The Halifax Academy

Science

“Nothing in life is to be feared, it is only to be understood.”

Marie Curie

Not only does our curriculum for science meet all of the requirements demanded by the National Curriculum, it goes one better by supporting our own internal ambition of helping pupils become happy, confident, conscientious and aware. We achieve this ambition with a 3-themed approach embracing **Heart, Mind** and **Connect** each of which is carefully factored into the entire learning journey here.

We start by devising lesson programmes that are sequenced in a way that builds knowledge gradually but effectively, moving from tangible and small-scale everyday science – like plants, organs and states of matter – before progressing into more abstract and then fully conceptual learning. We provide an initial broad overview before revisiting topics in more and more detail, slowly building up a solid understanding of scientific principles and the examples and techniques that demonstrate them. We might move from a macroscopic to a microscopic study of the human body, for example, beginning with the skeleton, moving into muscle tissue and then, ultimately, exploring genetics.

As well as substantive fact-based knowledge, we put great effort into developing pupils’ disciplinary skills too, teaching them how to think and behave like a scientist, and giving them the specialist practical skills to be confident in the classroom or laboratory. Language is crucial too here, and special attention is paid to developing scientific fluency by teaching topical vocabulary and keywords. We also help pupils with their literacy and communication skills generally, and in this respect, we help to give them their voice: a quality they take into the wider world beyond school, something our ethos strongly promotes.

Our lessons are planned in ways that require pupils to develop personal qualities like perseverance and ingenuity, and we include activities which encourage them to think critically, organise themselves, and develop the care and patience it takes to follow step-by-step processes. We help pupils to understand that these aren’t just abilities they’ll need for passing their exams; they are life-long skills and qualities which will benefit them in every area of their lives. In terms of issues around inclusion and social disadvantage, we’re committed to levelling the playing field. We work hard to improve pupils’ general confidence and skills of oracy as a way of empowering them, and we make sure that every single pupil gets the chance to succeed. We take every opportunity to teach science using a variety of cultural reference points too, using this as a way to boost the cultural capital of pupils whose worlds can be limited by circumstance. Topics like health, nutrition and wellbeing are covered in a way that’s relevant and helpful to the everyday lives of our pupils, many of whom will share their learnings with family members who can benefit. When it comes to careers, we discuss with pupils the full range of jobs open to scientists, not just the obvious ones, and we often link our lessons to the world of work as well.

We want our students to leave us with the knowledge required to understand the world around them, the skills to learn for themselves and the ability to process and critique the information they will encounter.

Curriculum Overview - Science

Phase 1

Understanding the world - Statutory Framework EYFS 21 NC - Science

	Term 1	Term 2	Term 3
Know and remember	Observe and describe changes in the natural world from Autumn into Winter Know that freezing cooling and heating can change materials and that sometimes this can be reversed including water/ice, chocolate and baking bread. Know that we can use simple equipment such as magnifying glasses to find out more about that natural world	Observe and describe changes in the natural world from Winter-Spring Know that some things can be recycled at home and at school. Know that some materials are magnetic and others are not. Know that animals change as they grow and that some young animals are named differently from the adult including cow-calf, horse-foal, duck-ducking Know that there are lots of different animals in the world, naming and increasing number. Know, identify and describe farm animals. Know that some specialist equipment can help us to understand the natural world and enhance our experiences including an incubator.	Observe and describe changes in the natural world from Spring-Summer. Know that some animals change in different ways as they grow through observing the life-cycles of frogs and butterflies . Know that plants and have a lifecycle through planting and observing seeds/fruits and vegetables – know that a plant needs sun and water to grow and begin to talk about why. Know that there are lots of different plants in the world and that some of these can provide us with food. The world is made up of different animals and plants – name, identify and describe.
Do	Start to use vocabulary associated with the seasons, comment on the weather, comment on what they see in their local environment such as flowers in bud or leaves falling from trees and make connections, linking it to their seasonal understanding, collect and examine evidence of changing seasons talking about what they see, communicate orally, in simple descriptions and explanations for example talk about a farm, which animals live there / plants grow there and the job of the farmer, describe what they see, hear, and feel whilst outside, oral hygiene – daily toothbrushing.		
Key Vocabulary	Science, experiment, test, fair, why, senses, world, plant – leaf, stem, root, flower, animals, humans, materials – waterproof, natural change, growth, decay, environment		

