Science Curriculum Overview

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Shaping Positive Futures

Introduction

This document outlines the curriculum and key considerations including:

- Aims and purpose
- Alignment with the whole school provision and curriculum intent
- A summary programme of study which includes sequencing of taught content

We use the National Curriculum as our statutory foundation and broadly share its principles and aims including:

- 'To provide students with an introduction to the essential knowledge that they need to be educated citizens. To introduce students to the best that has been thought and said; and help engender an appreciation of human creativity and achievement'.
- To prepare students to be confident in themselves, to have a fulfilled and successful life beyond our school – one where they contribute positively to society.
- Our statutory curriculum is just one element in the education of every child. There is time and space in the school day and in each week, term and year to range beyond statutory specifications.
- Provision of a framework of core knowledge around which teachers can develop exciting and stimulating lessons to promote the development of students' knowledge, understanding and skills as part of the wider school curriculum.
- The wider school curriculum includes an extensive range of opportunities and activities that are routinely available to students, are inclusive and reflect our diverse community.

Numeracy and literacy

Teachers should take opportunities to develop students' mathematical fluency, spoken language, reading, writing and vocabulary within their specific discipline and in line with the expectations laid out in our school curriculum statement.

Purpose of study

'A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.' National Curriculum, DfE, 2015.

Curriculum Aims

The Winifred Holtby Academy curriculum aims to ensure that all students:

- Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics and can manipulate and apply their knowledge of key concepts to unfamiliar scenarios.
- Develop resilience to tackle unknown and unseen challenges that present themselves throughout the duration of their studies and beyond.
- Are inquisitive learners who are curious about their place in the world. These learners develop into competent scientific enquirers who can ask questions about ideas and data.
- Master the key content delivered through the science curriculum, by being able to manipulate and apply their knowledge of key concepts to unfamiliar scenarios.
- Develop understanding of transferrable skills that can be applied cross-curricular and into everyday life - from application of maths skills to scientific literacy.
- Develop the skills needed to make educated, informed lifestyle choices to see the relevance, employability, and cultural importance of science, particularly in Hull and the East Riding.
- Become curious to find the "why" in different aspects of their life, inspiring the next generation of Scientists.

Building on prior learning

Building on their learning from Key Stage 1, students should have secured the following knowledge by the end of their primary school science curriculum.

Biology

- Identify and describe the functions of different parts of flowering plants: roots, stem-trunk, leaves, and flowers
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow
- Know the part that flowers play in the life cycle of flowering plants, including pollination, seed formation, and seed dispersal.
- Identify that humans and some other animals have skeletons and muscles for support, protection, and movement.
- Explore and use classification keys to help group, identify, and name a variety of living things in their local and wider environment.
- 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.
- Describe the difference 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 into old age.
- Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels, and blood.
- Describe the ways in which nutrients and water are transported within animals, including humans.
- Identify how animals and plants are adapted to suit their environment in different ways, and that adaptation may lead to evolution.

Chemistry

- Compare and group together different kinds of rocks based on 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.
- Compare and group materials together, according to whether they are solids, liquids or gases.
- Observe that some materials change state when they are heated or cooled.
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
- Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.

Physics

- Compare and group together a variety of everyday materials based on whether they are attracted to a magnet and identify some magnetic materials.
- Describe magnets as having two poles.
- Identify how sounds are made, associating it with vibration.
- Recognise that sounds get fainter as the distance from the sound source increases.
- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches, and buzzers.
- Use recognised symbols when representing a simple circuit in a diagram.
- Recognise some common conductors and insulators, and associate metal with being good conductors.
- 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.
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.
- Recognising that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
- 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.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

What can students do by the end of KS2?

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

What are the skills gaps?

- Forming hypotheses and predictions
- Recording and presenting data
- Planning experiments

Curriculum Structure

In Science, there is not necessarily a clear line between Key Stage 3 and Key Stage 4. Science is a hierarchical subject. For example, students must understand states of matter before explaining distillation as a separation technique. As such, to succeed at GCSE, students need to have mastered (and then built upon) concepts that were first introduced in Key Stage 3, and even Key Stage 2.

Io support the transition of learners from KS3 to KS4, year 9 transition units enables our learners to build confidence in more complex scientific ideas, over a longer period. For these units, we have chosen content from B1, C1 and P1 of the specification. We have also introduced a Science Communication Challenge which helps develop students speaking and listening skills, building toward their GCSE English presentations. Students will then transition to completing the GCSE Syllabus following the completion of these.

Subject Discipline	Substantive knowledge threads	Disciplinary knowledge threads
Biology	• Cells and organisms • Organisation • Infection and response • Bioenergetics • Homeostasis and response • Inheritance, evolution and inheritance • Ecology	**Disciplinary knowledge 1 - Scientific Attitudes and Ways of Thinking** • Seeking objectivity • Development of methods and theories over time • Using a variety of models • The importance of peer review **Disciplinary knowledge 2 - Scientific Enquiry** • Planning for valid methods • Common techniques and apparatus • Planning valid methods which are safe • Making valid observations **Disciplinary knowledge 3 - Analytical and Evaluative Approaches** • Presenting data • Analysing data • Interpreting data • Developing explanations **Disciplinary knowledge 4 - Applications of Science and its Implications**
Chemistry	• Particulate nature • Chemical reactions • Atomic structure and the periodic table • Rocks and materials • Energy changes • Quantitative chemistry • Organic chemistry • Chemical analysis • Atmosphere	

Physics	• Energy • Electricity • Particle model • Atomic structure • Forces • Waves • Magnetism and electromagnetism • Space	• Developing scientific knowledge through technology • Developing technology through scientific knowledge • Ethical, social, economic and political implications **Disciplinary knowledge 5 – Protocols for Measurement** • Units • Notation and conversions • Symbols and formulae

Vocabulary

Having a rich, ambitious, broad vocabulary is vital for learners to succeed, both in school and throughout their lives. Tier 1 vocabulary is the simplest. These are the words we use in everyday conversation, such as "put", "get", "walk", etc. Tier 2 vocabulary are challenging, ambitious words that don't usually crop up in day-to-day conversation. These are the words that allow learners to access academic texts, such as high-level literature, newspaper articles and exam papers.

Tier 3 vocabulary is the subject-specific vocabulary of a particular discipline. These are words that are uncommon outside of the context of a specific subject, and enable learners to communicate effectively within the subject. At Winifred Holtby Academy, tier 3 vocabulary is explicitly taught across our school curriculum and is mapped within the schemes of learning.

Assessment

Formative assessment is used throughout the year to check learners' knowledge and understanding, using feedback techniques including exit tickets and end of topic quizzes. Summative assessment is calendared at end points within each academic year and is conducted more formally.

Year	Assessment Window	Topics to be assessed
7	Mid-Year – January	Cells and organisation, Particles, substances and mixtures, Fundamentals in Physics
	End of year - June	Biology - Cells and organisation, Organ systems Chemistry - Particles, substances and mixtures, Chemical Changes, Materials Physics - Fundamentals in Physics, Sound and Light
10	June PPE	Biology – Cells and Transport, Enzymes, Growth, Genetics, Evolution Chemistry – Atomic structure, Bonding, Separating mixtures, Acids, Electrolysis Physics – Motion, Forces, Energy, Waves, EM spectrum, Radioactivity
11	October PPE	Biology – Cells and Transport, Enzymes, Growth, Genetics, Evolution Chemistry – Atomic structure, Bonding, Separating mixtures, Acids, Electrolysis Physics – Motion, Forces, Energy, Waves, EM spectrum, Radioactivity
	February PPE	Biology – Ecosystems, CNS, Circulatory systems, Homeostasis, Cells, Enzymes Chemistry – Rates of Reaction, Metal Extraction, Groups and the periodic table, Fuels and the Earth, Physics – Forces and Energy, Electricity, Magnetism, EM induction, Particles and energy

Curriculum Sequencing

Year 7

Autumn term	Biology	Chemistry	Physics
Substantive Knowledge	**Cells and organisation** • Organisms • Introduction to the microscope • Proficiency with the microscope • Levels of organisation • Animal cell structures and functions • Plant cell structures and functions • Preparing a slide to observe cells • Comparing cell structure • Needs of cells • Factors affecting diffusion	**Particles, substances and mixtures** • The particle model and states of matter • Changes of state • Using a Bunsen burner • Melting and boiling points • Diffusion • Gas pressure • Pure substances and mixtures • The particle model and solutions • Conservation of mass in solutions • Saturation and solubility • Temperature and solubility • Filtration, evaporation and crystallisation • Purifying rock salt • Distillation • Chromatography • Interpreting chromatograms	**Fundamentals in Physics** • Forces cause change • Modelling and measuring forces • Balanced and unbalanced forces • Resultant forces • Forces that deform objects • Friction force • Investigating friction and lubricants • Interpreting the friction and lubricants enquiry • Energy stores • Energy pathways • Analysing energy transfers
Disciplinary Knowledge 1 Scientific Attitudes and Ways of thinking	Develop models that can represent reality, but do not show everything at once. Plan with help a scientific method where measuring is not always possible.	How scientific models can be devised to explain observations The importance of planning a systematic enquiry using a scientific method, manipulating variables.	Examples of models which are mathematical and representational. How to follow a hypothesis testing, variable manipulation method.
Disciplinary Knowledge 2 Scientific Enquiry	Classify results as observations: qualitative or quantitative, as measurements; consider if the data is 'good enough'.	What is meant by 'quantity' and how to measure certain quantities; plan the collection of data and carry it out.	Compare observations and measurements, and data; plan for repeatability and reproducibility.
Disciplinary Knowledge 3	Use qualitative data to describe patterns in the data collected using the data that supports this analysis.	Use given tables to record observations; the purpose of tables and what should be included: title, heading, units.	How to qualitatively compare energy using end-point analysis. Extract data from tables.

Analytical and Evaluative Approaches			
Disciplinary Knowledge 4 Applications of Science	How scientific advances have enabled STEM workers to develop processes, instrumentation leading to scientific researchers being able to work differently. For example, new materials for use in research, new tools and machines, making mass production possible, thus more accessible, cheaper materials, new products, made more efficiently, new medicines or medical techniques e.g., using echoes to observe foetuses in the womb, clean water to more people.		
Disciplinary Knowledge 5 Protocols for Measurement		What a 'unit' is and why they are important. Use words (and 'symbols') for units correctly. Use words (and 'symbols') for units correctly.	The units for length, time, mass, temperature, and force. The units for loudness and frequency.
Spring Term	**Biology**	**Chemistry**	**Physics**
Substantive knowledge	**<u>Organ systems</u>** • Unicellular organisms • Multicellular organisms • Gas exchange system • Inhaled and exhaled air • Digestive system • Circulatory system • Skeletal system • Joints and movement • Muscles and movement • Investigating muscle strength	**<u>Chemical Changes</u>** • Atoms and elements • Element properties • Investigating elements • Compounds • Chemical formulae • Naming compounds • Chemical reactions • Chemical reactions as rearrangement of atoms • Types of chemical reaction – oxidation • Types of chemical reaction – thermal decomposition • Representing reactions with chemical equations • Combustion reactions • Investigating conservation of mass • Exothermic and endothermic reactions	**<u>Sound and Light</u>** • Observing sound • Transmission of sound • Distance and absorption of sound • Sound reflection and scattering • Speed of sound • Sound and hearing • Observing light • Transmission of light • Reflection of light • Coloured light • Coloured objects • Reflected images • Refraction of light • Focussing • Seeing
Disciplinary Knowledge 1 Scientific Attitudes and Ways of thinking	Models representing systems and flow of materials in and out of systems are explored. Develop an understanding of planning a hypothesis testing, non-manipulative scientific method.	Models are developed further with representational flow diagrams, of pictorial and before and after diagrams. Make a prediction and ensure the planned method will collect data that could confirm the hypothesis.	Several models more models build students' range. The process to decide how a scientific method is selected (apparatus and techniques).

Disciplinary Knowledge 2 Scientific Enquiry	Observations can be primary or secondary data; how using both can improve the quality of data.	Collect data with regard to resolution and systematic error.	The importance of collecting over a range, with systematic and appropriate intervals between data points.
Disciplinary Knowledge 3 Analytical and Evaluative Approaches	Read data from given line graphs and bar charts, using it to identify and describe trends in collected data.	How to decide which headings, numbers of rows and columns to prepare in data tables. Identify and exclude anomalies from data.	Further prepare tables and collect data systematically.
Disciplinary Knowledge 4 Applications of Science	How technology advances have enabled scientific researchers to use more uniform devices e.g. lenses, and to make measurements of quantities that were too small, too large, too distant, or too difficult to resolve before. How technology advances have enabled the use of measuring instruments rather than make subjective observations e.g. digital thermometer, and to automate calculations using computers, which are less prone to mistakes and quicker.		
Disciplinary Knowledge 5 Protocols for Measurement		Use mathematical formulae to complete calculations.	Formulae: total magnification = eyepiece x objective The use of scaling prefixes. To use the 'milli', 'kilo' and 'centi' prefixes with confidence.
Summer Term	**Biology**	**Chemistry**	**Physics**
Substantive Knowledge	**<u>Life Cycles</u>** • Heredity • The genome • Variation • Discontinuous and continuous variation • Presenting data on variation • Growth and development • Adolescence and puberty in humans • Sexual reproduction in humans • Male and female reproductive systems • Fertilisation and embryo formation • Menstrual cycle and contraception • Pregnancy and foetal development • Birth • Flowers and pollination • Fertilisation and germination • Seed dispersal • Asexual reproduction	**<u>Materials</u>** • Ceramics • Polymers • Polymer properties and uses • Testing polymers • Problems with polymers • Composite materials • Selecting composite materials • Investigating composite materials	

Disciplinary Knowledge 1 Scientific Attitudes and Ways of thinking	Plan a scientific method for: range, intervals, resolution, systematic error and random error.	To consider how the same concept can be represented by different scientific models. Plan a scientific method for: range, intervals, resolution, systematic error and random error.	
Disciplinary Knowledge 2 Scientific Enquiry	Collect data with regard to managing random error.	Review data throughout its collection: if values are within estimates; if the data is likely to be trustworthy.	
Disciplinary Knowledge 3 Analytical and Evaluative Approaches	Read data from given line graphs and bar charts, using it to identify and describe trends in collected data.	Construct bar charts from their data given guidance, using data that has been processed for random error.	
Disciplinary Knowledge 4 Applications of Science	The scientific and technological developments that have increased the human population and some possible implications of it.	The implications of using raw materials in increasing amounts; using new raw materials from across the world; the impacts of polymers on society.	

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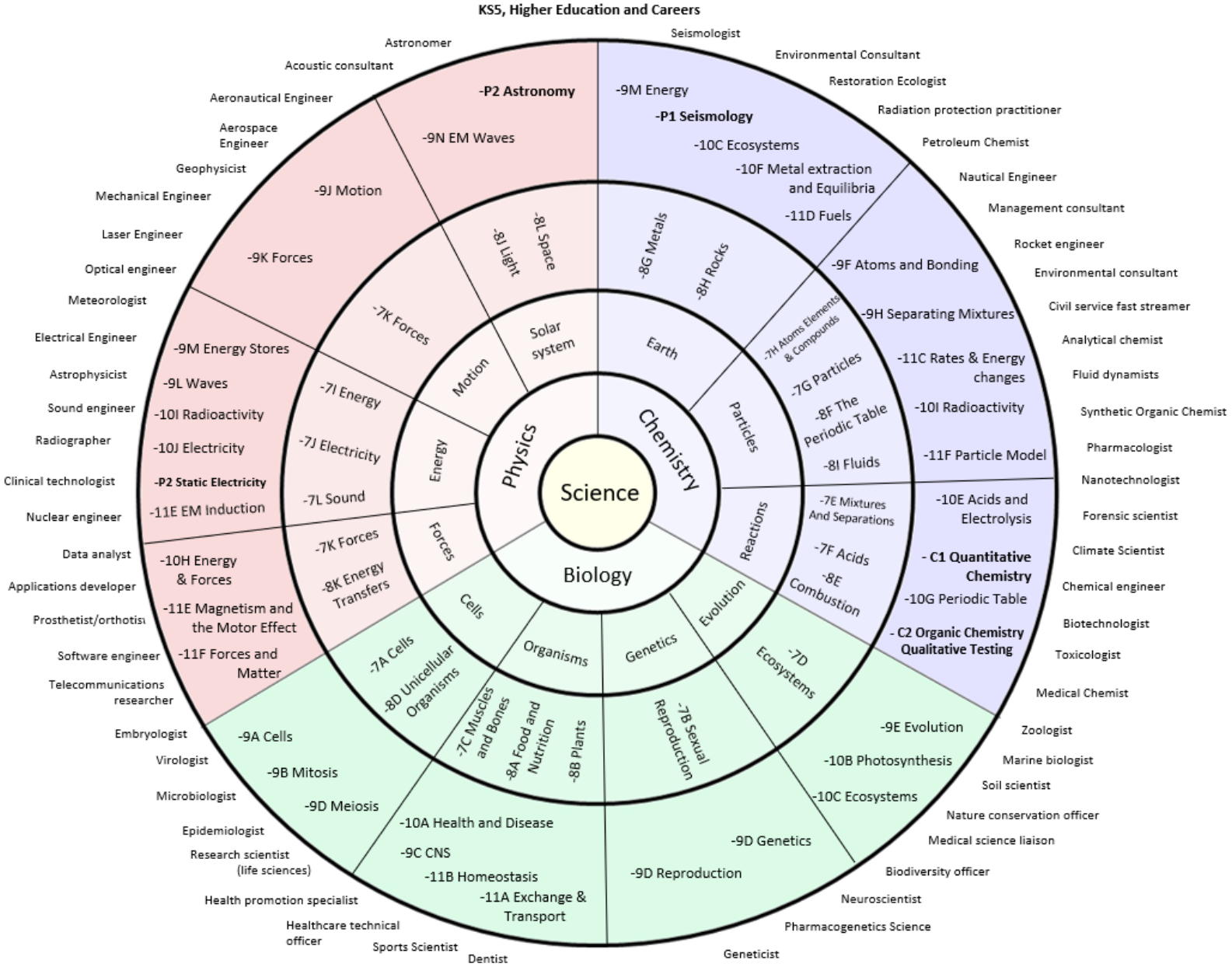
Year 8-11 Science Spiral Schemes of Work

Science 5-year Spiral Curriculum model



Disciplinary Science codes

Planning Skills

- P1 Selecting appropriate equipment
- P2 Identifying variables
- P3 Use diagrams to describe experiments
- P4 Plan basic experiments
- P5 Use theories to develop hypotheses
- P6 Select appropriate methods from a range of techniques
- P7 Select appropriate sampling techniques

Experimental Skills

- E1 Identify Risks & Hazards
- E2 Carry out basic experiments
- E3 Work safely to complete practical work
- E4 Apply sampling techniques

Analysis Skills

- A1 Record data in tables with headings
- A2 Draw simple conclusions from data
- A3 Correctly use the term accuracy
- A4 Correctly use the term precision
- A5 Correctly use the term repeatability
- A6 Correctly use the term reproducibility
- A7 Explain results & link to predictions
- A8 Evaluate methods & suggest improvements
- A9 Convert units
- A10 Complete basic calculations
- A11 Display data graphically
- A12 Estimate uncertainties of identify anomalies in data
- A13 Calculate simple statistical analysis e.g. mean average

Theoretical Understanding

- T1 Describe how theories are modified
- T2 Describe how peer review prevents misinformation
- T3 Explain science applications using real world examples
- T4 Use models to enhance learning
- T5 Know limits of science for moral & ethical issues

