerts a pulling force towards the centre of an object and is dependent on its mass. • The orbits of planets are caused by gravity	• Distance = speed x time • Distance time graphs can be used to represent the motion of an object • Acceleration is a how quickly the speed of an object is changing.	• Light rays are imaginary lines which show the path and direction light can travel along • Light can produces 'images' of real objects in different ways	• Weight (N) = mass x strength of gravity • Simple machines (levers) can increase the turning effect of a force • The extension of a spring is proportional to the force exerted on it.
Core substantive knowledge	• Stars are nuclear stores of energy that radiate light • Night and day are caused by the rotation of the earth • Seasons are caused by changes to the "tilt" of the earth as it orbits the sun • The solar system is a tiny part of a much larger galaxy. • The universe is all of space and everything in it	• A horizontal line on a D-T graph shows an object is stationary • A straight line sloping shows an object moving at a constant speed • A curved line shows an object that is accelerating • Drag is the result of particles exerting a pushing force on an object	• Why a pin hole camera (or eye) produces images which are upside down and back to front. • The law of reflection (angle of incidence = angle of reflection. • Light refracts (changes direction) • Lenses can refract light and produce an image	• Mass is a measure of the "amount" of matter in a material. Units: Kg. • The force needed to support an object is equal to its weight • Turning force = force x distance from pivot • Elastic objects can return to its original size and shape after being distorted. • Surfaces produce a "contact force" because they become squashed at a microscopic level
Core disciplinary knowledge	• Gravity is an example of a powerful physics **explanation** in that applies in all known situations everywhere in the universe	• **Mathematical formulation**: many ides in physics can be expressed as mathematical equations • **Analysis:** the conventions for representing and interpreting movement using DT graphs	• Light rays are a way of **modelling** the behaviour of light • **Mathematical formulation**: many ideas in physics can be expressed as mathematical equations • **Procedures:** How to use lasers and ray boxes to investigate light. • Independent and dependent variables in investigations & **reproducible experiments**	Graphs allow us to spot patterns and **analyse** data • A straight line on graph shows the change in the dependent variable is proportional to the change in the independent variable. • A curved line shows the change in the dependent variable is not proportional to the change in the independent variable

Year 8 Long term plan: Chemistry

Brief overview`
Year 8 develops the fundamentals established in Y7 to explore how chemistry shapes our planet. We start and finish with unit C5 (part A and B) which begins with looking the structure of the earth (or geosphere) and how it has changed over geological time scales (dynamic earth). Students look at minerals as an example of substances with a "giant" crystal forming structure. This unit is broken into two sections which bookend Y8 chemistry. Between parts A and B of unit C5 students revisit chemical change to look at types of chemical reaction – including neutralisation and other reactions of acids in C9. We then introduce two other important parts of the earth, its hydrosphere (liquid water) and atmosphere, before concluding by looking at physical weathering, the role of acid rain in chemical weathering and sedimentary rocks. C8 revisits Y7 work on energy transfers in the context of chemical reactions.