Curriculum Overview - Science

Phase 1

Year 1	Term 1		Term 2		Term 3	
	Body and Senses	Animals	Everyday materials	Discovering the use of materials	Plants	Gardening
Unit(s)	Weather & Seasonal changes (throughout) Observe changes across the 4 seasons. Observe and describe weather associated with the seasons and how day length varies. Plants Care for plants and make observations about their growth and interaction with soil, water and sunlight.					
Key Concepts	Classification Genetics Food web		Properties of matter		Pollination Ecosystem	
Knowledge Introduced	Identify, name, draw and label the basic parts of the human body; say which part of the body is associated with each sense.	Identify and name a variety of common animals, including those which are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals.	Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials. Describe the simple physical properties of a variety of everyday materials.	Compare and group together a variety of everyday materials on the basis of their simple physical properties.	Identify and name a variety of common wild and garden plants. Identify and describe the basic structure of a variety of common flowering plants and trees.	Planting and caring for bulbs and seeds. Identify fruits and vegetables and observe how plants grow over time. Report scientific findings.
Skills Introduced	Ask simple scientific questions; observe closely, using simple equipment; fair tests; classifying using Venn diagrams; block graphs; 1st scientific investigation		Perform simple tests; make basic predictions; identifying and classifying using scientific vocabulary; using simple equipment, block graphs; tables of results.		Use observations and ideas to suggest answers to questions; identifying properties; using simple equipment	

Phase 2

Year 2	Term 1		Term 2		Term 3	
Unit(s)	**Living things in their habitats (local)**	**Uses of everyday materials**	**Food chains & keeping healthy**	**Plants**	**Animals including humans**	**Living things in their habitats (worldwide)**
Key Concepts	Fossils Habitats Properties of matter		Food webs Health Biodiversity The human Body		Habitats Adaptation Ecosystem	
Knowledge Introduced	Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats. Identify and name a variety of plants and animals in their habitats. Describe how animals obtain their food from plants and other animals.	Identify and compare the suitability of a variety of everyday materials. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching..	How animals obtain food form other animals, simple food chains, sources of food, importance of a healthy diet, exercise, good hygiene.	Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	Notice that animals, including humans, have offspring which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival. Describe the importance of exercise for humans, eating the right amounts of different types of food, and hygiene.	Comparing habitats: seashore, woodland, ocean rainforest, global warming and human impact on habitats.
Skills Introduced	Use different types of scientific enquiry to gather and record data; notice similarities, differences and patterns; draw food chains.		How to carry out simple comparative tests; using simple equipment to gather data, where appropriate to answer questions.		Observe changes over time; find out information using secondary sources of information.	
Knowledge Revisited	Common animals; similarities between living things; animal diet; life processes; habitats. Properties of common materials; group materials by their physical properties		Structure of common plants;		life cycles; seasons and climate.	
Skills Revisited	Scientific observation; asking and answering scientific questions; identifying and classifying; grouping		Scientific observations; recording observations; comparing materials using scientific vocabulary; describe changes		Interpreting basic information; classifying, identifying and sorting; using simple equipment	