Disciplinary Science
Mapping 5-year Overview

	Disciplinary Skill		HSW	7A	7B	7C	7D	7E	7F	7G	7H	7I	7J	7K	7L	8A	8B	8C	8D	8E	8F	8G	8H	8I	8J	8K	8L	9A	9B	9C	9D	9E	9F	9G	9H	9I	9J	9K	9L	9M	9N	10A	10B	10C	10D	10E	10F	10G	10H	10I	10J	11A	11B	11C	11D	11E	11F
Planning	• Select appropriate equipment	P1	✓					✓	✓	✓						✓			✓				✓	✓	✓			✓					✓			✓			✓	✓	✓			✓			✓	✓			✓			✓		✓	✓
	• Identify variables	P2	✓						✓			✓		✓	✓								✓	✓		✓			✓										✓	✓	✓			✓								✓			✓		✓	✓
	• Describe experiments using diagrams	P3		✓		✓							✓	✓										✓	✓	✓		✓							✓			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓			✓			✓		✓	✓
	• Plan basic experiments	P4																	✓					✓		✓									✓			✓	✓	✓					✓	✓				✓			✓		✓	✓
	• Use theories to develop hypothesis	P5								✓	✓																✓													✓	✓										✓			✓		✓	
	• Select appropriate methods from a range of techniques	P6						✓																										✓																	✓			✓
	• Select appropriate sampling techniques	P7																																									✓													✓
Experiment	• Identify risk & hazards	E1	✓	✓					✓			✓	✓	✓		✓				✓	✓			✓	✓	✓			✓					✓			✓	✓	✓	✓	✓			✓	✓	✓	✓		✓	✓		✓	✓			✓
	• Carry out basic experiments	E2	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓				✓	✓			✓	✓	✓		✓	✓						✓			✓	✓	✓		✓	✓	✓	✓	✓	✓	✓			✓		✓	✓		✓	✓
	• Work safely to complete practical work	E3	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓				✓	✓			✓	✓	✓		✓	✓						✓			✓	✓	✓		✓			✓	✓	✓	✓			✓		✓	✓			✓
	• Apply sampling techniques	E4																																	✓									✓											✓
Analysis	• Record data in tables with headings	A1	✓				✓				✓	✓	✓	✓	✓	✓						✓		✓		✓									✓			✓	✓	✓			✓			✓	✓			✓			✓		✓	✓
	• Draw simple conclusions from data	A2	✓				✓		✓			✓	✓	✓	✓	✓							✓		✓	✓	✓		✓						✓			✓	✓	✓	✓		✓			✓		✓	✓			✓			✓
	• Correctly use the term accuracy	A3	✓																							✓			✓									✓	✓	✓					✓							✓			✓
	• Correctly use the term precision	A4	✓																							✓			✓									✓	✓	✓					✓							✓			✓
	• Correctly use the term repeatability	A5	✓											✓												✓												✓	✓	✓			✓								✓	✓			✓
	• Correctly use the term reproducibility	A6	✓																							✓												✓	✓	✓					✓							✓	✓			✓
	• Explain results & link to predictions	A7	✓											✓		✓								✓		✓	✓											✓	✓	✓							✓				✓	✓		✓	✓
	• Evaluate methods & suggest improvements	A8	✓																																								✓				✓								✓			✓
	• Convert units	A9								✓																✓			✓							✓	✓	✓	✓										✓	✓	✓				✓	✓
	• Complete basic calculations	A10	✓									✓	✓	✓	✓			✓		✓								✓							✓	✓	✓	✓		✓		✓			✓				✓	✓	✓		✓	✓		✓	✓
	• Display data graphically	A11	✓											✓												✓				✓								✓	✓			✓			✓				✓	✓	✓			✓			✓
	• Estimate uncertainties or identify anomalies in data	A12	✓																										✓							✓																				✓
	• Calculate simple statistical analysis e.g. mean averages	A13	✓																																																✓	✓			✓		✓	✓
Theory	• Describe how theories are modified	T1																		✓	✓						✓				✓	✓																				✓	✓				✓	
	• Describe how the peer review process prevents misinformation	T2																													✓	✓																									
	• Explain applications of science using real world examples	T3		✓	✓															✓		✓	✓												✓						✓		✓										✓	✓			✓	✓	✓
	• Use models to enhance learning	T4								✓	✓		✓					✓			✓	✓			✓		✓					✓	✓	✓	✓	✓										✓	✓						✓	✓	✓		✓	✓	✓
	• Know limits of science in terms of moral & ethical issues	T5		✓	✓							✓						✓		✓											✓	✓	✓							✓														✓		✓			

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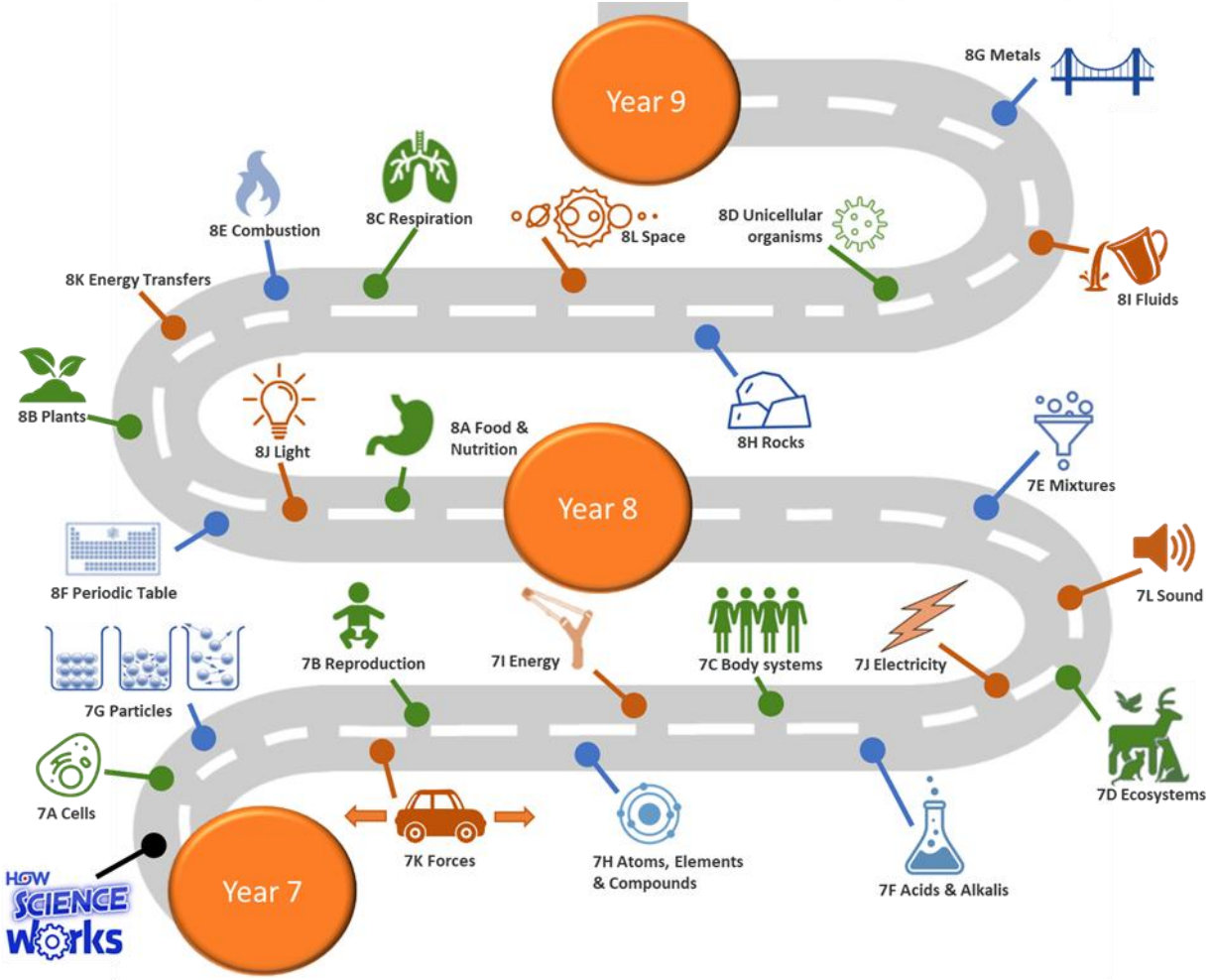
Year 8 Science Scheme of Work



Year 8 Science Outline Scheme of Work

Week	W/C	Lesson 1	Lesson 2	Lesson 3
1	1-Sep-25			Topic 1.1
2	8-Sep-25	Topic 1.2	Topic 1.3	Topic 1.4
3	15-Sep-25	Topic 1.5	EW / I	Topic 1 Test
4	22-Sep-25	Topic 1 Intv	Topic 2.1	Topic 2.2
5	29-Sep-25	Topic 2.3	Topic 2.4	Topic 2.5
6	6-Oct-25	EW / I	Topic 2 Test	Topic 2 Intv
7	13-Oct-25	Topic 3.1	Topic 3.2	Topic 3.3
8	20-Oct-25	spare	spare	spare
	27-Oct-25			
9	3-Nov-25	Topic 3.4	Topic 3.5	EW / I
10	10-Nov-25	Topic 3 Test	Topic 3 Intv	Topic 4.1
11	17-Nov-25	Topic 4.2	Topic 4.3	Topic 4.4
12	24-Nov-25	Topic 4.5	EW / I	Topic 4 Test
13	1-Dec-25	Topic 4 Intv	Topic 5.1	Topic 5.2
14	8-Dec-25	Topic 5.3	Topic 5.4	Topic 5.5
15	15-Dec-25	spare	spare	spare
	22-Dec-25			
	29-Dec-25			
16	5-Jan-26	EW / I	Topic 5 Test	Topic 5 Intv
17	12-Jan-26	Topic 6.1	Topic 6.2	Topic 6.3
18	19-Jan-26	Topic 6.4	Topic 6.5	EW / I
19	26-Jan-26	Topic 6 Test	Topic 6 Intv	Topic 7.1
20	2-Feb-26	Topic 7.2	Topic 7.3	Topic 7.4
21	9-Feb-26	spare	spare	spare
	16-Feb-26			
22	23-Feb-26	Topic 7.5	EW / I	Topic 7 Test
23	2-Mar-26	Topic 7 Intv	Topic 8.1	Topic 8.2
24	9-Mar-26	Topic 8.3	Topic 8.4	Topic 8.5
25	16-Mar-26	Topic 8.5	EW / I	Topic 8 Test
26	23-Mar-26	Topic 8 Intv	Topic 9.1	Topic 9.2
	30-Mar-26			
	6-Apr-26			
27	13-Apr-26	spare	spare	spare
28	20-Apr-26	Topic 9.3	Topic 9.4	Topic 9.5
29	27-Apr-26	EW / I	Topic 9 Test	Topic 9 Intv
30	4-May-26	Topic 10.1	Topic 10.2	Topic 10.3
31	11-May-26	Topic 10.4	Topic 10.5	Topic 10 Test
32	18-May-26	Topic 10 Intv	Topic 11.1	Topic 11.2
	25-May-26			
33	1-Jun-26	Revision & EOY 1		
34	8-Jun-26	Topic 11.3	Topic 11.4	Topic 11.5
35	15-Jun-26	EW / I	Topic 11 Test	Topic 11 Intv
36	22-Jun-26	Topic 12.1	Topic 12.2	Topic 12.3
37	29-Jun-26	Topic 12.4	Topic 12.5	Topic 12 Test
38	6-Jul-26	Topic 12 Intv	spare	spare
39	13-Jul-26	spare	spare	spare

Lesson 1-5	Content delivery
Lesson 6	Ext Write / Interrupt
Lesson 7	Topic test
Lesson 8	Test Intervention

Year 8 Rotation 1

Class set	Topic 1	Topic 2	Topic 3
1/2	8J Light	8F The Periodic Table	8A Food & Nutrition
3/4	8A Food & Nutrition	8J Light	8F The Periodic Table
5	8F The Periodic Table	8A Food & Nutrition	8J Light

Year 8 Rotation 2

Class set	Topic 4	Topic 5	Topic 6
1/2	8K Energy Transfers	8E Combustion	8B Plants & their Reproduction
3/4	8B Plants & their Reproduction	8K Energy Transfers	8E Combustion
5	8E Combustion	8B Plants & their Reproduction	8K Energy Transfers

Year 8 Rotation 3

Class set	Topic 7	Topic 8	Topic 9
1/2	8L Earth & Space	8H Rocks	8C Breathing & Respiration
3/4	8C Breathing & Respiration	8L Earth & Space	8H Rocks
5	8H Rocks	8C Breathing & Respiration	8L Earth & Space

Year 8 Rotation 4

Class set	Topic 10	Topic 11	Topic 12
1/2	8I Fluids	8G Metals & their uses	8D Unicellular Organisims
3/4	8D Unicellular Organisims	8I Fluids	8G Metals & their uses
5	8G Metals & their uses	8D Unicellular Organisims	8I Fluids

8J Light	8F The Periodic Table	8A Food & Nutrition
Light on the Move	Dalton's Model	Uses of Nutrients
Reflection	Chemical Properties	Food Tests
Refraction	Mendeleev's Table	Balanced Diets
Cameras and Eyes	Physical Trends	Digestion
Colours	Chemiscal Trends	Absorbtion
8K Energy Transfers	**8E Combustion**	**8B Plants & their Reproduction**
Energy & Temperature	Burning Fuels	Classification
Conduction	Conservation of mass	Reproduction
Convection	Fire Safety	Flower Structure
Radiation	Air Pollution	Pollination
Insulation	Global Warming	Preventing Germination
8L Earth & Space	**8H Rocks**	**8C Breathing & Respiration**
The 4 Seasons	Wegners Theory	Breathing
Magnetic Earth	Igneous Rocks	Aerobic Respiration
Gravity & Space	Sedimentary Rocks	Gas Excahnges
Solar system	Metamorphic Rocks	Lack of Oxygen
Beyond Space	The Rock cycle	Anaerobic Respiration
8I Fluids	**8G Metals & their uses**	**8D Biodiversity**
Particle Model	Properties of Metals	Unicellular or Multicellular
Changes of State	Corrosion of Metals	Fungi
Fluid Pressures	Reactions with Water	Bacteria
Floating & Sinking	Reactions with Acids	Protocists
Drag	Chemical equations	Carbon cycle & Decomposition

8A Food & Nutrition

Key vocabulary

- Malnutrition
- Enzymes
- Protease
- Carbohydrase
- Lipase
- Soluble
- Insoluble
- Egestion

Common Misconceptions

- Malnutrition – is not just too little of a nutrient
- Food travels through the trachea

Prior Learning

Year 4 - Describe the basic parts of the human digestive system
7A - Cells, Organs & Organ systems - Identify & Describe function of parts of the human digestive system
7C – Muscles & Bones – Describe aerobic respiration using word equations

Cross curricular links

- PE – Essential Nutrients
- Health & Social care - Health

Assessment Strategies

- 8A - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10A Health & Disease
- 10C Ecosystems
- 11A Transport mechanisms

Disciplinary Science

- P1 / E1 / E2 / E3 / A1/ A2 / A7

	8A – Food and Nutrition What you need to be able to do:	Maths
Developing	Recall why we need food	
	Recall the names of the nutrients in food	
	Recall some good sources of carbohydrates, fats, proteins and fibre	
	Describe the general uses of carbohydrates, fats (lipids), proteins, vitamins and minerals by the body	
	Explain the benefits of a balanced diet and correctly use the term: malnutrition	
	Describe the functions of the organs in the human digestive system	
	Recall where digested food enters the blood	
	Explain how diffusion occurs in terms of movement of particles	
Secure	Describe tests for fat and starch	
	Explain why body mass changes if energy input does not match energy output	3a
	Describe the effects of obesity on health	
	Recall and identify examples of deficiency diseases	
	Describe what happens during ingestion, absorption and egestion	
	Explain how food is moved through the digestive system	
	Explain how the cells in the small intestine are adapted to absorb nutrients quickly	
Exceeding	Interpret results from food tests for sugars	
	Describe the roles of vitamin A, vitamin C, calcium and iron in the body	
	Describe the causes and control of Type 2 diabetes	
	Evaluate different models of basic enzyme action	
	Explain how bile helps in the digestion of lipids	

Lesson1 | Lesson 2 | Lesson 3 | Lesson 4 | Lesson 5

Core Knowledge

- Recall sources & uses of the 7 essential nutrients
- Describe tests to identify the nutrients foods
- Describe the effect of diet deficiencies on health
- Describe the role of organs in the digestive system
- Describe how nutrients are absorbed by the small intestine

1	Arithmetic and numerical computation
a	Recognise and use expressions in decimal form
b	Recognise and use expressions in standard form
c	Use ratios, fractions and percentages
d	Make estimates of the results of simple calculations
2	Handling data
a	Use an appropriate number of significant figures
b	Find arithmetic means
c	Construct and interpret frequency tables and diagrams, bar charts and histograms
d	Understand the principles of sampling as applied to scientific data
e	Understand simple probability
f	Understand the terms mean, mode and median
g	Use a scatter diagram to identify a correlation between two variables
h	Make order of magnitude calculations
3	Algebra
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
b	Change the subject of an equation
c	Substitute numerical values into algebraic equations using appropriate units for physical quantities
d	Solve simple algebraic equations
4	Graphs
a	Translate information between graphical and numeric form
b	Understand that $y = mx + c$ represents a linear relationship
c	Plot two variables from experimental or other data
d	Determine the slope and intercept of a linear graph
e	Draw and use the slope of a tangent to a curve as a measure of rate of change
f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate
5	Geometry and trigonometry
a	Use angular measures in degrees
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects
c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes

8B Plant Reproduction

Key vocabulary

- Species
- Hybrid
- Biodiversity
- Autotroph
- Saphrophyte
- Heterotroph
- Pollination
- Germination

Assessment Strategies

- 8B - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9A Cells
- 9E Evolution
- 10B Plants & Photyosyn'sis
- 10C Ecosystems

Common Misconceptions

- Plants obtain their energy directly from the sun – rather than producing sugars for respiration
- Leaves take in water

Prior Learning

Year 3 - explore life cycle of flowering plants, pollination, seed formation & dispersal
Year 6 - Recognise living things produce offspring of the same kind, but not normally identical to their parents
7A – Cell specialisation
7B – Reproduction systems
7D - Adaptations

Cross curricular links

- Health & Social care - reproduction

	8B – Plant Reproduction What you need to be able to do:	Math
Developing	Describe the key characteristics of the five kingdoms of organisms and use this to assign organisms to their kingdoms	
	Describe how the fusing of gametes (sex cells) and their nuclei during fertilisation form a fertilised egg cell	
	Correctly use the terms species and hybrid	
	Use flower structure and pollen shape to identify wind-pollinated and insect-pollinated flowers	
	Describe the events that occur after pollination leading to fertilisation	
	State the word equation for photosynthesis including reactants and products	
Secure	Identify the genus and species names from a binomial name	
	Explain why preserving biodiversity is important	
	Explain the difference in outcomes of asexual and sexual reproduction in plants	
	Describe how the structures of a flower are adapted to their functions	
	Explain the functions of the different parts of a seed	
	Explain the importance of seed dispersal	
	Explain the importance of pollination for the production of foods	
	Describe how leaves are adapted for the process of photosynthesis	
	Describe examples of interdependence and explain how changes in a population or community in an ecosystem affect other populations	
	Explain how and why some seeds are prevented from germinating until a certain time	
Exceeding	Evaluate the advantages and disadvantages of sexual and asexual reproduction in plants in different conditions	
	Explain the production of seedless fruits using hybridisation	
	Describe how life on earth depends on light for photosynthesis	
	Explain the importance of light/darkness for some seeds and their germination.	