Unit	C5 (Parts a & b)	C6	C7	C8	C9
Unit title	How is our planet changing?	What types of chemical reaction are there?	What are the atmosphere and hydrosphere?	How is energy transferred in chemical reactions?	How do acids react?
Big question/ core concept	What is the Earth made of and how is it changing? Core concepts: Dynamic Earth	What is chemical change? Core concepts: chemical change	How does chemistry effect our world Core concept: Chemical earth	What is chemical change? Core concept: chemical change	What is chemical change? Core concepts: chemical change
Relevant end points	• The geosphere is made of different minerals. • Rocks are a mixture of minerals • The surface of the earth is slowly changing as a result of physical and chemical processes	• Mass is conserved in all chemical reactions. • That reactions can be classified into different types.	• That the atmosphere is the mixture of gases surrounding the earth • The hydrosphere is all the water on earth • How water cycles the earth	• That energy is transferred to and from the surroundings during chemical change	• Acids can react with alkali's and metals • That solutions can be acidic or alkaline. • The acidity / alkalinity of a solution is measured by the pH scale
Core substantive knowledge	• Earths internal structure. • How the main three types of rocks are classified • How the three main rock types are formed • Difference between chemical & physical weathering • Earths surface is made of slow moving tectonic plates	• The characteristic features of the following "types" of reaction - Combustion - Oxidation - displacement - Thermal decomposition • That mass is conserved during thermal decomposition reactions	• Why water evaporates and clouds form. • The hydrosphere includes salt water; fresh water (surface or ground); and water vapour • The composition of todays atmosphere • .Human activity adds visible and invisible pollutants into the atmosphere	• That energy is transferred from the internal (chemical) store to the surroundings in an exothermic change • That energy is transferred form the surroundings to the internal (chemical) store of the products during an endothermic change	• A salt and water are formed in a neutralisation reaction • A salt and hydrogen are formed when a acid reacts with an alkali • Pollution can form acid rain which reacts with rocks and damages wildlife
Core disciplinary knowledge	• Earth scientists classify rocks according to their structure. • The term "mineral" has a specific meaning in the earth sciences community.	• Chemists classify chemical reactions into different types. • Diagrams of the sub-microscopic can be used to **model** reactions. • Reactions can be **represented** in different ways	• That scientific **conclusions** are based on experimental evidence that can be reproduced by other teams.	• `Chemical investigation involves careful **measurement** and recording. • To measure a change in temperature you must measure before and after.	• Chemical **techniques** can be used to **identify** a substance or the properties of a mixture. • Diagrams of the sub-microscopic can be used to **model** reactions. • Reactions can be **represented**

Year 8 Long term plan: Biology

Brief overview
Y8 biology starts by exploring the concepts of health and disease in students first exploration of the big question "What keeps organisms healthy?". Other units start students journeys into other big questions. "How organisms grow and reproduce?" is studied in unit's B6. Y8 ends with "Why do organisms depend on each other and their environment?" with students being introduced to a basic understanding of the concept of "interdependence" ahead of a more detailed journey into ecology in Y9. Our short unit on "biochemistry" consciously follows our Y8 units on chemical change enabling students to appreciate the links between disciplines. This looks at a few of the key chemical reaction in cells – drawing students attention to the sub-microscopic world of substances within cells now their chemical schema is more developed.

Unit	B5	B6	B7	B8	B9
Unit title	What keeps us healthy?	How do organisms grow and reproduce?	How do we classify living things?	What is the chemistry of living things?	What are ecosystems
Big question/ core concept	What keeps organisms healthy? Core concepts: Health	How do organisms grow and reproduce? Core concepts: inheritance	Why are living things so diverse Core concept: Evolution	What are living things made of? Core concept: The cellular basis of life	Why do organisms depend on each other and their environment Core concept: interdependence
Relevant end points	• Health is defined as physical and mental well being • .Disease can be caused by pathogens, environment, our genome or lifestyles. • Only diseases caused by pathogens can be infectious	• Multicellular organisms primarily grow by cell division • All new cells are produced from existing cells dividing • Growth & development are part of an organisms life cycle • Organism reproduce sexually or asexually	• Organisms are classified based on observable characteristics and cell structure. • Organisms are classified into five kingdoms. • Humans are part of the kingdom "animalia"	• Producers make glucose by photosynthesis. • All cells transfer energy by respiration for their life processes	• Biomass and energy are passed along food webs. • All ecosystems depend on producers • Decomposers recycle materials in an ecosystem
Core substantive knowledge	• Asthma is a disfunction of our lungs. • The percentage of carbohydrate, lipid and protein in a balanced diet • Cause of obesity, & deficiency diseases. • How fitness contributes to good health. • Food is a source of energy (a chemical story	• Parts of human male and female reproductive systems. • Role of the menstrual cycle • What fertilisation is. • How the body supports foetal development during pregnancy • How plants can reproduce sexually or asexually	• Organisms are classified hierarchically into groups. • The distinction between scientific and common names.	• Word equation for photosynthesis. • Word equation for aerobic respiration. • Why anaerobic respiration (in humans) is less efficient. • Where respiration and photosynthesis happen in a cell	• Producers make all the biomass in an ecosystem. • Many plants rely on animals for pollination or seed dispersal. • Population sizes of different organisms are dependent on each other
Core disciplinary knowledge	• How to measure resting heart rate and lung volume. • How to measure the energy in food by simple calorimetry • Biologists **communicate** their research to improve human health.	• Biology is studied as at different **levels** including the organism, interactions between organisms and organ systems	• Biologists use systems to **classify** all organisms. • Use of keys in **classification** • A continuous **cycle** of collecting and analysing data constantly improves classification systems	• Biology is studied as at different **levels** including the chemistry of living things	• Biology is studied as at different **levels** including how different organisms interact in an ecosystem • Simple means of investigating seed dispersal