Curriculum Overview - Science

Phase 2

Year 3	Term 1		Term 2		Term 3
Unit(s)	**Rocks & soils**	**Light**	**Animals including humans 2**	**Force & Magnets**	**Plants**
Key Concepts	Minerals Radiation Waves		The human body Foods webs Forces Magnetism		Biodiversity Pollination
Knowledge Introduced	Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter.	Recognise that they need light in order to see things and that dark is the absence of light. Notice that light is reflected from surfaces. Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. Recognise that shadows are formed when the light from a light source is blocked by an opaque object.	Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	Compare how things move on different surfaces. Observe how magnets attract or repel each other and attract some materials and not others Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials Describe magnets as having 2 poles	Identify and describe the functions of different parts of flowering plants. Investigate the way in which water is transported within plants. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.
Skills Introduced	Set up experiments independently, according to a method; ask relevant questions and using different types of scientific enquiries to answer them, explore fair testing; report on findings from enquiry.		Identify differences, similarities or changes related to simple scientific ideas and processes; accurately read scales; use standard units; suggest improvements and make further suggestions.		Using scientific evidence to answer questions and support findings; using simple electrical equipment; how to use a data logger; scaled scientific drawing
Knowledge Revisited	Basic properties of an object History – palaeontology and Mary Anning, Stone age.		Parts of the human body; five senses; skeleton; healthy lifestyles PSHCE – healthy eating (Y1 / Y2) PE – muscles		States of matter; parts of the human body; five senses; protection of hearing flowering plants and their life cycles; effect of the local environment
Skills Revisited	Compare and classify by properties		Labelling; observing changes		Identify differences and similarities; record findings using scientific language

Year 4	Term 1		Term 2		Term 3
Unit(s)	**States of matter**	**Electricity**	**Living things in their habitat**	**Sound**	**Animals including humans**
Key Concepts	Models in science Electricity		Waves Habitat Adaptation		Health Models in science Food webs
Knowledge Introduced	Compare and group materials together. Observe that some materials change state when they are heated or cooled. Identify the part played by evaporation and condensation in the water cycle.	Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers Recognise some common conductors and insulators, and associate metals with being good conductors.	Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose dangers to living things.	Identify how sounds are made, associating some of them with something vibrating. Recognise that vibrations from sounds travel through a medium to the ear Find patterns between the volume of a sound and the strength of the vibrations that produced it	Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey.
Skills Introduced	Take accurate measurements; use labelled diagrams; identifying differences, similarities or changes related to simple scientific ideas and processes		Accurate annotations; suggest improvements to an investigation, using evidence; make predictions for new values, report on findings from enquiries		Use and create classification keys; present information using labelled graphs
Knowledge Revisited	Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.		Conductors and insulators; properties of materials; effect of temperature; light; why materials change state; importance of water		Parts of the human body; teeth; taste; impact of diet; food chains; carnivores, omnivores and herbivores; habitats; changing environments; living things in the local environment
Skills Revisited	Identify differences and similarities; record findings using scientific language		Set up practical enquiries; dissection of plants;		Report on findings, including oral and written explanations

Phase 3

Year 5	Term 1		Term 2		Term 3	
Unit(s)	**Forces**	**Earth & Space**	**Materials and their properties**	**Changes in materials**	**Living things in their habitats**	**Animals including humans**
Key Concepts	Forces Gravity The universe		Properties of matter Chemical reactions		Habitat Ecosystem The human body	
Knowledge Introduced	Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.	Describe the movement of the Earth and other planets relative to the sun in the solar system. Describe the movement of the moon relative to the Earth. Describe the sun, Earth and moon as approximately spherical bodies	Compare and group together everyday materials on the basis of their properties. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials. Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible.	Demonstrate that dissolving, mixing and changes of state are reversible changes. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.	Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Describe the life process of reproduction in some plants and animals.	Describe the changes as humans develop to old age.
Skills Introduced	Recognising and controlling variables, planning different types of enquiries to answer questions; taking measurements with accuracy and precision.		Everyday materials and their impact on the quality of sound; uses of everyday materials; dissolving and mixing; reversible changes; properties of materials		Life cycles of plants and animals; impact of the local environment; human development; adaptation	
Knowledge Revisited	Magnetism; different forces on an object; friction; pushing and pulling		Magnetism; different forces on an object; friction; pushing and pulling		Life cycles of plants and animals; impact of the local environment; human development; adaptation	
Skills Revisited	Scaled drawing; using scientific equipment to take measurements, with increasing accuracy and precision		Using classification keys; comparing and exploring a broad range of materials; using data loggers		Dissection of plants; identify and classify common plants and animals	