Lesson1 **Lesson 2** **Lesson 3** **Lesson 4** **Lesson 5**

Core Knowledge

- Recall the 5 kingdoms & 3 domains of classification
- Describe the production of fertilised egg cells
- Describe Photosynthesis using word equations
- Identify differences between wind & insect pollinated plants
- Explain what causes seeds to germinate

Disciplinary Science

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8C Breathing & Respiration

Key vocabulary

- Alveoli
- Diffusion
- Trachea
- Mitochondria
- Haemoglobin
- Aerobic
- Anaerobic
- Cytoplasm

Assessment Strategies

- 8C - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10B Plants & Photosyn'sis
- 11A Circulatory system

Disciplinary Science

- A10 / T4 / T5

Common Misconceptions

- Breathing is the same as respiration
- Air enters the lungs through the oesophagus

Prior Learning

Year 6 - Identify & Describe function of parts of the human circulatory system

7A - Cells, Organs & Organ systems - Identify & Describe function of parts of the human circulatory system

7C – Muscles & Breathing – Structure and function of circulatory system

Cross curricular links

- PE - Respiration
- Health & social care

	8C - Breathing and Respiration What you need to be able to do:	Maths
Developing	Recall what happens in respiration	
	Describe how muscles attached to ribs and the diaphragm produce breathing movements and use a model to explain how lungs expand and contract	
	Describe the effects of nicotine, tar and carbon monoxide in tobacco smoke	
	Describe ways in which respiration can be detected	
	Recall what happens in anaerobic respiration in humans	
Secure	Model aerobic respiration using a word equation	
	Explain how the lungs are adapted for efficient gas exchange	
	Explain the changes in heartbeat and breathing rate during exercise	
	Describe how gas exchange occurs in plants	
	Model anaerobic respiration using a word equation	
	Describe how lactic acid is removed from tissues	
Exceeding	Evaluate the use of a word equation to model aerobic respiration	
	Explain how and why a concentration gradient is maintained for oxygen and carbon dioxide between the blood and lungs	
	Explain why exercise is recommended to help people with cardiovascular disease	
	Compare the efficiencies of different gas exchange organs	
	Explain the effects of poisons that disrupt certain metabolic processes	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Describe process of pulmonary ventilation
- Describe the process of aerobic respiration
- Describe gas exchange in plants & animals
- Describe effects of smoking on health
- Describe the process of anaerobic respiration

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8D Biodiversity

Key vocabulary

- Unicellular
- Multicellular
- Prokaryote
- Eukaryote
- Mitochondria
- Chloroplasts
- Diffusion
- Fermentation
- Ecosystems

Assessment Strategies

- 8D - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9A Cells
- 9E Evolution
- 10C Ecosystems
- 11A Circulatory system

Disciplinary Science

- P1 / P4

Common Misconceptions

- Organisms grow because cells get larger
- Prokaryotes don't contain genetic information
- Eukaryotes must always be multicellular

Prior Learning

7A - Describe cell structure
7B - Describe process of reproduction
7D – Ecosystems – identify habitats
8B - Classify organisms by kingdoms and domains & Plants photosynthesising
8C – Describe aerobic and anaerobic respiration

Cross curricular links

- PE - Respiration
- Geography - Habitats

	8D – Biodiversity What you need to be able to do:	Maths
Developing	State the meaning of: multicellular, unicellular	
	State which organism are Unicellular	
	Describe how to use a quadrat in sampling	
	Describe the conditions needed for decay	
	Describe, identify and state the basic functions of the parts of a bacterial cell	
	Define feeding relationships in terms of energy flow	
	Calculate a mean number of species through sampling techniques	2b
	Give examples of decomposer microorganisms	
	Explain the importance of decomposers in an ecosystem	
Secure	To explain why energy is lost at each food chain	
	Calculate an estimate number of species using the quadrat technique	1d
	Explain why bacteria grow well in certain conditions	
	Describe how bacteria multiply by binary fission	
	Explain the functions of light and chlorophyll in photosynthesis	
	Predict how changes in physical and biological factors will affect carbon supply in an ecosystem	
Exceeding	Explain how bioaccumulation can have an effect of food chains	
	Apply microbial growth rates to growth curves of other organisms	4a, 4b, 4d
	Describe how Gram staining works and use results to identify differences between bacteria	
	Explain how eutrophication occurs and the problems associated with eutrophication in an aquatic environment	
	Explain ways in which decay can be prevented, such as freezing, refrigeration, drying, canning, salting, jamming, pickling and pasteurisation	

Lesson1 **Lesson 2** **Lesson 3** **Lesson 4** **Lesson 5**

Core Knowledge

- Classify microorganisms using characteristics
- Describe reproduction in microorganisms
- Describe how bacteria reproduce
- Describe energy flow in terms of food chains
- Describe the role of decomposers in the carbon cycle

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8E Combustion

Key vocabulary

- Fuel
- Combustion
- Hydrocarbon
- Oxidation
- Pollution
- Fossil fuel
- Global warming
- Climate change
- Exothermic reaction

Assessment Strategies

- 8E - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9I Chem Calculations
- 11C Energy Changes
- 11D Hydrocarbons

Disciplinary Science

- E1 / E2 / E3 / A1/ T1 / T3

Common Misconceptions

- Mass is not always conserved during chemical reactions
- Global warming, greenhouse effect and climate change are all the same thing

Prior Learning

Year 5 - Explain some irreversible changes form new materials including burning
7H - Atoms, Elements & Compounds - Describe reactions using word equations
7I – Energy - Recall fossil fuels as energy sources and burning fossil fuels causes the planet's atmosphere to warm

Cross curricular links

- Geography – Acid rain & Climate change

	8E - Combustion What you need to be able to do:	Maths
Developing	State the meaning of: fuel, combustion	
	State the meaning of hydrocarbon	
	Describe the tests for carbon dioxide and water	
	State what happens to mass in a chemical reaction	
	State the meaning of oxidation	
	Name the three sides of the fire triangle	
	Recall examples of non-metal oxide pollutants caused by burning fossil fuels & their impurities	
	Recall some effects of global warming, climate change	
Secure	Describe how rocket engines obtain enough oxygen in space to explode	
	Compare and contrast the oxygen and phlogiston theories for combustion	
	Describe the reactions of metals with oxygen	
	Describe what is meant by exothermic changes	
	Compare the temperature rise of water when some fuels are burnt	4a
	Describe the products formed by the combustion of hydrocarbons and issues they cause	
	Describe how sulphur dioxide and nitrogen oxides help to cause acid rain	
	Describe how vehicle catalytic converters work (to reduce pollution from fossil fuel combustion)	
	Describe how carbon dioxide helps to cause the greenhouse effect.	
Exceeding	Explain the term oxidising agent and why rockets use them	
	Explain the change in mass seen in reactions.	
	Evaluate the evidence used to displace the phlogiston theory of combustion.	
	Evaluate data on burning fuels to deduce the best energy per gram of fuel.	1c, 4a
	Evaluate ways in which pollution from non-metal oxides can be reduced	
	Evaluate the link between global temperature and levels of carbon dioxide in the atmosphere.	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Describe combustion using a word equation
- Recall what oxidation means
- Recall the sides of the fire triangle
- Describe formation of acid rain due to hydrocarbon combustion
- Describe the link between CO_2 and global temperatures

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8F The Periodic Table

Key vocabulary

- Element
- Compound
- Molecule
- Metal
- Non-metal
- Periodic Table
- Atomic mass
- Physical property
- Chemical property

Common Misconceptions

- Compounds are found on the periodic table
- Solid/Liquid or Liquid/Gas State changes occur at different temperatures
- Pure substances can be split

Prior Learning

Year 5 – Compare materials based on properties, including their hardness, solubility, transparency & conductivity

7G – Recall that all matter is made from atoms

7H - Describe how atoms can react together to form compounds & changes in energy alter the state observed

Cross curricular links

- DT – Construction Materials

Assessment Strategies

- 8F - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9F Atomic structure
- 9I Chem Calculations
- 10G Groups of the Periodic Table

	8F - The Periodic Table What you need to be able to do:	Maths
Developing	Recall that different elements have different physical properties	
	Identify the chemical symbols for some common elements and vice versa	
	Explain the difference between physical and chemical properties of a substance	
	Describe simple chemical reactions using word equations	
	Identify the alkali metals, halogens, T-metals and noble gases	
	Predict the state of a substance at a given temperature.	
	Identify metals and non-metals by their physical properties	
	Identify metals & non-metals using the periodic table	
	Describe reactions of metals & non-metals with water and oxygen	
Secure	Describe the differences between an element & a compound	
	Describe complex chemical reactions using word equations	
	Calculate simple chemical formulae from information on structure	
	Describe how the periodic table is arranged	
	Use data to identify trends in physical properties within a group	
	Identify a pattern in reactivity between some alkali metals and water	
Exceeding	Use information about reaction ratios to calculate atomic masses	2a
	Use the valency of elements to deduce the formula of compounds	
	Explain differences between the Modern and Mendeleev's periodic tables	
	Describe the difference between molecules and giant lattice structures	

Lesson1 **Lesson 2** **Lesson 3** **Lesson 4** **Lesson 5**

Core Knowledge

- Identify common chemical symbols for elements
- Describe simple chemical reactions using word equations
- Identify names groups in the periodic table
- Use properties to predict if substances are metals/ non-metals
- Identify reactivity patterns for alkali metals in water

Disciplinary Science

- E1 / E2 / E3 / T1 / T4

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8G Metals & their Uses

Key vocabulary

- Malleable
- Ductile
- Sonorous
- Corrosion
- Rusting
- Rate
- Oxidation
- Sacrificial
- Catalyst

Assessment Strategies

- 8G - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 8F Periodic table
- 9F Atomic structure
- 9G Properties of Metals
- 10F Metal extraction

Disciplinary Science

- A1/ T3 / T4

Common Misconceptions

- All metals are magnetic
- Corrosion only requires oxygen to occur
- Some metals/alloys never corrode
- Balancing equations is hard

Prior Learning

Year 5 – Compare materials based on properties, including their hardness, solubility, transparency & conductivity

7H – Atoms, Elements & Compounds – Identify metals & non-metals from the periodic table

7F – Acids & Alkalis – Describe reactions to form named salts

Cross curricular links

- DT – selecting materials

	8G - Metals and their uses What you need to be able to do:	Maths
Developing	Recall some common properties of metals and non-metals	
	Relate the uses of different elements to their properties	
	Describe the corrosion of metals by reactions with oxygen	
	Describe the reactions of acids with metals	
	State the meaning of rusting	
	Recall ways in which iron can be prevented from rusting	
	Describe the reactions of different metals with water	
Secure	Name the compounds formed by a reaction between a metal and a non-metal	
	Describe how catalysts affect the speed or rate of a reaction	
	Model simple oxidation reactions using word equations	
	Explain how barrier methods protect iron from rust	
	Identify and explain the products formed by the reactions of metals with water	
	Model simple reactions of metals and water as well as metal and acids using word equations	
	Use information on the reactions of metals with water to place them in an order of reactivity	
Exceeding	Use valency's to deduce the formula of simple 2 element compounds including T-metals	
	Model simple reactions using balanced symbol equations	
	Use ideas about reactivity to explain how sacrificial metals can protect iron from rusting	
	Write and derive the formulae for common acids and simple salts	
	Model simple reactions using balanced symbol equations	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Explain links between metallic properties to their uses
- Describe ways in which rusting may be prevented
- Place metals into an order of reactivity with water and acids
- Name salts produced during reactions with acids
- Balance simple chemical reactions

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g	Use a scatter diagram to identify a correlation between two variables
h	Make order of magnitude calculations
3	**Algebra**
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
b	Change the subject of an equation
c	Substitute numerical values into algebraic equations using appropriate units for physical quantities
d	Solve simple algebraic equations
4	**Graphs**
a	Translate information between graphical and numeric form
b	Understand that $y = mx + c$ represents a linear relationship
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d	Determine the slope and intercept of a linear graph
e	Draw and use the slope of a tangent to a curve as a measure of rate of change
f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate
5	**Geometry and trigonometry**
a	Use angular measures in degrees
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects
c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes

8H Rocks

Key vocabulary

- Igneous
- Sedimentary
- Metamorphic
- Weathering
- Minerals
- Fossil
- Ore
- Extraction
- Core/Mantle/Crust

Common Misconceptions

- All rocks are the same
- Rocks and minerals are the same
- There is an inexhaustible amount of metal in the ground

Prior Learning

Year 3 - compare and group together different kinds of rocks based on appearance & simple physical properties

Year 3 - Describe in simple terms how fossils are formed

Year 3 - Recognise that soils are made from rocks and organic matter

7H - Identify metals in P- table

Cross curricular links

- Geography – Continental drift
- Physics – Convection currents

Assessment Strategies

- 8H - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9G Properties of Metals
- 10F Metal Extraction
- 11F Particles & Energy
- Chemistry - Corrosion

Disciplinary Science

- P2 / A2 / T3

	8H - Rocks What you need to be able to do:	Maths
Developing	Recall why different rocks have different properties	
	Recall some examples of rocks with different textures	
	Recall that the Earth consists of a core, mantle and crust	
	Describe how igneous rocks are formed	
	Describe how metamorphic rocks are formed	
	Describe the effect of physical and biological weathering on rocks	
	Recall how weathered rocks are eroded & explain how fragments get worn down during transport	
	Describe how sedimentary rocks are formed	
	Recall how some elements are found in their native states	
Secure	Explain why certain rocks are used for certain applications	
	Use crystal size to classify igneous rocks as intrusive and extrusive	
	Explain the variation in crystal size in an igneous intrusion, in terms of cooling rate	
	Describe how weathering can break up rocks	
	Describe how fossils are formed	
	Use the rock cycle model to link the formation of igneous, sedimentary and metamorphic rocks	
	Recall how metals are extracted from ores taken from the Earth's crust	
	Evaluate the environmental effects of quarrying and mining	
Exceeding	Interpret formulae to identify the types of, and ratios of, atoms in a compound	1c
	Compare the densities of igneous rocks and relate them to the minerals contained in the rocks	
	Describe features in limestone landscapes and relate them to the way they were formed	
	Compare quantitative data about the effect of speed on the size of grain that can be transported	
	Explain why the method used to extract a metal is related to its position in the reactivity series and the cost of the extraction process	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Describe how rocks are extracted from the Earth
- Describe the formation of igneous rocks
- Describe the effects of weathering on rocks
- Describe the formation of sedimentary rocks
- Describe the formation of metamorphic rocks

1	**Arithmetic and numerical computation**
a	Recognise and use expressions in decimal form
b	Recognise and use expressions in standard form
c	Use ratios, fractions and percentages
d	Make estimates of the results of simple calculations
2	**Handling data**
a	Use an appropriate number of significant figures
b	Find arithmetic means
c	Construct and interpret frequency tables and diagrams, bar charts and histograms
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8I Fluids

Key vocabulary

- Volume
- Mass
- Density
- Fluid
- Balanced
- Friction
- Drag / Air resistance
- Streamlined
- Pressure

Disciplinary Science

- P1 / P2 / P3 / P4 / E1 / E2 / E3 / A1/ A7

Assessment Strategies

- 8I - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9J Motion
- 9K Forces
- 10H Forces & Energy
- 11F Particles & Energy

Common Misconceptions

- Gases don't have mass
- Expansion is caused by particles increasing in size
- Objects float due to low mass
- State changes only apply to water

Prior Learning

Year 5 - Explain that unsupported objects fall to Earth due to gravity & identify the effects of air/water resistance & friction on objects
7K - Forces – Types and Balanced/Unbalanced forces
7G - Particle Model – Particle arrangements in 3 States & pressure model

Cross curricular links

- DT – Air resistance
- 9H Chemistry - States/Matter

	8I Fluids What you need to be able to do:	Maths
Developing	State the properties of the three states of matter in terms of shape, volume, and compressibility	
	Identify some consequences of changing the temperature of objects or substances, such as structures expanding or contracting	
	State what is meant by density and recall its units and the factors that affect it	
	Recall that pressure in a fluid changes with depth	
	Recall the different changes of state	
	Recall that a change of state of a pure substance takes place at a constant temperature	
	Define streamlines/aerodynamic	
	Identify shapes that will reduce drag	
	Identify forces that affect if an object floats or sinks	
Secure	Describe a substance as pure or impure form a heating/cooling curve	
	Describe how to measure the volume of regular and irregular objects	3b, 3c
	Describe how temperature affects pressure	
	Explain why pressure in a fluid increases with depth	
	Describe the effects of balanced forces in simple situations	
	Describe how drag changes with speed	
	Describe the ways in which the size of drag forces can be changed	
Exceeding	Calculate the density of objects	3b, 3c
	Explain what happens to particles and temperature during changes of state, in terms of energy and forces	
	Explain why pressure in a fluid increases with depth	
	Use the particle model of matter to explain why gas pressure changes with temperature, number of particles and volume	
	Use ideas about density changes to explain how a hot air balloon flies/how the depth of a submarine is controlled	
	Explain why objects float	
	Explain why a vehicle needs a force from the engine to keep moving at a constant speed	

Lesson1 **Lesson 2** **Lesson 3** **Lesson 4** **Lesson 5**

Core Knowledge

- Calculate the density of an object
- Describe particle energy & arrangements during state changes
- Describe pressure in gases/ liquids using the particle model
- Explain why objects float
- Describe how drag affects objects

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8J Light

Key vocabulary

- Reflection
- Refraction
- Opaque
- Transparent
- Translucent
- Incidence
- Normal
- Spectrum
- Pupil / Retina

Common Misconceptions

- White light is different to coloured light
- Paint mixing or colours of light give the same results
- Heat rises

Prior Learning

Year 6 – Recall light travels in straight lines

Year 6 - Explain that objects are seen because they give out or reflect light into the eye

Year 6 - Explain why shadows have the same shape as the objects that cast them due to light travelling only in straight lines

Cross curricular links

- DT – Total Internal Reflection
- English – Descriptive Language

Assessment Strategies

- 8J - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9L Waves
- 9M EM Waves
- Physics - Astronomy

	8J - Light What you need to be able to do:	Maths
Developing	Recall that light travels in straight lines and can pass through empty space	
	Use the ray model of light to explain how we see things that are not sources of light and to explain how shadows are formed	
	Describe the difference between even reflection and scattering, and recall the law of reflection	
	Recall that light, sound travels at different speeds in different materials	1b,2a
	Identify the parts of the eye (including rods and cones) and state their functions	
	Recall the colours of the visible spectrum, in order	
	State the meaning of focal length, focus, and principal axis	
Secure	Use a ray diagram to explain how shadows are formed and to explain image formation in pinhole cameras	
	State the meaning of: diffuse, specular, incident ray, reflected ray	
	Use ray diagrams to explain the law of reflection and to describe the differences in light reflected from smooth and rough surfaces	
	Explain why refraction occurs	5a
	Explain why coloured objects appear coloured	
	Identify which parts of the eye cause refraction of light and describe how light is focused on the retina	
	Describe how secondary colours of white light can be made from primary colours of light	
	Explain how filters can be used to make coloured light	
	Explain why objects look different in light of different colours	
Exceeding	Use ray diagrams to model and explain the effect of hole size on the image formed by a pinhole camera	
	Use ray diagrams to explain some of the features of images in periscopes	
	State the meaning of: total internal reflection and critical angle	
	Describe the causes and effects of long-sight and short-sight & how different types of lens are used to correct these defects	
	Explain how different types of lens are used to correct long-sight and short-sight	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Describe how light travels
- Recall different types of reflection
- Describe how refraction occurs
- Describe the function of the eye
- Explain why objects appear coloured