Long term plan: Year 8 breakdown by lesson

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
L0 Introduction to space (and prerequisite knoweldge test) (optional) **P04 Where are we in space** L1, What are days, months and years? L2. What is gravity? L3 How does Gravity effect the solar system? L4 Why does the night sky change? (optional) L5 Where are we in space? L6 Why do we get seasons? L7 Investigating why it is hotter in summer. (optional) L8 EOTT L9 Mastery and feedback **P05 Moving by force** L1 What is speed? L2. How do we describe speed? (instantaneous vs average speed) (optional) L3 What do D-T graphs tell us? L4 How does force effect motion? L5 What is acceleration? L6 What causes drag? L7 How do parachutes work? L8 Investigating drag in different fluids (Pt 1) L9 Investigating drag in different fluids (Pt 2) L10 Relative motion L11 Moving by Force EOTT	L12 Mastery and feedback **P06 Making images** L1 How do pin hole cameras work? L2 Making pin hole cameras (optional) L3 What are reflected images? L4 What is the "law" of reflection? L5 What is "refraction"? L6 Investigating refraction (optional) L7 What are lenses? L8 How does the eye work? (optional) L9 EOTT Making images lL0 Mastery and feedback **P07 More on forces** L1 What causes weight? L2 How do we calculate weight? L3 How does a bridge supports an objects weight? L4 Investigating bridges (optional) L5 How does a floor support a weight? L6 How does force effect a spring? L7 How does a wire support an objects weight? (optional) L8 How do levers work? L9 Investigating moments of a force L10 EOTT More on forces L11 Mastery and feedback **C5a How is our planet changing?** L1. How do we classify rocks? L2 What are minerals? L3 What is the geosphere made of? L4 How is the surface of the earth changing?	**Mid year OCL assessment (optional)** L5 What happens at plate boundaries (optional) L6 How are igneous rocks formed? L7 How are rocks transformed? **C6 What types of chemical reaction are there?** L1 What are chemical reactions (optional) L2 What is combustion? L3 What are oxidation reactions? L4 Why does oxidation increase mass? (optional) L5 What is a displacement reaction? L6 Why does displacement not effect mass? (optional) L7 What is thermal decomposition? L8 How does thermal decomposition effect mass? L9 EOTT What types of chemical reaction are there? L10 Mastery and feedback **C7 What are the atmosphere and hydrosphere?** L1 What gases make up our atmosphere? L2 How are we polluting our atmosphere? L3 Why does water evaporate? L6 Why does water evaporate faster on a hot day? (optional) L7 What are clouds? L8 What is the hydrosphere? L9 How do rocks store ground water (investigation) (optional) L10 How do humans contaminate ground water? (optional)	L11 How does water cycle the planet? L12 EOTT What are the atmosphere and hydrosphere? L13 Mastery and feedback **C8 How is energy transferred in chemical reactions?** L1 Energy stores and transfers (optional recap) L2 What is an exothermic reaction? L3 How do we measure an exothermic change? L4 What is an endothermic change? L5 Measuring an endothermic change (optional) **C9 How do acids react?** L1 How can we identify acidic and alkaline solutions? L2 What is the pH scale? L3 What are neutralisation reactions? L4 How can we show an acid is neutralised (practical) (optional) L5 How is acid rain formed? L6 Investigation: what rocks does acid rain react with? (optional) L7 How do acids react with metals? L8 EOTT How do acids react L9 Feedback and mastery **C5b How is our planet changing?** L1 How does rain weather rocks? L2 What is the difference between weathering and erosion? L3 How are sedimentary rocks formed?	L4 Why is crude oil found in rocks? L5 EOTT How is our planet changing L6 Mastery and feedback **B5 What keeps us healthy?** L1 What is "good health"? L2 What causes disease? L3 What causes asthma? L4 What causes Covid-19? (optional) L5 How do we get the nutrients we need? L6 What is malnutrition? L7 How much energy is in food? L8 Investigating energy in food L9 What is fitness? L10 Investigating fitness (optional) L11 EOTT: What keeps us healthy L12 Feedback and mastery **B6 How do organisms grown and reproduce?** L1 How do (multicellular) organisms grow? L2 What are life cycles? L3 How do organisms develop and reproduce? L4 How does the female reproductive system work?	L5 How is the male reproductive system different? L6 How does a baby develop? L7 How do plants reproduce? L8 What is in a seed (Seed and flower dissection) (optional) L9 EOTT growth and reproduction L10 Mastery and feedback **B7 How do we classify living things** L1 How do biologists classify organisms L2 Why biologists classify organisms into kingdoms? L3 Where do humans fit in the classification system? **B8 What is the chemistry of living things?** L1 How do producers make glucose? L2 Where does photosynthesis happen in a leaf? (optional) L3 How do cells transfer energy? L4 What reactions take place in plant cells? L5 Can our cells respire without oxygen? **End of year OCL assessment** **B9 What is an ecosystem?** L1 What are food webs? L2 How do food webs effect populations? L3 Why does an ecosystem depend on producers? L4 Why are pollinators so important? L5 Why are decomposers important? L6 Field work Pt1 (optional) L7 Field work pt2 (optional) (5 core lessons)