Curriculum Overview - Science

Phase 3

Year 6	Term 1		Term 2		Term 3
Unit(s)	**Light**	**Living things in their habitats**	**Materials and their properties**	**Electricity**	**Animals including humans**
Key Concepts	Animals including humans		Evolution Genetics Adaptation Electricity Fossils		The human body Health Chemical reactions Models in science
Knowledge Introduced	Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals Give reasons for classifying plants and animals based on specific characteristics	Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. Recognise that living things produce offspring of the same kind. Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Compare and give reasons for variations in how components function. Use recognised symbols when representing a simple circuit in a diagram.	Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function Describe the ways in which nutrients and water are transported within animals, including humans.
Skills Introduced	Importance of the travel of light in everyday life (rear-view mirrors on cars, periscopes) Drawing light rays; identifying scientific evidence to support an argument.		Drawing light rays Identify patterns in data; separate opinion from fact, record using diagrams; using testing results to make predictions.		Use secondary sources of information to support primary findings; evaluate the trustworthiness of sources
Knowledge Revisited	Light sources; reflection; shadows; electrical insulators; series circuits; switches, bulbs, buzzers and motors		Classification systems and keys; grouping living things; fossils; how living things have changed over time		Main body parts and internal organs (skeletal, muscular and digestive system)
Skills Revisited	Scaled drawing, with labels; identify common electrical circuit components		Group and classify; use and create classification keys		Create graphs, with labelled scales, of increasing complexity

Phase 3

Year 7	Cycle 1	Cycle 2	Cycle 3
Key Concepts and knowledge introduced	**Unit 1: Working Scientifically Scientific** Attitudes and key vocabulary such as accuracy, precision repeatability and reproducibility are all introduced as are health and safety; risks in a lab. This helps ensure students can understand the language used to work in the laboratory environment safely. **Unit 2: Structure and function of living organisms** Fundamental concepts relating to living things: Cells and organisation, microscopes, diffusion; animal & plant reproduction; Human Skeletal and Muscular Systems and movement. **Unit 3: The particulate nature of matter** How do particles interact. Energy in matter; Physical and Chemical changes; The Periodic Table; Atoms, Elements & Compounds, states of matter, gas pressure, atoms, molecules, internal energy, Brownian motion.	**Unit 4: Nutrition, Digestion & Gas exchange** Having learnt about living things and particles we look at how this relates to our health. Components of a healthy diet are studied; calculation of energy; digestive system; enzymes; respiratory system; measuring lung volume; impact of smoking, exercise & asthma; gas exchange in stomate **Unit 5: Forces** We now move onto Physics. Forces are seen as pushes or pulls; students learn to draw force arrows; using Newton meters to measure forces; Balanced forces, investigate Hooke's law; calculate work done; forces & equilibrium; Pressure in fluids and atmospheric pressure; draw and interpret distance-time graphs and describing motion.	**Unit 6: Earth & Atmosphere** How the structure & composition of the Earth links into the rock cycle and geology; This is vital to understand the evidence we have for evolution in Year 8 and Year 11. The importance of recycling and finite resources; carbon cycle looks at how human activity now impacts on the natural processes affecting our climate; **Unit 7: Space Science** We end the year moving beyond the Earth to the biggest topic of all - Space. The motion and tilt of the Earth gives rise to the seasons, Years. Gravity is seen as the force between Earth and Moon and Sun and compared on different celestrial objects. Students learn about other stars and galaxies looking at images taken with our own telescope,
Skills Introduced	**Scientific Attitudes:** **Unit 1:** Understanding variables, accuracy and precision. **Unit 2:** Identifying questions from investigation **Unit 3:** Make and record observations; methods & evaluations; improvement; Using SI units.	**Measurements, Analysis and Evaluation:** **Unit 4:** Calculate energy requirements. **Unit 5:** analyses & evaluation through mathematical concepts; reasoned explanation of results, production and hypothesis; random & systematic errors.	**Measurements:** **Unit 6:** Calculating percentages; interpreting data through graphs **Unit 7:** rearranging equations, calculations and unit conversion will be introduced when looking at the relationship between weight and gravity.
Knowledge Revisited	Year 1: Animals - Describe and compare the structure of a variety of common animals. Year 5: Changes in materials Year 6: Animals including humans	Year 2: keeping healthy Year 3: Animals including humans Year 3: Forces & Magnets Year 5: Forces now built upon further with ideas such as pressure.	Year 3: Knowledge of Rocks & soils is now built upon to explain layers of the earth. Year 5: Earth & Space helps appreciate the nature our planet and it's place in the solar system.
Skills Revisited	Working scientifically skills from upper key stage 2 such as taking measurements, using scientific equipment, recording data and presenting findings.	Working scientifically skills referred back to throughout the scheme; particulate model of matter; Calculations and numeracy skills revisited with energy requirement calculations (in Nutrition & Gas Exchange and forces.)	Numeracy skills will be revisited such as multiplication, division and the use of mathematical equations.