Disciplinary Science

- P1 / P3 / E1 / E2 / E3 / A2 / T4

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8K Energy Transfers

Key vocabulary

- Heat
- Temperature
- Joules
- Conduction
- Convection
- Radiation
- Absorb / Absorption
- Reflect / Reflection
- Emit / Emission
- Insulate

Disciplinary Science

- P1 / P2 / P3 / P4 / E1 / E2 / E3 / A1-7 / A9 / A11

Assessment Strategies

- 8K - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9M Energy
- 9N EM Waves
- 11F Particles & Energy

Common Misconceptions

- Temperature & Heat are the same
- At temperatures below 0°C particles have no energy and particles stop moving
- Black is only absorbing colour

Prior Learning

Year 6 – Light travels in straight lines through space

7G – Particle Model – Particle model of the three states of matter

7I - Energy – Describe thermal store and heating / radiation transfers

8J - Light – EM radiation transfers as radiation

Cross curricular links

- DT – Selecting Materials
- 9F – Chem – Heat Conduction

	8K - Energy Transfers What you need to be able to do:	Maths
Developing	Recall some units for measuring temperature	
	State how internal energy and temperature are different	
	Identify the direction in which energy will be transferred in given circumstances	
	Recall examples of common thermal conductors and insulators	
	Recall how heat is transferred in conduction, convection and radiation	
	Recall ways of reducing energy transfer	
Secure	Describe how evaporation affects energy of a liquid	
	Describe how colour can affect temperature	
	Describe how energy is transferred in conduction	
	Describe how energy is transferred in convection	
	Describe how energy is transferred in radiation	
	Convert between the Kelvin and Celsius scales	1a, 1c
	Use data to consider cost efficiency by calculating payback times	1a, 1c
Exceeding	Explain the causes and effects of wind chill	
	Explain ways of increasing or decreasing energy transfer by conduction, convection, radiation and evaporation	
	Apply the idea of different colours being good or poor emitters or absorbers	4a
	Use the particle model of matter to explain energy transfer by evaporation from a surface	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Explain the difference between heat & temperature
- Describe heat transfers in solids
- Describe heat transfers in fluids
- Calculate efficiencies for devices using data
- Calculate payback times using data

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8L Earth & Space

Key vocabulary

- Solar system
- Orbit
- Hemisphere
- Equator
- Magnetic field
- Attraction
- Repulsion
- Satellite
- Galaxy
- Universe

Common Misconceptions

- Seasons are due to distance from the sun
- Our Sun and stars are different
- All stars are the same size
- Magnetic North pole location

Prior Learning

Year 5 - Describe the movement of the Earth, and other planets, relative to the Sun in the solar system

Year 5 - Describe the movement of the Moon relative to the Earth

Year 5 - Describe the Sun, Earth and Moon as approximately spherical bodies

Cross curricular links

- Geography – Magnetic poles

Assessment Strategies

- 8L - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9L Waves
- 10H Forces & Energy
- 11E Magnetism
- Physics - Astronomy

	8L Earth and Space What you need to be able to do:	Maths
Developing	State how we see the Moon	
	State the planets of the solar system in order	
	Describe differences in the seasons in terms of day length and the height of the Sun	
	Explain the changes in day length and height of the Sun in terms of the tilt of the Earth's axis	
	State what is meant by a magnetic field and recall the shape of the field of a bar magnet	
	Recall the direction in which gravity acts	
	State how to arrange two magnets so that they attract or repel each other	
	State the meaning of: Moon, planet, Sun, star, galaxy, Universe	
	State the meaning of a light year	
Secure	Describe the different sections of our solar system	
	Describe how the Earth, Moon and planets move	
	Describe the effect of the tilt of the Earth's axis on the energy received from the Sun	
	Describe how a plotting compass can be used to show the shape and direction of a magnetic field	
	Describe the shape of the magnetic field between two bar magnets in different arrangements	
	Describe how mass and distance affect the strength of gravity	
	Use gravitational field strength to calculate weights	3c
	Describe why the moon has phases	
Exceeding	Explain how technological developments have increased our knowledge of the universe	
	Compare the geocentric and heliocentric models of the Solar System	
	Use a model to explain why we have partial and total solar eclipses	
	Use a model to explain why the height of the Sun at noon & hours of daylight vary with latitude	
	Explain why the weight of an object changes if taken to the Moon, but not its mass	
	Explain why the speed of a planet changes as it moves around its orbit	
	Explain how the Earth's magnetic field protects the planet	

Lesson1 | **Lesson 2** | **Lesson 3** | **Lesson 4** | **Lesson 5**

Core Knowledge

- Compare the geocentric and heliocentric models
- Describe why we have seasons
- Describe magnetic field around a bar magnet
- Describe the difference between mass and weight
- Describe the universe including galaxies & solar systems

Disciplinary Science

- P5 / A2 / A7 / T1 / T4

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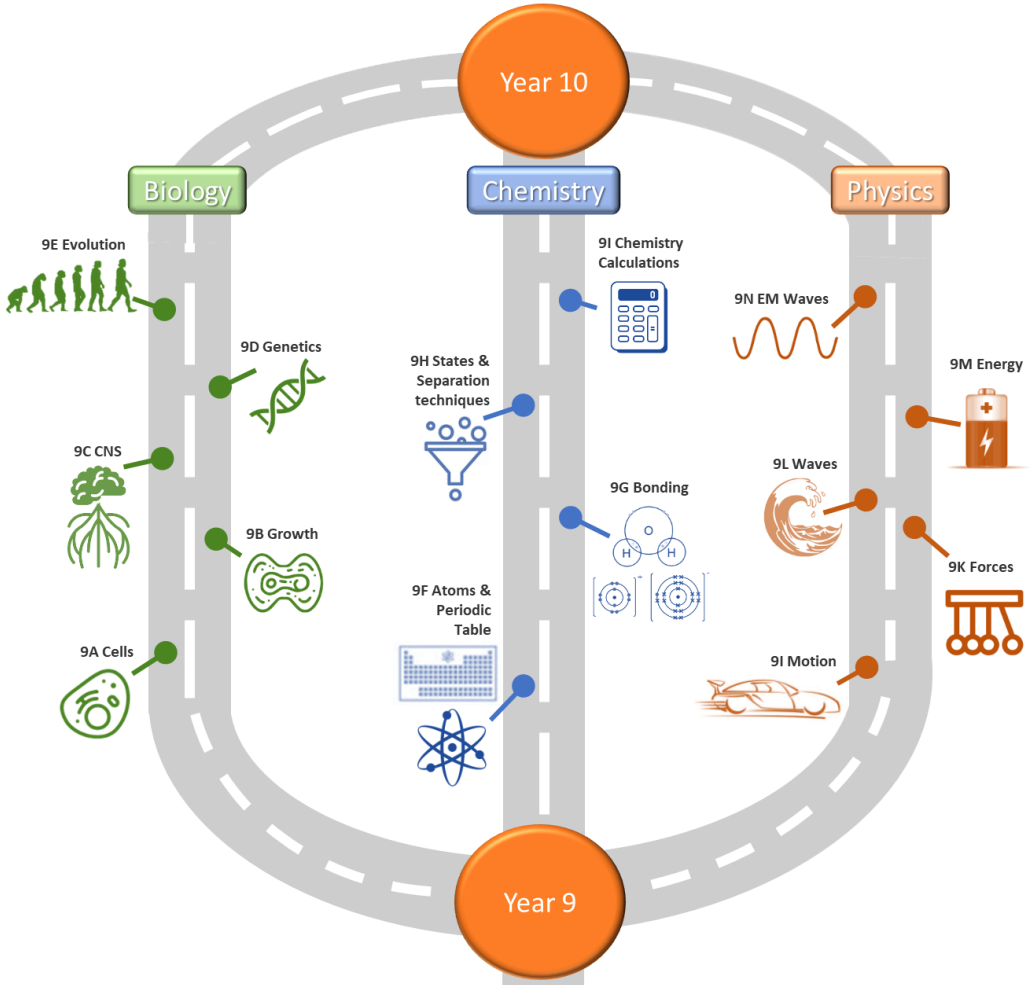
Winifred Holtby Academy

Aspiration | Achievement | Respect

THE CONSORTIUM ACADEMY TRUST

Year 9 Science Scheme of Work



Year 9 Science Outline Scheme of Work

Week	W/C	Lesson 1	Lesson 2	Lesson 3	Lesson 4
1	1-Sep-25				Rotation 1.1
2	8-Sep-25	Rotation 1.2	Rotation 1.3	Rotation 1.4	Rotation 1.5
3	15-Sep-25	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9
4	22-Sep-25	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13
5	29-Sep-25	Rotation 1.14	Rotation 1.15	Rotation 1.16	Rotation 1.17
6	6-Oct-25	Rotation 1.18	Rotation 1.19	Rotation 1.20	Rotation 1.21
7	13-Oct-25	Rotation 1.22	Rotation 1.23	Rotation 1.24	Rotation 1.25
8	20-Oct-25	Rotation 1.26	Rotation 1.27	Rotation 2.1	Rotation 2.2
	27-Oct-25				
9	3-Nov-25	Rotation 2.3	Rotation 2.4	Rotation 2.5	Rotation 2.6
10	10-Nov-25	Rotation 2.7	Rotation 2.8	Rotation 2.9	Rotation 2.10
11	17-Nov-25	Rotation 2.11	Rotation 2.12	Rotation 2.13	Rotation 2.14
12	24-Nov-25	Rotation 2.15	Rotation 2.16	Rotation 2.17	Rotation 2.18
13	1-Dec-25	Rotation 2.19	Rotation 2.20	Rotation 2.21	Rotation 2.22
14	8-Dec-25	Rotation 2.23	Rotation 2.24	Rotation 2.25	Rotation 2.26
15	15-Dec-25	Rotation 2.27	Rotation 3.1	Rotation 3.2	Rotation 3.3
	22-Dec-25				
	29-Dec-25				
16	5-Jan-26	Rotation 3.4	Rotation 3.5	Rotation 3.6	Rotation 3.7
17	12-Jan-26	Rotation 3.8	Rotation 3.9	Rotation 3.10	Rotation 3.11
18	19-Jan-26	Rotation 3.12	Rotation 3.13	Rotation 3.14	Rotation 3.15
19	26-Jan-26	Rotation 3.16	Rotation 3.17	Rotation 3.18	Rotation 3.19
20	2-Feb-26	Rotation 3.20	Rotation 3.21	Rotation 3.22	Rotation 3.23
21	9-Feb-26	Rotation 3.24	Rotation 3.25	Rotation 3.26	Rotation 3.27
	16-Feb-26				
22	23-Feb-26	Rotation 1.28	Rotation 1.29	Rotation 1.30	Rotation 1.31
23	2-Mar-26	Rotation 1.32	Rotation 1.33	Rotation 1.34	Rotation 1.35
24	9-Mar-26	Rotation 1.36	Rotation 1.37	Rotation 1.38	Rotation 1.39
25	16-Mar-26	Rotation 1.41	Rotation 1.42	Rotation 1.43	Rotation 1.44
26	23-Mar-26	Rotation 1.44	Rotation 1.45	Rotation 1.46	Rotation 1.47
	30-Mar-26				
	6-Apr-26				
27	13-Apr-26	Rotation 1.48	Rotation 1.49	Rotation 1.50	Rotation 1.51
28	20-Apr-26	Rotation 1.28	Rotation 1.29	Rotation 1.30	Rotation 1.31
29	27-Apr-26	Rotation 1.32	Rotation 1.33	Rotation 1.34	Rotation 1.35
30	4-May-26	Rotation 1.36	Rotation 1.37	Rotation 1.38	Rotation 1.39
31	11-May-26	Rotation 1.41	Rotation 1.42	Rotation 1.43	Rotation 1.44
32	18-May-26	Rotation 1.44	Rotation 1.45	Rotation 1.46	Rotation 1.47
	25-May-26				
33	1-Jun-26	Rotation 1.48	Rotation 1.49	Rotation 1.50	Rotation 1.51
34	8-Jun-26	Rotation 1.28	Rotation 1.29	Rotation 1.30	Rotation 1.31
35	15-Jun-26	Rotation 1.32	Rotation 1.33	Rotation 1.34	Rotation 1.35
36	22-Jun-26	Rotation 1.36	Rotation 1.37	Rotation 1.38	Rotation 1.39
37	29-Jun-26	Rotation 1.41	Rotation 1.42	Rotation 1.43	Rotation 1.44
38	6-Jul-26	Rotation 1.44	Rotation 1.45	Rotation 1.46	Rotation 1.47
39	13-Jul-26	Rotation 1.48	Rotation 1.49	Rotation 1.50	Rotation 1.51

	Lesson	Biology	Chemistry	Physics
Rotation 1	1	Microscopes	Development of the atomic model	Vector vs Scalar
	2	Plant & Animal Cells	Atomic structure	Distance Time Graph
	3	Specialised Cells	Electronic structure	Acceleration
	4	Inside Bacteria	Chem Interrupt Lesson 1	Velocity Time Graph
	5	**Core Practical: Microscopes**	Isotopes	9J Motion Revision
	6	9A Cells Revision	Mendeleev's periodic table	9J Motion Test
	7	9A Cells Test	Modern periodic table	9J Motion Intervention
	8	9A Cells Intervention	Literacy Atomic Model	Phys Interrupt Lesson 1
	9	Bio Interrupt Lesson 4	Formation of ions	Newtons law 1
	10	Digestive Enzymes & Nutrition	9F Atoms Revsion	Newtons law 1
	11	Enzyme Action & Activity	9F Atomic structure Test	**Core Practical – Acceleration**
	12	**Core Practical: pH & Enzymes**	9F Atomic structure Intervention	**Core Practical – Acceleration**
	13	**Core Practical: pH & Enzymes**	Why do atoms bond?	Newtons Law 3
	14	Transporting Substances	Ionic bonding	Momentum
	15	**Core Practical: Osmosis in**	Ionic compounds	Momentum
	16	**Core Practical: Osmosis in**	Properties of ionic compounds	9K Forces Revision
	17	9BCells Revision	Covalent bonding	9K Forces Test
	18	9B Cells Test	Properties of covalent molecules	9K Forces Intervention
	19	9B Cells Intervention	Giant Covalent Structures	Phys Interrupt Lesson 2
	20	Bio Interrupt Lesson 1	Metallic bonding	Wave Basics 1
	21	Mitosis	Literacy C1A & C1B	Wave Basics 2
	22	Growth in Animals & Plants	Chem Interrupt Lesson 2 (bonding props)	Wave Velocity
	23	Stem Cells	9G Bonding Revision	Measuring Waves
	24	9C Literacy Task	9G Bonding Test	Refraction
	25	9C Growth Revision	9G Bonding Intervention	9L Waves Revision
	26	9C Growth Test	Chemistry interrupt lesson 3	9L Waves Test
	26	9C Growth Intevention	Chemistry interrupt lesson 4	9L Waves Intervention
	27	Bio Interrupt Lesson 4	Chemistry interrupt lesson 5	Phys Interrupt Lesson 3
Rotation 2	28	Meiosis & Reproduction	States of Matter/ Changes of state	Energy Stores and Transfers
	29	**DNA & Practical: DNA Extraction**	Purity	GPE
	30	Mendel & Alleles	Filtration and crystallisation	KE
	31	Pedigree Analysis	Paper chromatography (pens)	Efficiency + Sankey Diagrams
	32	Alleles & Inheritance	**ctical: Composition of ink (chromat**	Dissipation (keep warm prac)
	33	9D Genetics Revision	Simple distillation (salt water)	Non Renewable Resources
	34	9D Genetics Test	**Practical: Composition of ink (distill**	Renewable Resources
	35	9D Genetics Intervention	Drinking water	9M Energy Revision
	36	Bio Interrupt Lesson 5	9H Separating mixtures Revision	9M Energy Test
	37	Bio Interrupt Lesson 6	9H Separating mixtures Test	9M Energy Intervention
	38	Darwin's Theory	9H Separating mixtures Intervention	Phys Interrupt Lesson 4
	39	Evidence for Evolution	RFM	Phys Interrupt Lesson 5
	40	Classification	Conservation of mass	Electromagnetic Waves
	41	Selective Breeding	Balancing equations	The E.M. Spectrum
	42	Genetic Modification	Calculating empirical formulas experimenta	Using Long Wavelengths
	43	9E Evolution Revision	Empirical Formulae	Using Short Wavelengths
	44	9E Evolution Test	Concentration	Dangers of EM Waves
	45	9E Evolution Intervention	HT moles/Interrupt 6	**Core practical: Refraction**
	46	Bio Interrupt Lesson 7	HT moles calcs/ interrupt 7	**Core practical: Refraction**
	47	Bio Interrupt Lesson 8	HT Limiting reactants/ Interrupt 8	9N EM Revision
	48	Bio Interrupt Lesson 9	Chem Interrupt Lesson 9	9N EM Test
	49	Bio Interrupt Lesson 10	9I Chem Calculations revision	9N EM Intervention
	50	Bio Interrupt Lesson 11	9I Chem Calculations Test	Phys Interrupt Lesson 6
	51	Bio Interrupt Lesson 12	9I Chem Calculations intervention	Phys Interrupt Lesson 7

9A Cells

Key vocabulary

- Enzyme
- Denature
- Mitochondria
- Chloroplast
- Flagella
- Osmosis
- Diffusion
- Eukaryotic
- Prokaryotic

Assessment Strategies

- 9A - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9B – Growth
- 9D – Genetics & 9E Evolution
- 10B Photosynthesis
- 11A Transport systems

Disciplinary Science

- P3 / E2 / E3 / A9 / A10

Common Misconceptions

- Osmosis & Diffusion are the same thing
- Function of mitochondria and ribosomes is mixed up

Prior Learning

7A - cells, tissues & organs - Using microscopes to draw cells & calculate magnifications
7A - Recall basic cell organelles
7A, 7B & 7C - Describe adaptations of specialised cells
8B - Plant Reproduction - specialised cells
8D - Unicellular organisms - Recall differences between ~~eukaryotic and prokaryotic cells~~

Cross curricular links

- PE – Respiration & Energy
- Health & Social care – sex ed

	9A - Cells What you need to be able to do:	Maths
Developing	**1.4:** Demonstrate an understanding of size and scale including the use of estimations and when they should be used	2h
Developing	**1.5:** Demonstrate an understanding of the relationship between quantitative units in relation to cells, including a) milli (10-3) b) micro (10-6) c) nano (10-9) d) pico (10-12) e) calculations with numbers written in standard form	1a, 1b, 2a, 3b, 2h
Secure	**1.2:** Describe how specialised cells are adapted to their function, including: a) sperm cells – acrosome, haploid nucleus, mitochondria and tail b) egg cells – nutrients in the cytoplasm, haploid nucleus and changes in the cell membrane after fertilisation c) ciliated epithelial cells	
Exceeding	**1.3:** Explain how changes in microscope technology, including electron microscopy, have enabled us to see cells with more clarity and detail than in the past and increased our understanding of the role of sub-cellular structures	
Exceeding	**1.1:** Explain how the sub-cellular structures of eukaryotic … cells are related to their functions, including a) animal cells – nucleus, cell membrane, mitochondria and ribosomes b) plant cells – nucleus, cell membrane, cell wall, chloroplasts, mitochondria and ribosomes	
Exceeding	**1.1:** Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: c) bacteria - chromosomal DNA, plasmid DNA, cell membrane, ribosomes and flagella.	
	1.6: Core Practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations	1a, 1b, 1c,1d,