Year 9 Long term plan

Biology: The wondrous diversity of life and its human stewards	*Our Y9 curriculum provides a bridge between KS4 and KS3. We start with returning to the big question "what are living things made of?" with a substantial unit building up students concept of "cells" first introduced in topic B1. We then look deeper into the idea of "infection" and develop the concept of "pathogens" in answer to the question "what keeps organisms healthy?" with a conscious decision to focus on both plants and animals. This unit includes work on sexual health and contraception* *The two most significant units of Y9 biology are topics B13 and B14 looking in detail at the ideas of evolution by natural selection and students impact on biodiversity. We aim for students to have a rounded understanding of the scientistic answer to why life is so diverse and a deep understanding of how various human activates threaten fragile ecosystems.* **B10:** the cellular basis of life **B11:** Health and infectious disease **B12:** Biodiversity and human impact **B13:** Variation through evolution
Chemistry: The periodic table, rates and structure of the atom.	*Year 9 chemistry returns to our three core "big questions" of chemistry and introduces students to how chemical knowledge is represented on the periodic table and a more complex model of the atom.* *Year 9 starts by introducing the periodic table by looking at the meaning of the term periodic and the patterns in physical and chemical properties down the groups. Our unit on rates of reaction builds upon prior knowledge "What is chemical change?" to develop a meaningful chemical definition of "rate". Students are introduced to the Bohr model of the atom for the first time and use it to explain the trends in the periodic properties of the elements. Year 9 also includes a practical unit returning to the separation techniques introduced in year 7 to develop a more rigorous procedural knowledge of these techniques.* **C10:** Substances and mixtures **C11**: The periodic table **C12**: Rates of reaction **C13**: Structure of the atom
Physics: Developing ideas of electricity and magnetism	*We intentionally wait to begin the question "What are electricity and magnetism?" until Y9 because of the cognitive demands of both the practical work required and the abstract modelling of electricity. A substantial period of time is spent in year 9 embedding the practical skills of using circuits and qualitative relationships between the concepts of current, voltage, resistance and energy. Y9 also sees students build on their understanding of the particle movement of water and sound waves to look at the graphical representations of waves. Y9 finishes with a unit building students understanding of "density" and pressure. Topic 13 is one of our most challenging topics pushing students towards a complicated application of balanced and unbalanced forces to make sense of pressure in fluids and convection.* P08: Electricity P09: Waves P10: More on Electricity P11: Magnetism P12: Floating and sinking