Curriculum Overview - Science

Phase 4

Year 8	Cycle 1	Cycle 2	Cycle 3
Key Concepts and knowledge introduced	**Unit 1: Energy** Studying energy opens up a deeper understanding of the aspects of science covered later this year. Energy transfers and Power. Energy - Calculation of fuel uses and costs in the domestic context such as understanding gas and electricity bills, Energy changes and transfers, Changes in systems, Thermal equilibrium. These ideas then lead into the changes that energy can have on an atomic level when studying chemicals and their interactions: **Unit 2: Chemical Reactions** Types of chemical reactions. Writing chemical equations, Acids and Alkalis and the pH scale, Energetics of chemical reactions, the use of a catalyst.	From chemical reactions we now move on to some specific reactions in plants and animals: **Unit 3: Material Cycles and Energy** Photosynthesis including the chemical equation. Plant Adaptations. Respiration both aerobic and anaerobic, Cellular Respiration. **Unit 4: Interactions and Interdependence** Food chains and interactions within ecosystems. **Unit 5: Waves** From photosynthesis to understanding the waves that power the process. Linking waves and energy from cycle 1 this year. Observed waves and their properties, Light waves and behaviours, colours, Sound waves, frequency and hearing. Energy and waves.	**Unit 6: Electricity and Magnetism** Having learned about light and sound we move onto electricity and magnetism. Current electricity and resistance in circuits. Static electricity and charges, magnetism and magnetic field diagrams. **Unit 7: Genetics and Evolution** Having learned about obtaining raw materials we now look at ecosystems before finishing with genetics. Inheritance, chromosomes, DNA, genes and health.
Skills Introduced	**Analysis and evaluation:** Present observations and data using appropriate methods, including tables and graphs. Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions. **Experimental Skills and investigations:** Make predictions using scientific knowledge and understanding. Use appropriate techniques, apparatus, and materials during laboratory work, paying attention to health and safety. **Measurement:** Calculate energy costs using correct units and write chemical equations using standard formats.	**Experimental Skills and investigations:** Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience. Draw and interpret graphs to investigate factors which affect the rate of photosynthesis. Students will also learn to construct and interpret ray diagrams accurately to demonstrate and predict the path of light through materials and bouncing from surfaces.	**Experimental Skills and investigations:** Plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying different variables where appropriate. Apply sampling techniques. **Analysis:** Identify patterns in data for example by studying graphs of predator - prey population sizes to make conclusions. Students will also construct circuit diagrams, field diagrams and complete separation techniques successfully.
Knowledge Revisited	Year 7 work on atoms elements and compounds is now broadened to include how the elements can re-arrange and combine to form new compounds. The importance of the periodic table from previous years can now be seen when we predict how chemicals might combine and behave based on their position in the table.	Year 1 & 2 Plants, animals and habitats were first introduced. Year 3 Animals and nutrition links into the processes studied this term. Year 3&6 Light was a key focus of science and Year 4 Sound waves were investigated.	Year 1 Discovering Materials, Year 2 Plants and habitats, Year 3 Forces and Magnets, Year 3 States of matter, Year 4 Electricity, Year 5 Changes in materials, Year 4&5 living things in their habitats, Year 6 Evolution.