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a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
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f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate
5	**Geometry and trigonometry**
a	Use angular measures in degrees
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9B Enzymes & Transport

Key vocabulary

- Isotonic
- Hypertonic
- Hypotonic
- Diffusion
- Osmosis
- Active transport
- Active site
- Denature
- Enzyme / Catalyst

Common Misconceptions

- Particles stop diffusing after reaching equilibrium
- Enzymes always work best at 37°C
- Enzymes are 'killed' at extreme pH or temperatures

Prior Learning

7G - Particle model - Describe diffusion across membrane

7C - Body systems - Describe particle movement via diffusion into cells

8A - Food & Nutrition - Describe the function of enzymes on foods

Cross curricular links

- PE - Enzyme activity & nutrition
- Maths - % calculations

Assessment Strategies

- 9A - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9B Growth
- 9D Genetics & 9E Evolution
- 10B Photosynthesis
- 11A Transport systems

Disciplinary Science

- P3 / E2 / E3 / A9 / A10

	9A - Enzymes and Transport What you need to be able to do:	Maths
Developing	**1.11:** Demonstrate an understanding of rate calculations for enzyme activity	1a, 2a, 2c, 2d, 3b, 3c, 4a
Secure	**1.17:** Calculate percentage gain and loss of mass in osmosis	1a, 2a, 2c, 2d, 3b, 3c, 4a
Exceeding	**1.12:** Explain the importance of enzymes as biological catalysts in the synthesis of carbohydrates, proteins and lipids and their breakdown into sugars, amino acids and fatty acids and glycerol	2c, 2d, 4a, 4c, 4e
	1.7: Explain the mechanism of enzyme action including the active site and enzyme specificity	
	1.8: Explain how enzymes can be denatured due to changes in the shape of the active site	
	1.9: Explain the effects of temperature, substrate concentration and pH on enzyme activity	
	1.15: Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport	

1.10: Core Practical: *Investigate the effect of pH on enzyme activity*	2c, 2d, 4a, 4c, 4e
1.16: Core Practical: *Investigate osmosis in potatoes*	2c, 2d, 4a, 4c, 4e

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9C Cell Division & Growth

Key vocabulary

- Mitosis
- Diploid
- Haploid
- Chromosome
- Centromere
- Spindle fibres
- Equator
- Interphase
- Prophase
- Metaphase
- Anaphase
- Telophase
- Cytokinesis
- meristem

Disciplinary Science

- P2 / E1 / E2 / E3 / A2 / A3 / A4 / A11 / A12

Assessment Strategies

- 9B - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9D Cell structure & cell cycle
- **A-Level Biology**
- Genetic variation, relationships & mutation

Common Misconceptions

- Chromosome number is doubled in prophase & halved in the anaphase
- Diploid means double
- Interphase is a resting phase
- Mitosis has discrete phases

Prior Learning

7A - Cells - Recall name and function of organelles

8B - Plants - Describe asexual reproduction

8D - Unicellular - Describe differences between unicellular vs. multicellular organisms & reproduction of yeast/bacteria

9A - Cells - Explain uses of sub-cellular organelles

Cross curricular links

- Health & Social care – Stem cell treatments

	9B - Cell Division and Growth What you need to be able to do:	Maths
Developing	**2.3** Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes in the nucleus to the parent cell, and that this results in the formation of two genetically identical diploid body cells	3c
Developing	**2.5** Describe growth in organisms, including: a cell division and differentiation in animals b cell division, elongation and differentiation in plants	
Developing	**2.7** Demonstrate an understanding of the use of percentiles charts to monitor growth	2c, 2f, 2g, 4a
Secure	**2.1** Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis	3c
Secure	**2.2** Describe the importance of mitosis in growth, repair and asexual reproduction	
Secure	**2.6** Explain the importance of cell differentiation in the development of specialised cells	
Exceeding	**2.4** Describe cancer as the result of changes in cells that lead to uncontrolled cell division	1c, 2c, 2f
Exceeding	**2.8** Describe the function of embryonic stem cells, stem cells in animals and meristems in plants	
Exceeding	**2.9** Discuss the potential benefits and risks associated with the use of stem cells in medicine	

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9D Genetics

Key vocabulary

- Heterozygous
- Homozygous
- Diploid
- Haploid
- Gene
- Genome
- Genotype
- Phenotype
- Dominant
- Recessive

Assessment Strategies

- 9D - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9E Evolution
- **A-level Biology**
- Cells, Genetics, Evolution
- Gene expression control

Disciplinary Science

- T1 / T2 / T4 / T5

Common Misconceptions

- One alleles set determines each trait e.g. eye colour has 3
- Mutations are always harmful
- Dominant alleles are most common in populations

Prior Learning

9B – Describe growth relating to the process of mitosis
9A - Explain differences between Chromosomal and plasmid DNA
8D –- Describe function of organelles in protocyst cells
7B - Describe fusing gametes to form zygotes
7A – Recall basic cell organelles

Cross curricular links

- Chemistry – hydrogen bonding in DNA backbone

	9C - Genetics What you need to be able to do:	Maths
Developing	**3.13** Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote	
	3.14 Explain monohybrid inheritance using genetic diagrams, Punnett squares and family pedigrees	1c, 2c, 2e
	3.16 Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits	2g
	3.19 State that most phenotypic features are the result of multiple genes rather than single gene inheritance	2g
	3.22 State that there is usually extensive genetic variation within a population of a species and that these arise through mutations	
	3.23 State that most genetic mutations have no effect on the phenotype, some mutations have a small effect on the phenotype and, rarely, a single mutation will significantly affect the phenotype	
	3.4 Describe DNA as a polymer made up of: a) two strands coiled to form a double helix b) strands linked by a series of complementary base pairs joined together by weak hydrogen bonds c) nucleotides that consist of a sugar and phosphate group with one of the four different bases attached to the sugar	1b
	3.6 Explain how DNA can be extracted from fruit	
Secure	**3.3** Explain the role of meiotic cell division, including the production of four daughter cells, each with half the number of chromosomes, and that this results in the formation of genetically different haploid gametes (the stages of meiosis are not required)	2c
	3.5 Describe the genome as the entire DNA of an organism and a gene as a section of a DNA molecule that codes for a specific protein	
	3.12 Explain why there are differences in the inherited characteristics as a result of alleles	
	3.15 Describe how the sex of offspring is determined at fertilisation, using genetic diagrams	1c, 2c, 2e
	3.20 Describe the causes of variation that influence phenotype, including: a genetic variation – different characteristics as a result of mutation and sexual reproduction b environmental variation – different characteristics caused by an organism's environment (acquired characteristics)	
Exceeding	**3.21** Discuss the outcomes of the Human Genome Project and its potential applications within medicine	4a

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9E Evolution

Key vocabulary

- Gene
- Genome
- Restriction enzyme
- DNA Ligase
- Eukaryotic
- Prokaryotic
- Species
- Recombinant DNA
- Vector

Common Misconceptions

- Confusion with binomial names relating to genus & species
- Incorrectly refer to bacteria being 'immune' to antibiotics rather than resistant

Prior Learning

9D - Genetics – Explain genetic inheritance of characteristics in organisms

9A - Explain differences between Chromosomal & plasmid DNA

8D - Describe function of protocyst organelles

7A - Basic cell structure

7D - Describe effects of ecosystems on organisms

Cross curricular links

- History - Palaeontology & fossils
- Chemistry - protein synthesis

Assessment Strategies

- 9E - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A-level Biology**
- Cells, Genetics, Evolution
- Gene expression control

Disciplinary Science

- T1 / T2 / T4 / T5

	9E - Evolution What you need to be able to do:	Maths
Developing	**4.2** Explain Darwin's theory of evolution by natural selection	
Developing	**4.4** Describe the evidence for human evolution, based on fossils, including: a) Ardi from 4.4 million years ago b) Lucy from 3.2 million years ago c) Leakey's discovery of fossils from 1.6 million years ago	2c
Developing	**4.5** Describe the evidence for human evolution based on stone tools, including: a) the development of stone tools over time b) how these can be dated from their environment	2c
Developing	**4.7** Describe how genetic analysis has led to the suggestion of the three domains rather than the five kingdoms classification method	2c
Developing	**4.8** Explain selective breeding and its impact on food plants and domesticated animals	
Secure	**4.3** Explain how the emergence of resistant organisms supports Darwin's theory of evolution including antibiotic resistance in bacteria	2a, 2c, 2g, 4a
Secure	**4.10** Describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics	
Exceeding	**4.11** Describe the main stages of genetic engineering including the use of: a) restriction enzymes b) ligase c) sticky ends d) vectors	
Exceeding	**4.14** Evaluate the benefits and risks of genetic engineering and selective breeding in modern agriculture and medicine, including practical and ethical implications	

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9F Atoms & Periodic Table

Key vocabulary

- Atom
- Proton
- Neutron
- Electron
- Charge
- Nucleus
- Isotope
- Relative Atomic mass
- Atomic number

Common Misconceptions

- Gaps in and between atoms consist of air
- Isotopes are elements which lose or gain electrons and/or protons

Prior Learning

Year 5 - Compare materials based on properties, including their hardness, solubility, transparency & conductivity

7H - Atoms, Elements & Compounds – Recall matter is made from particles called atoms

8F – Periodic Table – Describe periodic table order

Cross curricular links

- 10I Radioactivity/11F particles
- Maths – weighted averages

Assessment Strategies

- 9F - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9G Bonding
- 10D Acids
- 10E Electrolysis
- 10G Groups of Periodic Table

Disciplinary Science

- T4

	9F - Atomic Structure & Periodic Table What you need to be able to do:	Maths
Developing	**1.3** Recall the relative charge and relative mass of protons, neutrons and electrons	
	1.6 Recall that most of the mass of an atom is concentrated in the nucleus	1d
	1.7 Recall the meaning of the term mass number of an atom	1d
	1.18 Identify elements as metals or non-metals according to their position in the periodic table, explaining this division in terms of the atomic structures of the elements	
Secure	**1.1** Describe how the Dalton model of an atom has changed over time because of the discovery of subatomic particles	
	1.2 Describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by electrons in shells	1c
	1.5 Describe the nucleus of an atom as very small compared to the overall atom	
	1.8 Describe atoms of a given element as having the same number of protons in the nucleus and that this number is unique to that element	
	1.9 Describe isotopes as different atoms of the same element containing the same number of protons but different numbers of neutrons in their nuclei	
	1.10 Calculate the numbers of protons, neutrons and electrons in atoms given the atomic number and mass number	3d
	1.12 Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes	1a, 1c, 2a, 2b, 2f, 3a, 3c
	1.13 Describe how Mendeleev arranged the elements, known at that time, in a periodic table by using properties of these elements and their compounds	1c
	1.14 Describe how Mendeleev used his table to predict the existence and properties of some elements not then discovered	2b,4c
	1.17 Describe that in the periodic table **a)** elements are arranged in order of increasing atomic number, in rows called periods **b)** elements with similar properties are placed in the same vertical columns called groups	
Exceeding	**1.4** Explain why atoms contain equal numbers of protons and electrons	1c
	1.11 Explain how the existence of isotopes results in relative atomic masses of some elements not being whole numbers	1a, 1c, 2a, 2b, 2f, 3a, 3c
	1.15 Explain that Mendeleev thought he had arranged elements in order of increasing relative atomic mass but this was not always true because of the relative abundance of isotopes of some pairs of elements in the periodic table	3c
	1.16 Explain the meaning of atomic number of an element in terms of position in the periodic table and number of protons in the nucleus	
	1.20 Explain how the electronic configuration of an element is related to its position in the periodic table	

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9G Bonding

Key vocabulary

- Ion / Anion / cation
- Lattice
- Electrostatic
- Bond
- Force
- Structure
- Property
- Molten
- Solution / aqueous

Common Misconceptions

- Ionic bonds share electrons
- Covalent bonds are weaker than ionic and metallic bonds
- Metals are always hard and strong

Prior Learning

Year 5 - Compare materials based on properties, including their hardness, solubility, transparency & conductivity

7H - Atoms, Elements & Compounds – Recall matter is made from particles called atoms

9F – Periodic Table – Describe sub-atomic structure

Cross curricular links

- DT – Properties of Materials

Assessment Strategies

- 9G - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10D Salt formation
- 10E ions movement & half equations
- 10G Alkali metals & halogens

Disciplinary Science

- T4

	9G - Bonding	Maths
	What you need to be able to do:	
Developing	**1.22** Recall that an ion is an atom or group of atoms with a positive or negative charge	
Developing	**1.29** Recall that covalent bonding results in the formation of molecules	
Developing	**1.30** Recall the typical size (order of magnitude) of atoms and small molecules	1d
Developing	**1.35** Recall that graphite and diamond are different forms of carbon and that they are examples of giant covalent substances	
Secure	**1.23** Calculate the numbers of protons, neutrons and electrons in simple ions given the atomic number and mass number	3b
Secure	**1.26** Deduce the formulae of ionic compounds (including oxides, hydroxides, halides, nitrates, carbonates and sulfates) given the formulae of the constituent ions	1c
Secure	**1.28** Explain how a covalent bond is formed when a pair of electrons is shared between two atoms	
Secure	**1.36** Describe the structures of graphite and diamond	5b
Secure	**1.41** Describe the limitations of particular representations and models, to include dot and cross, ball and stick models and two- and three-dimensional representations	5b
Secure	**1.42** Describe most metals as shiny solids which have high melting points, high density and are good conductors of electricity whereas most non-metals have low boiling points and are poor conductors of electricity	
Exceeding	**1.21** Explain how ionic bonds are formed by the transfer of electrons between atoms to produce cations and anions, including the use of dot and cross diagrams	5b
Exceeding	**1.24** Explain the formation of ions in ionic compounds from their atoms, limited to compounds of elements in groups 1, 2, 6 and 7	1c, 5b
Exceeding	**1.25** Explain the use of the endings –ide and –ate in the names of compounds	
Exceeding	**1.27** Explain the structure of an ionic compound as a) lattice structure a consisting of a regular arrangement of ions b) held together by strong electrostatic forces (ionic bonds) between oppositely-charged ions	5b
Exceeding	**1.31** Explain the formation of simple molecular, covalent substances, using dot and cross diagrams, including: **a)** hydrogen **b)** hydrogen chloride **c)** water **d)** methane **e)** oxygen **f)** carbon dioxide	5b
Exceeding	**1.32** Explain why elements and compounds can be classified as: **a)** ionic **b)** simple molecular (covalent) **c)** giant covalent **d)** metallic and how the structure and bonding of these types of substances results in different physical properties, including relative melting point and boiling point, relative solubility in water and ability to conduct electricity (as solids and in solution)	
Exceeding	**1.33** Explain the properties of ionic compounds limited to: **a)** high melting points and boiling points, in terms of forces between ions **b)** whether or not they conduct electricity as solids, when molten and in aqueous solution	4a
Exceeding	**1.34** Explain the properties of typical covalent, simple molecular compounds limited to: **a)** low melting points and boiling points, in terms of forces between molecules (intermolecular forces) **b)** poor conduction of electricity	
Exceeding	**1.37** Explain, in terms of structure and bonding, why graphite is used to make electrodes and as a lubricant, whereas diamond is used in cutting tools	5b
Exceeding	**1.38** Explain the properties of fullerenes including C60 and grapheme in terms of their structures and bonding	5b
Exceeding	**1.40** Explain the properties of metals, including malleability and the ability to conduct electricity	5b

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3	**Algebra**
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
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9H States & Separating

Key vocabulary

- Pure
- Mixture
- Filter
- Soluble
- Solution
- Solute
- Mobile/Stationary
- Potable
- Sedimentation

Common Misconceptions

- Evaporation and boiling are the same thing
- Paper is mobile phase because things move on it
- Substances must become liquids before gases

Prior Learning

7G - Particle model – Describe changes of state using particles
7H - Atoms, Elements & Compounds – Describe differences between mixtures and compounds
7E - Mixtures & Separations - separating mixtures using variety of techniques
8H – Rocks – forming crystals

Cross curricular links

- Physics – particle model and changes of state

Assessment Strategies

- 9H - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 11D Fractional distillation of crude oil
- 11F Particle models & state changes

Disciplinary Science

- P1 / P3 / P4 / P6 / E1 / E2 / E3 / A1 / A2 / A10 / T3

	9H - Separating Mixtures What you need to be able to do:	Maths
Developing	**2.6** Interpret melting point data to distinguish between pure substances which have a sharp melting point and mixtures which melt over a range of temperature	1a
Developing	**2.10** Interpret a paper chromatogram to distinguish between pure and impure substances; to identify substances by comparison with known substances and to identify substances by calculation and use of Rf values	3a,3c,4a
Developing	**2.2** Recall the names used for the interconversions between the three states of matter, recognising that these are physical changes: contrasted with chemical reactions that result in chemical changes	4a, 4c
Developing	**2.4** Predict the physical state of a substance under specified conditions, given suitable data	1d, 4a, 4c
Secure	**2.1** Describe the arrangement, movement and the relative energy of particles in each of the three states of matter: solid, liquid and gas	5b
Secure	**2.8** Describe an appropriate experimental technique to separate a mixture, knowing the properties of the components of the mixture	
Secure	**2.9** Describe paper chromatography as the separation of mixtures of soluble substances by running a solvent (mobile phase) through the mixture on the paper (stationary phase), which causes the substances to move at different rates over the paper	
Secure	**2.12** Describe how: **a)** waste and ground water can be made potable, including the need for sedimentation, filtration and chlorination b) sea water can be made potable by using distillation **c)** water used in analysis must not contain any dissolved salts	
Exceeding	**2.3** Explain the changes in arrangement, movement and energy of particles during these interconversions	5b
Exceeding	**2.5** Explain the difference between the use of 'pure' in chemistry compared with its everyday use and the differences in chemistry between a pure substance and a mixture	
Exceeding	**2.7** Explain the experimental techniques for separation of mixtures by simple distillation, fractional distillation, filtration, crystallisation and paper chromatography	
	2.11 Core Practical: Investigate the composition of inks using simple distillation and paper chromatography	

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9I Chemical Calculations

Key vocabulary

- Relative Formula Mass
- Empirical Formula
- Molecular Formula
- System
- Reactant
- Product
- Conservation
- Excess
- Balanced

Assessment Strategies

- 9I - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10D Acid reactions
- 11C Rate of reactions
- Chemistry – Quantitative tests

Disciplinary Science

- A9 / A10

Common Misconceptions

- Checking volume units are consistent with concentration units
- Mass changes during reactions are due to addition or loss of gases

Prior Learning

7H - Atoms, Elements & Compounds - Conservation of mass

7F - Complete simple word equations for reactions

8F – Describe simple chemical reactions using word equations & predict formulas of simple binary compounds