Year 10 Long term plan

Physics: Energy and energy transferred.	*Y10 physics is linked together by the big idea of energy which underpins several of our key questions. Across all topics students are supported in recognising the qualitative nature of physics. That we can use mathematical relationships between (sometimes abstract) concepts to make accurate predictions about phenomena. Students investigate this further through a series of required practical's. All physics topics in year 10 are in essence applications of the big idea of "energy transfers" and that modelling them mathematically enables us to make accurate predictions. This supports students understanding of role of mathematical modelling which is central to how knowledge is developed within physics.* *Students also cover a short unit developing their understanding of the concept of the particle model and atomic structure in answer to "What is matter?"* *The final units being placed at the end of the sequence because of their overlap with big questions within chemistry.* **P13**: Energy **P14**: Electricity **P15**: Domestic uses of electricity **P16**: Particle model **P17**: Structure of the atom and radiation
Chemistry: Chemical bonding.	*The aim of Y10 is for students to make a qualitative leap in their answers to the first two big questions of chemistry. We start by bringing together several Y9 topics and introducing a simplified electrostatic model of the atom. This model of the atom is used throughout topic C14 to link the different types of chemical bonding to one central underlying concept (electrostatic attraction). This encourages students to develop a more flexible schema around chemical structure to support further progression. Students then return to more complex examples of chemical change supported by their more advanced understanding of the nature of chemical bonding.* **C14**: Chemical bonding **C15**: Chemical Changes **C16**: Qualitative chemistry **C17**: Rates of reaction
Biology: Systems within cells and organisms	*KS4 biology starts by developing a cellular basis for students concept of "growth" before returning to ways substances are transferred across the cell membrane (last dealt within detail during Y7). Our start to KS4 biology is linked together by a focus on "systems" within organisms leading students to an understanding of how different processes within organisms are themselves interdependent. B15 is a vast unit which starts with looking at enzyme action and biological molecules (sub-microscopic - biochemistry) and digestion before linking together ideas of biological organisation (what are living things made of?) with health and disease (how do organisms stay heathy) at the level of organs and organ systems. The year finishes with a look at the development of drugs and vaccinations before deepening students knowledge of the biochemistry introduced in Y9.* **B14:** Cell structure, division and transport **B15:** Systems and organisation **B16:** Infection and disease **B17:** Bioenergetics

Year 11 Long term plan

Chemistry Chemistry n a changing planet.	*Y11 Chemistry comprises a series of short units which picks up and develops ideas covered earlier in the course. The units, covering C2 chemistry are linked thematically by the application of chemistry to societies' interaction with our planet and its resources.. C22 explores organic chemistry for the first time – picking up from work in Year 8 looking at how fossil fuels are created. C24 and C25 similarly pick up the story of how chemistry affects the Earth from topics C7 and C11 in Year eight.* **C18**: Organic chemistry **C19**: Chemical analysis **C20**: Earths atmosphere **C21**: Using the Earth's resources
Physics: Why objects move and information spreads	*Our final year of physics returns to one of the most central concepts in physics – force. Both unit P19 & 20 give a more developed, and quantitative, treatment of the ideas of force and motion developed in years seven and eight. Introducing acceleration equations, velocity-time graphs and the conservation of momentum. Units P21 builds on the Year 9 unit "waves" by looking at the electromagnetic spectrum and wave equations. Physics finishes by returning to the idea of electromagnetism introduced in P12 and exploring the motor effect.* **P18**: Forces and their effects **P19**: Force and Motion **P20**: Waves **P21**: electromagnetism
Biology: Systems within cells and organisms	*Biology starts with the looking briefly at the nervous system before exploring the uses of hormones within the human body. B20 develops a model of inheritance and relates it back to the ideas of evolution first explored in detail in unit 14. Our biology story closes with a final unit looking at ecology and the human threat to biodiversity that was covered in some depth in unit B13.* **B18:** controlling our bodies **B19:** From Inheritance to evolution **B20:** ecology