Curriculum Overview - Science

Phase 4

Year 8	Cycle 1	Cycle 2	Cycle 3
Skills Revisited	**Experimental Skills, investigations and analysis** continue to be developed. Y1 Observations and graphs Y2 Gathering data Y3 Using and reading scales Y7 Using the periodic table	**Scientific attitudes, experimental skills and investigations** continue to be developed: Y2 Scientific enquiries Y4 Using graphs Y6 Drawing light rays	**Experimental Skills, investigations and analysis** continue to be developed. Y3 Planning experiments and recording findings Y4 Handling electrical apparatus Y4 Presenting using graphs
Year 9	**Cycle 1**	**Cycle 2**	**Cycle 3**
Key Concepts and knowledge introduced	**Unit 1: C1 - Atomic Structure and the Periodic Table** Atoms - the most fundamental building blocks of nature. **Unit 2: C2 - Bonding, Structure and the properties of matter** How to these atoms interact with one another to form bonds and different molecules. **Unit 3: P3 - Particle Model of Matter** How can the arrangement of the atoms result in different states of matter depending on the energy that they have.	**Unit 4: P4 - Atomic Structure and Radioactivity** Deeper look at atomic structure to learn what happens when nuclei are unstable. Explore the science behind the Chernobyl disaster and the political situation that surrounded it. **Unit 5: B1 - Cell Biology** Piecing atoms together in a particular way gives rise to life in the form of cells and their functions. Specialised cells, diffusion and osmosis.	**Unit 6: B2 -** Organisation. How can cells work together to form organs and organ systems. A look at how lifestyle choices affect the healthy functioning of these systems. **Unit 7: Science of Wellbeing** looks at how drugs can affect our bodies, the importance of healthy lifestyles and sleep, mental health and what healthy relationships look like. **Unit 8: P1 - Energy** Energy transfers lead into resources for our planet. As humans deplete our finite resources what sustainable and renewable alternatives can we use for the future.
Skills Introduced	**The development of scientific thinking,** linked for example to the development of the atomic model over time. WS1.1 Understand how scientific methods and theories develop over time WS1.2 Use of models WS1.6 Recognise the importance of peer review. **Units, symbols and nomenclature:** Using SI units and prefixes to communicate the size of atoms and sub-atomic structures.	**Experimental skills and strategies:** For example, using microscopes to view cells and making observations of the properties of radioactive sources to identify their nature using previously unseen apparatus such as a Geiger counter. Units, symbols and nomenclature: Using prefixes, powers of ten and converting units when applied to small scale objects such as cells and organelles. To evaluate and justify the use of stem cells.	**Vocabulary, units, symbols and nomenclature:** Developing Scientific vocabulary when describing human and plant organ systems and processes and using new units and prefixes relating to Energy.
Knowledge Revisited	KS3 Particle model of matter, changing states and atoms. Now the idea of energy is combined with this knowledge to see how and why states of matter differ from one another. Work which began in Y7 with an overview of the periodic table can now been taken deeper by identifying trends within groups of chemicals in terms of their physical and chemical properties.	Building on both the Y7 work on atoms and the periodic table and the previous terms work on atomic structure. Evaluation skills are introduced when students discuss the moral issues surrounding stem cell research and the emerging uses of stem cells in therapeutic treatments. A more detailed structure of specialised cells is studied compare to the overviews seen in Year 7 and their function related to their adaptations.	KS2 and KS3 work on humans as organisms will be built upon in B2 this term. The P1 energy unit will build upon prior basics of energy studied at the start of Year 8. A closer look at health and lifestyle reveals the links between the human body and the choices we make.