8E - Combustion - Conservation of mass

Cross curricular links

- Physics –Simple calculations
- Maths – equations

	9I – Chemistry Calculations What you need to be able to do:	Maths
Developing	**1.50 Recall that one mole of particles of a substance is defined as:** **a) The Avogadro constant number of particles (6.02 × 1023 atoms, molecules, formulae or ions) of that substance** **b) a mass of 'relative particle mass' g**	1b
Secure	**1.46** Describe an experiment to determine the empirical formula of a simple compound such as magnesium oxide	1a, 1c ,2a
Exceeding	**1.43** Calculate relative formula mass given relative atomic masses	1a, 1c
	1.44 Calculate the formulae of simple compounds from reacting masses and understand that these are empirical formulae	1a, 1c, 2a
	1.45 Deduce: **a)** The empirical formula of a compound from the formula of its molecule **b)** The molecular formula of a compound from its empirical formula and its relative molecular mass	1c
	1.47 Explain the law of conservation of mass applied to: **a)** a closed system including a precipitation reaction in a closed flask **b)** A non-enclosed system including a reaction in an open flask that takes in or gives out a gas	1a
	1.48 Calculate masses of reactants and products from balanced equations, given the mass of one substance	1a, 1c, 2a
	1.49 Calculate the concentration of solutions in g dm^{-3}	1a, 1c, 2a 3b, 3c
	1.51 Calculate the number of: **a) Moles of particles of a substance in a given mass of that substance and vice versa** **b) Particles of a substance in a given number of moles of that substance and vice versa** **c) Particles of a substance in a given mass of that substance and vice versa**	1a, 1b, 1c, 3a, 3b, 3c
	1.52 Explain why, in a reaction, the mass of product formed is controlled by the mass of the reactant which is not in excess	1c
	1.53 Deduce the stoichiometry of a reaction from the masses of the reactants and products	

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9J Motion

Key vocabulary

- Acceleration
- Velocity
- Magnitude
- Vector
- Scalar
- Distance
- Displacement
- Momentum
- Conservation

Assessment Strategies

- 9J - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9K Force calculations
- 9M Energy calculations
- 10H Energy calculations
- **A-Level Physics**
- Newtonian mechanics

Disciplinary Science

- A9 / A10 / A11

Common Misconceptions

- Velocity & Speed are the same
- Momentum is lost
- Confuse velocity-time & displacement-time graphs
- Objects at constant speed in circular motion aren't accelerating

Prior Learning

Year 5 - Identify the effect of air resistance, water resistance and friction acting between moving surfaces

7K - Forces - Describe the effect of forces on objects

8L- Space - Calculate the weight of objects due to gravity

Cross curricular links

- Mathematics – algebraic rearrangements & graph skills

	9J - Motion What you need to be able to do:	Maths
Developing	**2.13** Recall that the acceleration, g, in free fall is 10 m/s^2 and be able to estimate the magnitudes of everyday accelerations	
	2.12 Recall some typical speeds encountered in everyday experience	1d 2h
	2.8 Recall and use the equation: acceleration (metre per second squared, m/s^2) = change in velocity ÷ time	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	2.6 Recall and use the equations: (average) speed = distance ÷ time	1a, 1c, 1d 2a 3a, 3c, 3d
	2.5 Recall that velocity is speed in a stated direction	5b
	2.4 Recall vector and scalar quantities	
Secure	**2.12** Recall some typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems	
	2.10 Analyse velocity/time graphs	1a, 1c, 1d 2a 4a, 4b, 4c, 4d, 4e, 4f 5c
	2.9 Use the equation: (final velocity)^2 – (initial velocity)^2= 2 × acceleration × distance	1a, 1c, 1d 2a 3a, 3c, 3d
	2.7 Analyse distance/time graphs	
Exceeding	**2.20 Explain that an object moving in a circular orbit at constant speed has a changing velocity (qualitative only)**	5b
	2.3 Explain the difference between vector and scalar quantities	5b
	2.2 Explain that a vector quantity has both magnitude and a direction	5b
	2.1 Explain that a scalar quantity has magnitude but no specific direction	

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9K Forces

Key vocabulary

- Inertial mass
- Resultant force
- Weight
- Gravity
- Contact
- Momentum
- Centripetal
- Stopping Distance
- Velocity
- Acceleration

Disciplinary Science

- P1 / P2 / P3 / P4 / E1 / E2 / E3 / A1 / A2 / A3 / A4 / A5 / A6 / A7 / A9 / A10 / A11 / A12

Assessment Strategies

- 9K - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9M Energy
- 10H Forces & Energy
- **A-Level Physics**
- Mechanics & turning moments

Common Misconceptions

- Forces are required to keep objects moving at constant speed
- Forces act on their own
- Weight and gravity are the same

Prior Learning

Year 5 - Recall objects fall towards the Earth due to gravity

Year 5 - Identify the effect of air resistance, water resistance & friction on objects

7K - Forces - Recall examples of contact and non-contact forces and describe the effects on objects

8L - Space - Calculate an objects weight using w = mg

Cross curricular links

- PE – Forces, acceleration and momentum

	9K - Forces What you need to be able to do:	Maths
Developing	**2.24 Define momentum, recall and use the equation: momentum = mass × velocity**	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	2.23 Recall and apply Newton's third law both to equilibrium situations and **to collision interactions and relate it to the conservation of momentum in collisions**	
	2.16 Define weight, recall and use the equation: weight= mass × gravity	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	2.15 Recall and use Newton's second law as: force = mass × acceleration	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	2.14 Recall Newton's first law	1a, 1d 2a 3a, 3c, 3d
	2.11 Describe a range of laboratory methods for determining the speeds of objects such as the use of light gates	
Secure	**2.31** Explain the dangers caused by large decelerations and estimate the forces involved in typical situations on a public road	1c, 1d, 2c, 2h, 3b, 3c
	2.28 Recall that the stopping distance of a vehicle is made up of the sum of the thinking distance and the braking distance	1a
	2.26 Use Newton's second law as: force = change in momentum ÷ time	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	2.25 Describe examples of momentum in collisions	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	2.18 Describe the relationship between the weight of a body and Gravitational field strength	1c
	2.17 Describe how weight is measured	
Exceeding	**2.29** Explain that the stopping distance of a vehicle is affected by several factors	
	2.27 Explain methods of measuring human reaction times and recall typical results	2a, 2b, 2c, 2g
	2.22 Explain that inertial mass is a measure of how difficult it is to change the velocity of an object and know that it is defined as the ratio of force over acceleration	1c
	2.19 Core Practical: Investigate the relationship between force, mass and acceleration by varying the masses added to trolleys	1a, 1c,1d 2a, 2b, 2f 3a, 3b, 3c, 3d 4a, 4b, 4c, 4d

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9L Waves

Key vocabulary

- Transverse
- Longitudinal
- Period
- Amplitude
- Frequency
- Wavelength
- Wavefront
- Velocity
- Incidence
- Peak
- Trough

Disciplinary Science

- P1 / P2 / P3 / P4 / E1 / E2 / E3 / A1 / A2 / A3 / A4 / A5 / A6 / A7 / T4

Assessment Strategies

- 9L - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 9N EM waves
- 10I Gamma rays
- P1.1 Properties of light
- P1.2 Space exploration
- P1.3 Nuclear power

Common Misconceptions

- Particles move along with waves
- Only visible light can be reflected or refracted
- Only shiny object reflect light

Prior Learning

Year 4 - Recognise pitch and volume are linked to object and size of vibration

Year 6 – Explain objects can be seen due to reflection of light to the eye

7L - Sound - Describe different types of waves

8J - Light - Describe types of reflection and explain how refraction occurs

Cross curricular links

- Geography - Earthquakes
- Maths - Algebra rearrangement

	9L - Waves What you need to be able to do:	Maths
Developing	**4.1** Recall that waves transfer energy and information without transferring matter	
	4.3 Define and use the terms frequency and wavelength as applied to waves	
	4.4 Use the terms, amplitude, period and wave velocity as applied to waves	
	4.6 Recall and use both the equations below for all waves: $v = f \times \lambda$ and $v = x / t$	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	4.11: Recall that different substances may absorb, transmit, refract, or reflect waves in ways that vary with wavelength	
Secure	**4.2** Describe evidence that with water and sound waves it is the wave and not the water or air itself that travels	
	4.5 Describe the difference between longitudinal and transverse waves by referring to sound, electromagnetic, seismic and water waves	
	4.7 Describe how to measure the velocity of sound in air and ripples on water surfaces	2g
Exceeding	**4.10** Explain how waves will be refracted at a boundary in terms of the change of direction **and speed**	
	4.17 Core Practical: *Investigate the suitability of equipment to measure the speed, frequency and wavelength of a wave in a solid and a fluid*	2g

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9M Energy

Key vocabulary
- Conservation
- Efficiency
- Closed system
- Joule
- Lubrication
- Renewable
- Non-renewable
- Useful
- Wasted
- Kinetic / Potential

Disciplinary Science
- P1 / P2 / P3 / P4 / P5 / E1 / E2 / E3 / A1 / A2 / A3 / A4 / A5 / A6 / A7 / A9 / A10 / A11 / T4

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Linked Future Topics
- 10H Forces & Energy
- 11F Particles & Energy
- **A-Level Physics**
- Mechanics, thermal physics & engineering physics

Common Misconceptions
- Things use up energy
- GPE is dependent only of the height of an object
- Doubling speeds doubles the KE of an object

Prior Learning
7I - Energy - Describe how friction can be reduced
7I - Describe the main sources of energy
7k & 8K - Calculate efficiency of devices
8K - Energy Transfers - Describe how thermal energy is transferred
9K - Forces - Link Newtons laws of motion with K.E. & P.E.

Cross curricular links
- PE – Body mechanics
- Chemistry - Thermodynamics

	9M - Energy What you need to be able to do:	Maths
Developing	**3.1** Recall and use the equation to calculate the change in gravitational PE when an object is raised above the ground: $\Delta GPE = m \times g \times \Delta h$	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
Developing	**3.2** Recall and use the equation to calculate the amounts of energy associated with a moving object: $KE = \frac{1}{2} \times m \times v^2$	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
Developing	**3.11** Recall and use the equation: efficiency = useful energy transferred by the device / total energy supplied to the device	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
Secure	**3.10** Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling qualitatively	
Secure	**3.3** Draw and interpret diagrams to represent energy transfers	1c, 2c
Exceeding	**3.14** Explain patterns and trends in the use of energy resources	2c, 2g
Exceeding	**3.13** Describe the main energy sources available for use on Earth (including fossil fuels, nuclear fuel, bio-fuel, wind, hydroelectricity, the tides and the Sun), and compare the ways in which both renewable and non-renewable sources are used	2c, 2g
Exceeding	**3.12** Explain how efficiency can be increased	
Exceeding	**3.9** Explain ways of reducing unwanted energy transfer including through lubrication, thermal insulation	
Exceeding	**3.8** Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways	
Exceeding	**3.7** Explain that mechanical processes become wasteful when they cause a rise in temperature so dissipating energy in heating the surroundings	
Exceeding	**3.6** Explain that where there are energy transfers in a closed system there is no net change to the total energy in that system	
Exceeding	**3.5** Analyse the changes involved in the way energy is stored when a system changes, including: **a)** an object projected upwards or up a slope **b)** a moving object hitting an obstacle **c)** an object being accelerated by a constant force **d)** a vehicle slowing down **e)** bringing water to a boil in an electric kettle	
Exceeding	**3.4** Explain what is meant by conservation of energy	

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c	Construct and interpret frequency tables and diagrams, bar charts and histograms
d	Understand the principles of sampling as applied to scientific data
e	Understand simple probability
f	Understand the terms mean, mode and median
g	Use a scatter diagram to identify a correlation between two variables
h	Make order of magnitude calculations
3	**Algebra**
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
b	Change the subject of an equation
c	Substitute numerical values into algebraic equations using appropriate units for physical quantities
d	Solve simple algebraic equations
4	**Graphs**
a	Translate information between graphical and numeric form
b	Understand that $y = mx + c$ represents a linear relationship
c	Plot two variables from experimental or other data
d	Determine the slope and intercept of a linear graph
e	Draw and use the slope of a tangent to a curve as a measure of rate of change
f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate
5	**Geometry and trigonometry**
a	Use angular measures in degrees
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects
c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes

9N Electromagnetic Waves

Key vocabulary
- Frequency
- Wavelength
- Velocity
- Absorption
- Reflection
- Refraction
- Radiowave / Microwave
- Infra-red / Visible
- Ultraviolet
- X-ray / Gamma ray

Common Misconceptions
- Different wavelengths of light have different energy & different speeds
- Radio waves are sound waves
- Our eyes produce light to see things

Prior Learning
7L - Sound - Describe different types of waves
8J - Light - Describe types of reflection and explain how refraction occurs
9A - Atoms - Describe Sub-atomic structures
9L - Waves - Describe wave structure and explain reflection and refraction

Cross curricular links
- Chemistry – atomic structure
- Biology – medical imaging

Assessment Strategies
- 9N - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics
- 10I Gamma rays
- P1.1-3 Light, Space & Nuclear

A-level Physics
- Waves, Radiation & Nuclear physics

Disciplinary Science
- P5 / E1 / A2 / T3

	9N – Electromagnetic Waves What you need to be able to do:	Maths
Developing	**5.10** Recall the main groupings of the continuous electromagnetic spectrum including (in order) radio waves, microwaves, infrared, visible (including the colours of the visible spectrum), ultraviolet, x-rays and gamma rays	
	5.12 Recall that our eyes can only detect a limited range of frequencies of electromagnetic radiation	
	5.13 Recall that different substances may absorb, transmit, refract or reflect electromagnetic waves in ways that vary with wavelength	
	5.20 Recall that the potential danger associated with an electromagnetic wave increases with increasing frequency	
	5.23 Recall that radio waves can be produced by, or can themselves induce, oscillations in electrical circuits	
	5.24 Recall that changes in atoms and nuclei can **a)** generate radiations over a wide frequency range **b)** be caused by absorption of a range of radiations	
Secure	**5.11** Describe the electromagnetic spectrum as continuous from radio waves to gamma rays that can be grouped in order of decreasing wavelength and increasing frequency	1a, 1c 3c
	5.21 Describe the harmful effects on people of excessive exposure to electromagnetic radiation, including: **a)** microwaves **b)** infrared **c)** ultraviolet **d)** x-rays and gamma rays	
	5.22 Describe some uses for each type of electromagnetic radiation	
Exceeding	**5.14 Explain the effects of differences in the velocities of electromagnetic waves in different substances**	1a, 1c 3c
	***5.9 Core Practical** Investigate refraction in rectangular glass blocks in terms of the interaction of electromagnetic waves with matter*	1a, 1c, 5a

Lesson 1 | Lesson 2 | Lesson 3 | Lesson 4 | Lesson 5 | Lesson 6 | Lesson 7

1	**Arithmetic and numerical computation**
a	Recognise and use expressions in decimal form
b	Recognise and use expressions in standard form
c	Use ratios, fractions and percentages
d	Make estimates of the results of simple calculations
2	**Handling data**
a	Use an appropriate number of significant figures
b	Find arithmetic means
c	Construct and interpret frequency tables and diagrams, bar charts and histograms
d	Understand the principles of sampling as applied to scientific data
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5	**Geometry and trigonometry**
a	Use angular measures in degrees
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects
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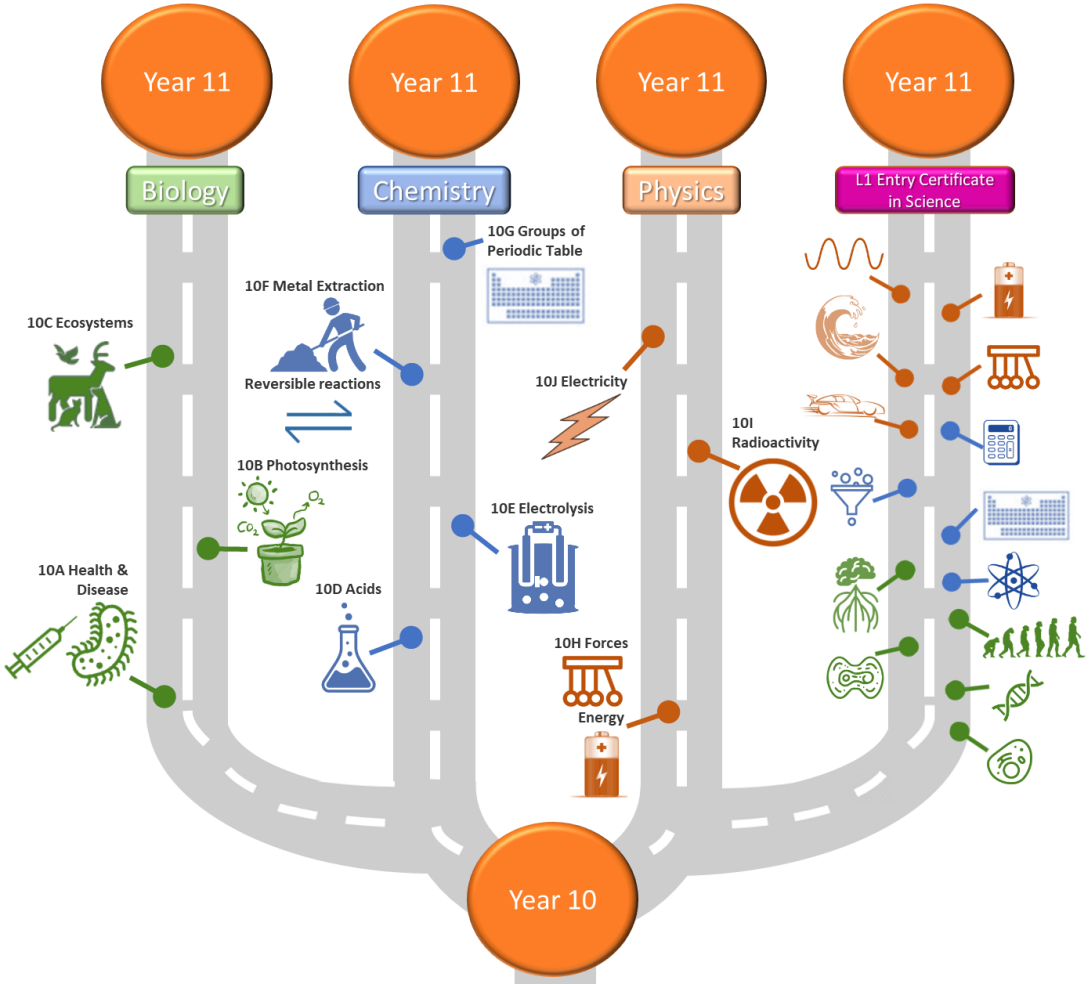
Winifred Holtby Academy

Aspiration | Achievement | Respect

THE CONSORTIUM ACADEMY TRUST

Year 10 Science Scheme of Work



Year 10 Science Outline Scheme of Work

Week	W/C	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
1	1-Sep-25					
2	8-Sep-25	Rotation 1.1	Rotation 1.2	Rotation 1.3	Rotation 1.4	Rotation 1.5
3	15-Sep-25	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9	
4	22-Sep-25	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13	Rotation 1.14
5	29-Sep-25	Rotation 1.15	Rotation 1.16	Rotation 1.17	Rotation 1.18	
6	6-Oct-25	Rotation 1.19	Rotation 1.20	Rotation 1.21	Rotation 1.22	Rotation 1.23
7	13-Oct-25	Rotation 1.24	Rotation 1.25	Rotation 1.26	Rotation 1.27	
8	20-Oct-25	Rotation 1.1	Rotation 1.2	Rotation 1.3	Rotation 1.4	Rotation 1.5
	27-Oct-25					
9	3-Nov-25	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9	
10	10-Nov-25	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13	Rotation 1.14
11	17-Nov-25	Rotation 1.15	Rotation 1.16	Rotation 1.17	Rotation 1.18	
12	24-Nov-25	Rotation 1.19	Rotation 1.20	Rotation 1.21	Rotation 1.22	Rotation 1.23
13	1-Dec-25	Rotation 1.24	Rotation 1.25	Rotation 1.26	Rotation 1.27	
14	8-Dec-25	Rotation 1.1	Rotation 1.2	Rotation 1.3	Rotation 1.4	Rotation 1.5
15	15-Dec-25	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9	
	22-Dec-25					
	29-Dec-25					
16	5-Jan-26	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13	Rotation 1.14
17	12-Jan-26	Rotation 1.15	Rotation 1.16	Rotation 1.17	Rotation 1.18	
18	19-Jan-26	Rotation 1.19	Rotation 1.20	Rotation 1.21	Rotation 1.22	Rotation 1.23
19	26-Jan-26	Rotation 1.24	Rotation 1.25	Rotation 1.26	Rotation 1.27	
20	2-Feb-26	Rotation 2.28	Rotation 2.29	Rotation 2.30	Rotation 2.31	Rotation 2.32
21	9-Feb-26	Rotation 2.33	Rotation 2.34	Rotation 2.35	Rotation 2.36	
	16-Feb-26					
22	23-Feb-26	Rotation 2.37	Rotation 2.38	Rotation 2.39	Rotation 2.40	Rotation 2.41
23	2-Mar-26	Rotation 2.42	Rotation 2.43	Rotation 2.44	Rotation 2.45	
24	9-Mar-26	Rotation 2.46	Rotation 2.47	Rotation 2.48	Rotation 2.49	Rotation 2.50
25	16-Mar-26	Rotation 2.28	Rotation 2.29	Rotation 2.30	Rotation 2.31	
26	23-Mar-26	Rotation 2.32	Rotation 2.33	Rotation 2.34	Rotation 2.35	Rotation 2.36
	30-Mar-26					
	6-Apr-26					
27	13-Apr-26	Rotation 2.37	Rotation 2.38	Rotation 2.39	Rotation 2.40	
28	20-Apr-26	Rotation 2.41	Rotation 2.42	Rotation 2.43	Rotation 2.44	Rotation 2.45
29	27-Apr-26	Rotation 2.46	Rotation 2.47	Rotation 2.48	Rotation 2.49	
30	4-May-26	Rotation 2.28	Rotation 2.29	Rotation 2.30	Rotation 2.31	Rotation 2.32
31	11-May-26	Rotation 2.33	Rotation 2.34	Rotation 2.35	Rotation 2.36	
32	18-May-26	Rotation 2.37	Rotation 2.38	Rotation 2.39	Rotation 2.40	Rotation 2.41
	25-May-26					
33	1-Jun-26	Rotation 2.42	Rotation 2.43	Rotation 2.44	Rotation 2.45	
34	8-Jun-26	**Year 10 PPE Revision**				
35	15-Jun-26	**Year 10 PPE 1**				
36	22-Jun-26					
37	29-Jun-26	Rotation 2.46	Rotation 2.47	Rotation 2.48	Rotation 2.49	Rotation 2.50
38	6-Jul-26	spare	spare	spare	spare	spare
39	13-Jul-26	**Work experience week**				

	Lesson	Biology	Chemistry SET 1	Chemistry Set 2-5	Physics
Rotation 1	1	Health & Disease	Acids, Alkalis and pH	Acids, Alkalis and pH	Changing Stores
	2	Non-Communicable Diseases	Reactions with acids	Indicators	Work and Power
	3	Cardiovascular Disease	**Core Practical: Neutralisation**	Reactions with acids 1	GPE and KE
	4	Pathogens & Transmission	**ractical: Prep CuSO4 crystals insolub**	Reactions with acids 2	Efficiency
	5	Immune System	**Core Practical: Salts from alkali**	**Core Practical: Neutralisation**	Forces
	6	Vaccinations	Balancing equations	**ractical: Prep CuSO4 crystals insolub**	Forces and Vectors
	7	Drug Testing	Solubility	**Salts from alkalis**	10H Literacy Task
	8	10A Literacy Task	10D Acids Revision	Solubility	10H Forces & Energy Revision
	9	10A Health & Disease Revision	10D Acids Test	**10D Literacy task**	10H Forces & Energy Test
	10	10A Health & Disease Test	10D Acids Intervention	10D Acids Revision	10H Forces & Energy Intervention
	11	10A Health & Disease Intervention	Electrolysis basics	10D Acids Test	Phys Interrupt Lesson 2
	12	Bio Interrupt Lesson 1	**Practical: Electrolysis of $CuSO_4$ (gra**	10D Acids Intervention	Phys Interrupt Lesson 3
	13	Photosynthesis	**Practical: Electrolysis of $CuSO_4$ (cop**	Electrolysis basics	Inside Atoms
	14	Leaf adaptations	Products from electrolysis	Products from electrolysis (molten)	EM and Ionisation
	15	Limiting Factors	Predicting Products in solutions	Investigating electrolysis	Nuclear Radiation
	16	**Core Practical: Light intensity**	Redox reactions	**Practical: Electrolysis of $CuSO_4$ (gra**	Nuclear Decay
	17	**Core Practical: Light intensity**	**HT: Half-equations**	**Practical: Electrolysis of $CuSO_4$ (cop**	Decay Equations
	18	Transport Mechanisms	10E Electrolysis revision	Purification of copper	Half Life 1
	19	Transpiration	10E Electrolysis Test	Predicting Products in solutions	Half Life 2
	20	Translocation	10E Electrolysis Intervention	**HT: Redox reactions**	Precautions
	21	10B Literacy Task	Chemistry calc revision Y9	**HT: Half-equations**	Background Radiation
	22	10B Photosynthesis Revision	**HT : Moles (Higher tier only)**	**10E Literacy task**	10I Literacy Task
	23	10B Photosynthesis Test	**HT : Avogadros number**	10E Electrolysis revision	10I Radioactivity Revision
	24	10B Photosynthesis Intervention	**HT : Calculating masses**	10E Electrolysis Test	10I Radioactivity Test
	25	Bio Interrupt Lesson2	**HT : Limiting reactants**	10E Electrolysis Intervention	10I Radioactivity Intervention
	26	Bio Interrupt Lesson 3	**: 10G.5 Further calculations assessm**	Chemistry Interrupt Lesson 1	Phys Interrupt Lesson 4
	27	Bio Interrupt Lesson 4	**: 10G.5 Further calculations intervent**	Chemistry Interrupt Lesson 2	Phys Interrupt Lesson 5
Rotation 2	28	Ecosystems	Reactivity	Reactivity	Electric Circuits
	29	AbioticBiotic Factors &	Ores	Ores	Current and Potential Difference
	30	**Core Practical: Random**	Oxidation and reduction	Oxidation and reduction	Current, Charge and Energy
	31	**Core Practical: Belt Transects**	Recycling Metals	Recycling Metals	Resistance
	32	Water Cycle	Life Cycle Assessments	Life Cycle Assessments	More about Resistance
	33	Preserving Diodiversity	Chemistry Interrupt Lesson 1	Chemistry Interrupt Lesson 3	More about Resistance
	34	Carbon Cycle	The Haber Process	The Haber Process	**Core practical: Investigating**
	35	Nitrogen Cycle	Reversible reactions	Reversible reactions	**Core practical: Investigating**
	36	Nitrogen Cycle	Chemistry Interrupt Lesson 2	Chemistry Interrupt Lesson 4	Transferring Energy
	37	10C Literacy Task	**HT: Dyn equil - changing conditions**	**HT: Dyn equil - changing conditions**	Power
	38	10C Ecosystems Revision	10F Metal Extraction & Equilibria Revision	10F Metal Extraction & Equilibria Revision	Transferring Energy by Electricity
	39	10C Ecosystems Test	10F Metal Extraction & Equilibria Test	10F Metal Extraction & Equilibria Test	Electrical Safety
	40	10C Ecosystems Intervention	10F Metal Extraction & Equilibria Intervention	10F Metal Extraction & Equilibria Intervention	10J Literacy Task
	41	Bio Interrupt Lesson 6	Chemistry Interrupt Lesson 3	Chemistry Interrupt Lesson 5	10J Electricity Revision
	42	CNS	Alkali metals	Alkali metals	10J Electricity Test
	43	Reflexes	Halogens	Halogens	10J Electricity Intervention
	44	Voluntary Responses	Halogens - Displacement reactions	Halogens - Displacement reactions	Phys Interrupt Lesson 9
	45	Drugs and reflexs	Noble gases	Noble gases	Phys Interrupt Lesson 10
	46	10C.5 Literacy Task	10G Groups of the P-Table Revision	10G Groups of the P-Table Revision	Phys Interrupt Lesson 11
	47	10C.5 CNS Revision	10G Groups of the P-Table Test	10G Groups of the P-Table Test	Phys Interrupt Lesson 12
	48	10C.5 CNS Test	10G Groups of the P-Table Intervention	10G Groups of the P-Table Intervention	Phys Interrupt Lesson 13
	49	10C.5 CNS Intervention	Chemistry Interrupt Lesson 4	Chemistry Interrupt Lesson 6	Phys Interrupt Lesson 14
	50	Bio Interrupt Lesson 7	Chemistry Interrupt Lesson 5	Chemistry Interrupt Lesson 7	Phys Interrupt Lesson 15

10A Health & Disease

Key vocabulary

- Antigen
- Antibody
- Communicable
- Transmission
- Immunity
- Pathogen
- Vector
- Phagocyte
- Lymphocyte
- Memory cell

Common Misconceptions

- Malaria is caused by mosquitos
- Use of antibiotics
- Using immunity and resistant as being the same term
- Incorrect recall of BMI formula

Prior Learning

Year 2 - Animals including humans – Describe importance of good nutrition

Year 6 - Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function

7C - Body systems - Describe function of parts of the circulatory system

Cross curricular links

- Health & Social Care – Disease Prevention

Assessment Strategies

- 10A - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 11A Circulatory system
- 11B Homeostasis
- **A-level Biology**
- Organism internal & external response

Disciplinary Science

- E1 / E2 / E3 / A10 / T3

	10A – Disease & Defence What you need to be able to do:	Maths
Developing	**5. 1** Describe health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, as defined by the World Health Organization (WHO)	
	5.2 Describe the difference between communicable and non-communicable diseases	
	5.12 Describe how the physical barriers and chemical defences of the human body provide protection from pathogens, including: a physical barrier, including mucus, cilia and skin b chemical defence, including lysozymes and hydrochloric acid	
	5.14 Explain the body's response to immunisation using an inactive form of a pathogen	
	5.16 Explain that antibiotics can only be used to treat bacterial infections because they inhibit cell processes in the bacterium but not the host organism	
Secure	**5.3** Explain why the presence of one disease can lead to a higher susceptibility to other diseases	
	5.4 Describe a pathogen as a disease-causing organism, including viruses, bacteria, fungi and protists	
	5.5 Describe some common infections, including: a) cholera (bacteria) causes diarrhoea b) tuberculosis (bacteria) causes lung damage c) Chalara ash dieback (fungi) causes leaf loss and bark lesions d) malaria (protists) causes damage to blood and liver e) HIV (virus) destroys white blood cells, leading to the onset of AIDS f) stomach ulcers caused by Helicobacter (bacteria) g) Ebola (virus) causes haemorrhagic fever	
	5.8 Explain how sexually transmitted infections (STIs) are spread and how this spread can be reduced or prevented, including: a) Chlamydia (bacteria) b) HIV (virus)	1c, 2a, 2c, 2f
	5.13 Explain the role of the specific immune system of the human body in defence against disease, including: a) exposure to pathogen b) the antigens trigger an immune response which causes the production of antibodies c) the antigens also trigger production of memory lymphocytes d the role of memory lymphocytes in the secondary response to the antigen	1c, 2c
	5.20 Describe that the process of developing new medicines, including antibiotics, has many stages, including discovery, development, preclinical and clinical testing	1d, 2c, 2g
	5.23 Describe that many non-communicable human diseases are caused by the interaction of a number of factors, including cardiovascular diseases, many forms of cancer, some lung and liver diseases and diseases influenced by nutrition	
	5.24 Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels, including: a) exercise and diet on obesity and malnutrition, including BMI and waist: hip calculations, b) alcohol on liver diseases c) smoking on cardiovascular diseases	1d, 2c, 2g, 3b, 3c
	5.25 Evaluate some different treatments for cardiovascular disease, including: a) life-long medication b) surgical procedures c) lifestyle changes	
Exceeding	**5.6** Explain how pathogens are spread and how this spread can be reduced or prevented, including: a) cholera (bacteria) – water b) tuberculosis (bacteria) – airborne c) Chalara ash dieback (fungi) – airborne d) malaria (protists) – animal vectors e stomach ulcers caused by Helicobacter (bacteria) – oral transmission f) Ebola (virus) – body fluids	2a, 2c, 2f
	5.14 Explain the body's response to immunisation using an inactive form of a pathogen	

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a	Recognise and use expressions in decimal form	
b	Recognise and use expressions in standard form	
c	Use ratios, fractions and percentages	
d	Make estimates of the results of simple calculations	
2	**Handling data**	
a	Use an appropriate number of significant figures	
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c	Construct and interpret frequency tables and diagrams, bar charts and histograms	
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3	**Algebra**	
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~	
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5	**Geometry and trigonometry**	
a	Use angular measures in degrees	
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10B Photosynthesis

Key vocabulary

- Xylem
- Phloem
- Osmosis
- Transpiration
- Translocation
- Adaptation
- Enzyme
- Endothermic
- Proportional

Disciplinary Science

- P2 / E2 / A1 / A2 / A5 / A8 / A11 / A13

Assessment Strategies

- 10B - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10C
- 11A
- **A-level Biology**
- Photosynthesis, Krebs cycle

Common Misconceptions

- Plants do 'Reverse breathing'
- Photosynthesis makes energy
- Plants get food from soil
- Plants can only do photosynthesis
- Plants only respire at night

Prior Learning

7A - Cells – Describe the function of some plant systems
8B – Plants - Describe plant reproduction systems
8E - Combustion - Describe reactions as endo or exothermic
8D - Unicellular organisms - Describe autotrophic organisms
9A - Cells –Explain the function of sub-cellular organelles

Cross curricular links

- Geography – environmental factors affecting habitats

	10B - Photosynthesis What you need to be able to do:	Maths
Developing	**6.1** Describe photosynthetic organisms as the main producers of food and therefore biomass	
Developing	**6.2** Describe photosynthesis in plants and algae as an endothermic reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen	2c
Secure	**6.3** Explain the effect of temperature, light intensity and carbon dioxide concentration as limiting factors on the rate of photosynthesis	2a, 2d, 2g, 3b, 3c, 4a, 4b, 4c, 4e
Secure	**6.5** Core Practical: Investigate the effect of light intensity on the rate of photosynthesis	2a, 2d, 2g, 3b, 3c, 4a, 4b, 4c, 4e
Secure	**6.7** Explain how the structure of the root hair cells is adapted to absorb water and mineral ions	
Secure	**6.8** Explain how the structures of the xylem and phloem are adapted to their function in the plant, including: a) lignified dead cells in xylem transporting water and minerals through the plant b) living cells in phloem using energy to transport sucrose around the plant	
Secure	**6.9** Describe how water and mineral ions are transported through the plant by transpiration, including the structure and function of the stomata	
Secure	**6.13** Demonstrate an understanding of rate calculations for transpiration	2g, 4a, 4c, 4e
Exceeding	**6.4** Explain the interactions of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis	2a, 2d, 2g, 3b, 3c, 4a, 4b, 4c, 4e
Exceeding	**6.6** Explain how the rate of photosynthesis is directly proportional to light intensity and inversely proportional to the distance from a light source, including the use of the inverse square law calculation	2a, 2d, 2g, 3b, 3c, 4a, 4b, 4c, 4e
Exceeding	**6.10** Describe how sucrose is transported around the plant by translocation	
Exceeding	**6.12** Explain the effect of environmental factors on the rate of water uptake by a plant, to include light intensity, air movement and temperature	

Lesson 1 | Lesson 2 | Lesson 3 | Lesson 4 | Lesson 5 | Lesson 6 | Lesson 7

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5	**Geometry and trigonometry**
a	Use angular measures in degrees
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10C Ecosystems

Key vocabulary

- Biotic / Abiotic
- Ecosystems
- Biodiversity
- Biomass
- Organism
- Eutrophication
- Interdependent
- Indigenous
- Quadrat

Assessment Strategies

- 10C - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

C1.3 - Fertilizers

- **A-Level Biology**
- Food chains, Ecosystems, Environmental consequences, Pest control & carbon cycle

Disciplinary Science

- P1 / P4 / P7 / E2 / E4 / A13

Common Misconceptions

- Anthropomorphize plants and animals
- ecosystems are unchanging
- Plants cant defend themselves
- Herbivores are weaker, with less energy than carnivores

Prior Learning

7A - Recall life processes

7D - Ecosystems - Describe relationships using food webs & Explain how adaptations affect survival

9D - Genetics - Describe characteristics passing to offspring

9E - Evolution - Describe formation of biodiversity

Cross curricular links

- Chemistry – Haber process
- Geography – Habitats/biomes

	10C – Ecosystems What you need to be able to do:	Maths
Developing	**9.1** Describe the different levels of organisation from individual organisms, populations, communities, to the whole ecosystem	
Developing	**9.3 & 9.4** Describe the importance of interdependence in a community and how the survival of some organisms is dependent on other species, including parasitism & mutualism	
Secure	**9.2** Explain how communities can be affected by abiotic and biotic factors	4a, 4c
Secure	**9.9** Explain the positive and negative human interactions within ecosystems and their impacts on biodiversity including; a) fish farming, b) introduction of non-indigenous species, c) eutrophication	2c, 2g, 4a, 4c
Secure	**9.10** Explain the importance of maintaining local and global biodiversity	
Exceeding	**9.6** Explain how the determine the number of organisms in a given area using raw data from field-work techniques, *including random sampling*	1c, 1d, 2b, 2c, 2d, 2g, 4a, 4c
Exceeding	**9.6** Explain how the determine the number of organisms in a given area using raw data from field-work techniques, *including belt transects*	1c, 1d, 2b, 2c, 2d, 2g, 4a, 4c
Exceeding	**9.13** Explain the importance of the carbon cycle	
Exceeding	**9.14** Explain the importance of the water cycle	
Exceeding	**9.15** Explain how nitrates are made available for plant uptake, including the use of fertilisers crop rotations and the role of bacteria in the nitrogen cycle	
	9.5 Core Practical: Investigate the relationship between organisms and their environment using field work techniques, *including random sampling*	1d, 2a, 2c, 2d, 2f, 2g, 3c, 4a, 4c
	9.5 Core Practical: Investigate the relationship between organisms and their environment using field work techniques, *including belt transects*	1d, 2a, 2c, 2d, 2f, 2g, 3c, 4a, 4c

Lesson 1 | Lesson 2 | Lesson 3 | Lesson 4 | Lesson 5 | Lesson 6 | Lesson 7

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10C.5 CNS

Key vocabulary

- Receptors
- Synapse
- Neurones
- Neurotransmitter
- Diffuse
- Reflex
- Axon
- Myelin Sheath

Assessment Strategies

- 9C - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 11B Homeostasis
- **A-level Biology**
- Cell structure & Responding to changes in the environment

Disciplinary Science

- T5

Common Misconceptions

- Electrical impulses diffuses across the synapse should be neurotransmitter/chemical impulses diffuse across the synapse
- New electrical impulse stimulated on the post synaptic neurone should be new action potential stimulated

Prior Learning

7A - Cells – Nerve cell specialisation

8D - unicellular vs multicellular – response to stimuli

9A - Cells – Recall sub cellular structure of specialised cells

Cross curricular links

- PE – Reflex arc
- Physics – electrical circuits

	Topic 2 - Nervous System	Maths
	What you need to be able to do:	
Exceeding	**2.13** Explain the structure and function of sensory receptors, sensory neurones, relay neurones in the CNS, motor neurones and synapses in the transmission of electrical impulses, including the axon, dendron, myelin sheath and the role of neurotransmitters	4c
	2.14 Explain the structure and function of a reflex arc including sensory, relay and motor neurones	