Curriculum Overview - Science

Year 9	Cycle 1	Cycle 2	Cycle 3
Skills Revisited	**KS3 Scientific attitudes** such as the improvements made to the periodic table over time are discussed, **experimental skills and investigations** are carried out to look at properties of ionic compounds, **measurements and calculations** all continue to be developed this term.	**KS3 Experimental skills, investigations and analysis** continue to be developed, particularly when looking at data collected from radioactive sources to determine their nature.	A wealth of scientific vocabulary continues to be built. **Measurement skills** will continue to develop through calculations and unit conversions in the energy topic.

Curriculum Overview - Science

Phase 5

Year 10	Cycle 1	Cycle 2	Cycle 3
Key Concepts and knowledge introduced	**Unit 1: B3 - Infection and Response** looks more closely at how our immune system responds to infections. **Unit 2: C4 - Chemical Changes** offers hands on experiences looking at relationships between groups of chemicals and how they react such as metals and acids. **Unit 3: C5 - Energy Changes** looks deeper into the energy and physical science behind the reactions we have studied. Endo/Exothermic reactions and profile diagrams. **Unit 4: C3 - Quantitative Chemistry** Apply mathematical processes to predict the amount of a substance made during a chemical reaction.	**Unit 5: B4 Bioenergetics** We now look at some of the most important chemical reactions of all, in greater depth - respiration and photosynthesis. **Unit 6: C9 - Chemistry of the Atmosphere** A wider view of how these two Biological processes lead into a natural cycle of gases in our atmosphere. We move through time looking at how our atmosphere has evolved both naturally and now driven by human activity. **Unit 7: P2 - Electricity** takes a closer look at one of the driving forces behind human impact on our atmosphere by studying the principles of electrical circuits & sensing components such as LDRs and thermistors. The unit ends the bigger picture - the national grid. **Unit 8: P7 Magnetism and Electromagnetism** How magnets and electromagnets work and their field diagrams..	**Unit 9: C7 - Organic Chemistry** A closer look at fuels by studying crude oil and the processes used to maximise its uses and value. **Unit 10: C10 - Using Resources** We consider the impact of consumer behaviour through life cycle assessments and looks at evaluating products based on more than just the raw materials from which they are made. **Unit 11: B7 - Ecology** During the summer term we head outside and conclude this years scientific journey learning about ecosystems, biodiversity and interdependence - how species depend on one another.
Skills Introduced	Developing vocabulary, units, symbols and nomenclature including the use of Ar and Mr to calculate masses and using moles. Interpreting energy profile diagrams	Continue to embed experimental skills and strategies including building electrical circuits, testing to identify gases. Continue to embed analysis and evaluation including using ammeters and voltmeters to record data and plot graphically. Plotting magnetic fields using a compass and iron filings.	Using nomenclature to name organic compounds. Using quadrats and transects as sampling techniques
Knowledge Revisited	KS1 & 2 allowed students an opportunity to learn more about plants and animals then during KS3 students have seen an overview of how cells are organised into systems to help processes inside living things. This term a deeper understanding of the role of our immune system will be built on top of this knowledge. Y8 Chemical Reactions introduced the idea of atoms being combined to form compounds - this knowledge is now used to make precise calculations and predictions.	Y1&2 Familiar examples of plants and animals are first introduced and then in Y8 an overview of Bioenergetics and processes such as photosynthesis are taught. This time round the link between chemical reactions and biological processes is made. Y4 introduces the idea of Electricity and how it is used. This knowledge is built upon in Y8 where basic circuits are constructed in the laboratory and compared. Now more components will be introduced and graphs will show how voltage, current and resistance can be related.	Y4&5 Living things in their Habitats were seen during trips outside. Organic chemistry links to the importance of fuels which is explained earlier this year with the chemical energetics unit in which students calculate how much energy can be released from a chemical. Y8 knowledge of ecosystems is now being taken to a more detailed level with the introduction of complex independency relationships and the impact that humans can have on them.

Curriculum Overview - Science

Phase 5

Year 10	Cycle 1	Cycle 2	Cycle 3
Skills Revisited	KS2&3 Using and interpreting graphs, Calculating percentages. Using the periodic table. Continue to embed experimental skills and strategies.	Constructing chemical equations. Continue to embed experimental skills and strategies including building electrical circuits and testing to identify common gases.	Continue to embed experimental skills and strategies including the use of sampling techniques in B7 to estimate population sizes of living things.
Year 11	**Cycle 1**	**Cycle 2**	**Cycle 3**
Key Concepts and knowledge introduced	**Unit 1: C6 – Rate and Extent of Chemical Change** Students investigate factors which affect the rate of a chemical reaction and look at collision theory to explain the mechanics behind why these factors are important. **Unit 2: C8 – Chemical Analysis** A range of tests are studied which help scientists identify chemicals including chromatography, common gas tests and purity analysis using changes of state. **Unit 3: P5 - Forces** Newtons Laws help to describe how objects interact and move and this leads into new concepts such as momentum and moments. Links are then made to real world situations such as vehicle stopping distances to see why this is important.	**Unit 4: P6 - Waves** Basic wave behaviour such as reflection and refraction is investigated before the uses and dangers of the electromagnetic spectrum are discussed. Measuring the speed of waves in a laboratory can be done in a number of ways - students compare methods and determine the suitability of apparatus. **Unit 5: B5 - Homeostasis and Response** The human body and the cells from which it is made, can only function properly and safely with the right conditions. This topic looks at key processes and systems which ensure the internal environment is maintained such as the endocrine system and the nervous system. Blood glucose levels and reproductive hormones are also studied in more depth.	**Unit 6: B6 - Inheritance, variation and evolution** Our final topic looks at DNA and what our understanding of reproduction and genetics means for inheritance and variation within a species. This knowledge along with the observations of adaptations and fossil records first studied by Darwin leads us into the idea of competition and evolution. We learn how classification and organisation of the natural world helps us to make sense of all of these evolving species. Natural and manmade causes of extinction are discussed along with the moral debate around genetic screening and engineering. Finally, students look to the future with the need to maintain biodiversity we consider whether our species uses land and resources in a sustainable way.
Skills Introduced	Continue to explore experimental skills and strategies now in relation to chemical reactions and investigating acceleration using appropriate apparatus.	Continue to explore experimental skills and strategies, specifically choosing the best apparatus to study waves in a laboratory.	Continue to explore the development of scientific thinking, specifically in regard to the development of theories of evolution over time and the ethical and religious discourse around this.
Knowledge Revisited	Year 3 & Year 7 Forces KS3 knowledge of the periodic table and chemical trends identified in Year 9 and 10 will help students to understand how the new idea of collision theory can be used to show why some reactions occur faster than others.	Throughout key stage 2 students look at everyday experiences of light and sound. During Year 8 the wave nature of sound and light is discussed and now this deeper analysis allows a more complete picture of the complex nature of light and sound to be established.	Year 6 and 8 Ecosystems and Evolution are first introduced but now the intricate mechanisms involved in reproduction and genetic inheritance offer the evidence to explain the observations which have been made.

Curriculum Overview - Science

Phase 5

Year 11	Cycle 1	Cycle 2	Cycle 3
Skills Revisited	Continue to develop experimental skills and strategies which have been demonstrated at Key Stage 3. This will include completing accurate chromatographs and testing for Hydrogen, Oxygen, Carbon Dioxide and Chlorine using a range of experimental techniques and recording observations. Students continue to become more confident with the use of SI units in both Chemistry and Physics.	Continue to develop experimental skills and strategies. Numerical skills are revisited such as using standard form to recall the speed of light and rearranging equations to calculate wavelength and frequency. Students will make observations of waves and use their knowledge of apparatus to evaluate which methods are most suitable for making accurate measurements of waves in the laboratory.	Continue to embed the development of scientific thinking. Students use their voice and scientific literacy to discuss complex moral issues such as genetic screening and the ethics of genetic testing. Students will see how scientific models can change over time with the example of evolution and appreciate the impact of new evidence on previous understanding.