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10D Acids

Key vocabulary

- Hydrogen ion
- Hydroxide ion
- Neutralisation
- Acid / Base / Alkali
- Indicator / pH
- Soluble
- Insoluble
- Solution
- Precipitate
- Effervescence

Disciplinary Science

- P1 / P3 / P4 / E1 / E2 / E3 / A1 / A2 / A3 / A4 / A5 / A6 / A10 / A11 / A13 / T3 / T4

Assessment Strategies

- 10D - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10E Electrolysis of water
- 10F Metal extraction
- **A-level Chemistry**
- Acids & Bases

Common Misconceptions

- Acids burn/melt everything
- Bases are not harmful
- Strong acids are always concentrated
- As pH increases, acidity increases

Prior Learning

7F - Acids & Alkalis - Recall indicator changes & name salts formed during neutralisation
7E - Mixtures & Separation - Describe how to form solutions
8G - Metals & Uses - Describe reaction of metals with acids
9G - Bonding - Predict Ion formation using the periodic table

Cross curricular links

- Biology – Buffers & pH
- Geography – Chem weathering

	Topic 3 - Acids What you need to be able to do:	Maths
Developing	**3.1** Recall that acids in solution are sources of hydrogen ions and alkalis in solution are sources of hydroxide ions	
	3.2 Recall that a neutral solution has a pH of 7 and that acidic solutions have lower pH values and alkaline solutions higher pH value	
	3.3 Recall the effect of acids and alkalis on indicators, including litmus, methyl orange and phenolphthalein	
	3.4 Recall that the higher the concentration of hydrogen ions in an acidic solution, the lower the pH; and the higher the concentration of hydroxide ions in an alkaline solution, the higher the pH	1c
	3.5 Recall that as hydrogen ion concentration in a solution increases by a factor of 10, the pH of the solution decreases by 1	1c
	3.9 Recall that a base is any substance that reacts with an acid to form a salt and water only	
	3.10 Recall that alkalis are soluble bases	
	3.19 Recall the general rules which describe the solubility of common types of substances in water	
Secure	**3.12** Describe the chemical test for: **a)** hydrogen **b)** carbon dioxide	
	3.13 Describe a neutralisation reaction as a reaction between an acid and a base	
	3.18 Describe how to carry out an acid-alkali titration, using burette, pipette and a suitable indicator, to prepare a pure, dry salt	
	3.20 Predict, using solubility rules, whether or not a precipitate will be formed when named solutions are mixed together, naming the precipitate if any	
	3.21 Describe the method used to prepare a pure, dry sample of an insoluble salt	
Exceeding	**3.7** Explain the terms dilute and concentrated, with respect to amount of substances in solution	
	3.8 Explain the terms weak and strong acids, with respect to the degree of dissociation into ions	
	3.11 Explain the general reactions of aqueous solutions of acids with: a) metals b) metal oxides c) metal hydroxides d) metal carbonates to produce salts	
	3.14 Explain an acid-alkali neutralisation as a reaction in which hydrogen ions (H^+) from the acid react with hydroxide ions (OH^-) from the alkali to form water	
	3.15 Explain why, if soluble salts are prepared from an acid and an insoluble reactant: a) excess of the reactant is added b) the excess reactant is removed c) the solution remaining is only salt and water	
	3.16 Explain why, if soluble salts are prepared from an acid and a soluble reactant: a) titration must be used b) the acid and the soluble reactant are then mixed in the correct proportions c) the solution remaining, after reaction, is only salt and water	

3.6 Core Practical: Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a fixed volume of dilute hydrochloric acid	4a, 4c
3.17 Core Practical: Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath	

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10E Electrolysis

Key vocabulary

- Electrolysis
- Electrode
- Ion / anion / cation
- Electrolyte
- Inert
- Oxidation
- Reduction
- Circuit
- Direct Current (D.C.)
- Binary compound

Assessment Strategies

- 10E - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10F Metal extraction using electrolysis
- **A-level Chemistry**
- Electrochemistry

Disciplinary Science

- P1 / P3 / E1 / E2 / E3 / A1 / A8

Common Misconceptions

- Same products are produced in both molten and aqueous states
- Cations have the same charge as a cathode and Anions have the same charge as Anode

Prior Learning

7H - Atoms - Recall matter is made from particles called atoms
8G - Metals & Uses – Describe effect of metal reactivity
9F - Atoms - Recall subatomic particles
9G - Bonding - Describe formation of ions
10E - Acids - Recall common ions in solutions

Cross curricular links

- Engineering - Electroplating

	10E - Electrolytic Processes What you need to be able to do:	Maths
Developing	**1.21** Describe the formation of ionic bonds by the transfer of electrons between atoms to produce cations and anions	
Developing	**3.22** Recall that electrolytes are ionic compounds in the molten state or dissolved in water	
Developing	**3.29** Recall that reduction occurs at the cathode and that oxidation occurs at the anode in electrolysis reactions	
Secure	**3.23** Describe electrolysis as a process in which electrical energy, from a direct current supply, decomposes electrolytes	
Secure	**3.26** Predict the products of electrolysis of other binary, ionic compounds in the molten state	1c
Exceeding	**3.24** Explain the movement of ions during electrolysis	
Exceeding	**3.25** Explain the formation of the products in the electrolysis, using inert electrodes	1c
Exceeding	**3.27 Write half equations for reactions occurring at the anode and cathode**	1c
Exceeding	**3.28 Explain oxidation and reduction in terms of loss or gain of electrons**	
Exceeding	**3.30** Explain the formation of the products in the electrolysis of copper sulfate solution, using copper electrodes, and how this can be used to purify copper	1c
	3.31 Core Practical: Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes	1a, 1c, 4a, 4b, 4c,4d

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10F Extraction & Equilibria

Key vocabulary

- Ores
- Mining
- Oxidation / Reduction
- Displacement
- Phytomining
- Bioleaching
- Life cycle assessment
- Recycling
- Dynamic equilibrium
- Rate

Common Misconceptions

- All metals extracted the same
- Plastic products are always worst materials in LCA's
- All metals are easy to recycle
- Equilibrium points are static and fixed

Prior Learning

7H - Atoms, Elements & Comp's – Describe chemical reactions using word equations

8G - Metals & Uses - Predict Metals reactivity order using experiments

9I – Chem Calculations – balance chemical equations

10E - Electrolysis - Describe how to separate ionic substances / Recall oxidation and reduction

Cross curricular links

- Geography – minerals, ores & metal recycling

Assessment Strategies

- 10F - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- Chemistry C1.3 Reversible reactions
- 11C Factors affecting Rate
- **A-level Chemistry**
- Equilibria

Disciplinary Science

- P1 / P3 / E1 / E2 / E3 / T4

	Topic 4 - Obtaining and Using Metals What you need to be able to do:	Maths
Developing	**4.4** Recall that: **a)** most metals are extracted from ores found in the Earth's crust **b)** unreactive metals are found in the Earth's crust as the uncombined elements	
	4.6 Recall that the extraction of metals involves reduction of ores	
	4.16 Recall the conditions for the Haber process as: **a)** temperature 450 °C **b)** pressure 200 atmospheres **c)** iron catalyst	
	4.13 Recall that chemical reactions are reversible and represent this using the symbol ⇌ in equations	
	4.13 Recall that the direction of some reversible reactions can be altered by changing the reaction conditions	
Secure	**4.1** Deduce the relative reactivity of some metals, by their reactions with water, acids and salt solutions	
	4.11 Describe that a life time assessment for a product involves consideration of the effect on the environment of obtaining the raw materials, manufacturing the product, using the product and disposing of the product when it is no longer useful	
	4.15 Describe the formation of ammonia as a reversible reaction between nitrogen (extracted from the air) and hydrogen (obtained from natural gas) and that it can reach a dynamic equilibrium	
Exceeding	**4.2 Explain displacement reactions as redox reactions, in terms of gain or loss of electrons**	
	4.3 Explain the reactivity series of metals (potassium, sodium, calcium, magnesium, aluminium, (carbon), zinc, iron, (hydrogen), copper, silver, gold) in terms of the reactivity of the metals with water and dilute acids and that these reactions show the relative tendency of metal atoms to form cations	
	4.5 Explain oxidation as the gain of oxygen and reduction as the loss of oxygen	
	4.7 Explain why the method used to extract a metal from its ore is related to position in the reactivity series and the cost of the extraction process, illustrated by **a)** heating with carbon (including iron) **b)** electrolysis (including aluminium)	
	4.8 Evaluate alternative biological methods of metal extraction (bacterial and phytoextraction)	
	4.9 Explain how a metal's relative resistance to oxidation is related to its position in the reactivity series	
	4.10 Evaluate the advantages of recycling metals, including economic implications and how recycling can preserve both the environment and the supply of valuable raw materials	
	4.12 Evaluate data from a life cycle assessment of a product	
	4.14 Explain what is meant by dynamic equilibrium	
	4.17 Predict how the position of a dynamic equilibrium is affected by changes in: a) temperature b) pressure c) concentration	

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10G Periodic Groups

Key vocabulary

- Alkali
- Halogen
- Noble gas
- Displacement reaction
- Oxidation / Reduction
- Physical properties
- Inert
- Reactivity
- Electronic configuration

Assessment Strategies

- 10G - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A-level Chemistry**
- Periodicity
- Inorganic chemistry
- Haloalkanes

Disciplinary Science

- P1 / P3 / E1 / E2 / E3 / A1 / A2 / T4

Common Misconceptions

- Single physical property can determine metallic/non-metallic Nature

Confusing chemical reactions with state changes

Prior Learning

7H - Atoms, Elements & Compounds – Identify elements using symbols

8F - Periodic Table - Reactivity patterns & element properties

9F - Periodic Table – Recall names of groups on P-Table

10E - Electrolysis – Predicting products formed at Anode (Halogens) /Describe oxidation & reduction

Cross curricular links

- DT – Physical properties of materials

	C6 - Groups of Periodic Table What you need to be able to do:	Maths
Developing	**6.1** Classify elements as alkali metals (group 1), halogens (group 7) or noble gases (group 0), based on their position in the periodic table	
	6.2 Recall that alkali metals are soft and have relatively low melting points	
	Recall some uses of noble gases	
	6.6 Recall the colours and physical states of chlorine, bromine and iodine at room temperature	
	6.10 Recall that the halogens form hydrogen halides which dissolve in water to form acidic solutions, and use this pattern to predict the reactions of other halogens	
Secure	**6.3** Describe the reactions of lithium, sodium and potassium with water	
	6.4 Describe the pattern in reactivity of the alkali metals with water; and use this pattern to predict the reactivity of other alkali metals	
	6.16 Describe the pattern in the physical properties of some noble gases and use this pattern to predict the physical properties of other noble gases	
	6.7 Describe the pattern in the physical properties of the halogens and use this pattern to predict the physical properties of other halogens	1d, 2c
	6.8 Describe the chemical test for chlorine	
	6.9 Describe the reactions of the halogens with metals to form metal halides, and use this pattern to predict the reactions of other halogens	
	6.11 Describe the relative reactivity of the halogens as shown by their displacement reactions with halide ions in aqueous solution, and use this pattern to predict the reactions of astatine	
Exceeding	**6.12 Explain why these displacement reactions are redox reactions in terms of gain and loss of electrons, identifying which of these are oxidised and which are reduced**	
	6.14 Explain why the noble gases are chemically inert, compared with the other elements, in terms of their electronic configuration	
	6.15 Explain how the uses of noble gases depend on their inertness, low density and/or non-flammability	
	6.5 Explain this pattern in reactivity in terms of electronic configurations	
	6.13 Explain the relative reactivity of the halogens in terms of electronic configurations	

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10H Forces & Energy

Key vocabulary

- Work
- Power
- Efficiency
- Kinetic
- Gravitational
- Force
- Closed system
- Field
- Resultant
- Scalar / Vector

Common Misconceptions

- Objects use up energy
- Stationary objects have no energy
- A force is required to keep objects moving at a constant speed

Prior Learning

7H - Atoms, Elements & Compounds – Recall matter is made from particles called atoms

8K - Energy Transfers - Calculate efficiency & describe heat transfers

9K – Forces - Calculate weight

9M - Energy - Calculate G.P.E. and K.E.

Cross curricular links

- Engineering - vector diagrams
- PE - Power & work calculation

Assessment Strategies

- 10H - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 10J Electrical Power
- **A-level Physics**
- Mechanics & materials
- Thermal Physics
- Engineering Physics

Disciplinary Science

- P3 / P4 / A9 / A10 / A11

	10H Forces & Energy What you need to be able to do:	Maths
Developing	**8.2** Draw and interpret diagrams to represent energy transfers	1c, 2c
	8.4 Identify the different ways that the energy of a system can be changed a through work done by forces b in electrical equipment c in heating	
	8.6 Recall and use the equation: work done (joule, J) = force (newton, N) × distance moved in the direction of the force (metre, m) E = F × d	1a, 1b, 1c, 1d, 2a, 3a, 3b, 3c, 3d, 4f
	8.8 Recall and use the equation to calculate the change in gravitational PE when an object is raised above the ground: change in gravitational potential energy (joule, J) = mass (kilogram, kg) × gravitational field strength (newton per kilogram, N/kg) × change in vertical height (metre, m) ΔGPE = m× g ×Δh	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	8.12 Define power as the rate at which energy is transferred and use examples to explain this definition	1c
	8.9 Recall and use the equation to calculate the amounts of energy associated with a moving object: kinetic energy (joule, J) = 2 1 × mass (kilogram, kg) × (speed)2 ((metre/second)2 , (m/s)2) 2 2 1 KE = × m× v	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	8.13 Recall and use the equation: power (watt, W) = work done (joule, J) ÷ time taken (second, s)	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	8.14 Recall that one watt is equal to one joule per second, J/s	
	8.15 Recall and use the equation: total energy supplied to the device / useful energy transferred by the device	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	9.3 Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations (scale drawings only)	4a, 5a, 5b
	9.4 Draw and use free body force diagrams	4a, 5a, 5b
Secure	**8.1** Describe the changes involved in the way energy is stored when systems change	
	8.5 Describe how to measure the work done by a force and understand that energy transferred (joule, J) is equal to work done (joule, J)	
	8.7 Describe and calculate the changes in energy involved when a system is changed by work done by forces	
	9.1 Describe, with examples, how objects can interact a) at a distance without contact, linking these to the gravitational, electrostatic and magnetic fields involved b) by contact, including normal contact force and friction c) producing pairs of forces which can be represented as vectors	
Exceeding	**8.3** Explain that where there are energy transfers in a closed system there is no net change to the total energy in that system	
	8.10 Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways	
	8.11 Explain that mechanical processes become wasteful when they cause a rise in temperature so dissipating energy in heating the surroundings	
	9.2 Explain the difference between vector and scalar quantities using examples	
	9.5 Explain examples of the forces acting on an isolated solid object or a system where several forces lead to a resultant force on an object and the special case of balanced forces when the resultant force is zero	5a
	9.10 Explain ways of reducing unwanted energy transfer through lubrication	

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10I Radioactivity

Key vocabulary

- Half life
- Alpha particles / ion
- Beta particles
- Gamma-rays
- Penetration
- Decay
- Random
- Isotope
- Geiger-muller tube

Disciplinary Science

- P5 / E1 / A2 / A5 / A6 / A9 / A10 / A11 / A13 / T1 / T3 / T4

Assessment Strategies

- 10I - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A-level Physics**
- Particles and Radiation
- Nuclear Physics
- Astrophysics

Common Misconceptions

- Contamination & Irradiation are the same thing
- Gamma rays are most ionising
- Radiation makes things radioactive

Prior Learning

7H - Atoms, Elements & Compounds – Recall matter is made from particles called atoms

9F - Atomic structure – Recall atoms are made from subatomic particles & Describe the formation of ions and isotopes from atoms

Cross curricular links

- History -Carbon dating
- Chemistry - atomic structure

	P6 Radioactivity What you need to be able to do:	Maths
Developing	**6.2** Recall the typical size (order of magnitude) of atoms and small molecules	
	6.4 Recall that the nucleus of each element has a characteristic positive charge, but that isotopes of an element differ in mass by having different numbers of neutrons	2g, 5b
	6.5 Recall the relative masses and relative electric charges of protons, neutrons, electrons and positrons	
	6.6 Recall that in an atom the number of protons equals the number of electrons and is therefore neutral	
	6.7 Recall that in each atom its electrons orbit the nucleus at different set distances from the nucleus	5b
	6.10 Recall that alpha, β– (beta minus), β+ (positron), gamma rays and neutron radiation are emitted from unstable nuclei in a random process	
	6.11 Recall that alpha, β– (beta minus), β+ (positron) and gamma rays are ionising radiations	
	6.15 Recall that an alpha particle is equivalent to a helium nucleus, a beta particle is an electron emitted from the nucleus and a gamma ray is electromagnetic radiation	
	6.21 Recall that nuclei that have undergone radioactive decay often undergo nuclear rearrangement with a loss of energy as gamma radiation	
	6.22 Use given data to balance nuclear equations in terms of mass and charge	1b, 1c, 3c
	6.27 Use the concept of half-life to carry out simple calculations on the decay of a radioactive isotope, including graphical representations	1a, 1b, 1c, 1d 2a, 2g 3a, 3b, 3c, 3d
Secure	**6.1** Describe an atom as a positively charged nucleus, consisting of protons and neutrons, surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with almost all of the mass in the nucleus	5b
	6.3 Describe the structure of nuclei of isotopes using the terms atomic (proton) number and mass (nucleon) number and using symbols in the format using symbols in the format	1a, 3a
	6.13 Describe the origins of background radiation from Earth and space	
	6.14 Describe methods for measuring and detecting radioactivity limited to photographic film and a Geiger–Müller tube	
	6.17 Describe how and why the atomic model has changed over time including reference to the plum pudding model and Rutherford alpha particle scattering leading to the Bohr model	5b
	6.18 Describe the process of β– decay (a neutron becomes a proton plus an electron)	1b, 1c, 3c
	6.19 Describe the process of β+ decay (a proton becomes a neutron plus a positron)	1b, 1c, 3c
	6.23 Describe how the activity of a radioactive source decreases over a period of time	2g, 4c
	6.29 Describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed	
	6.32 Describe the differences between contamination and irradiation effects and compare the hazards associated with these two	
Exceeding	**6.8** Explain that electrons change orbit when there is absorption or emission of electromagnetic radiation	5b
	6.9 Explain how atoms may form positive ions by losing outer electrons	5b
	6.12 Explain what is meant by background radiation	
	6.16 Compare alpha, beta and gamma radiations in terms of their abilities to penetrate and ionise	
	6.20 Explain the effects on the atomic (proton) number and mass (nucleon) number of radioactive decays (α, β, γ and neutron emission)	1b, 1c, 3c
	6.24 Recall that the unit of activity of a radioactive isotope is the Becquerel, Bq	
	6.25 Explain that the half-life of a radioactive isotope is the time taken for half the undecayed nuclei to decay or the activity of a source to decay by half	1c, 1d 2a
	6.26 Explain that it cannot be predicted when a particular nucleus will decay but half-life enables the activity of a very large number of nuclei to be predicted during the decay process	1c, 3d
	6.31 Explain the precautions taken to ensure the safety of people exposed to radiation, including limiting the dose for patients and the risks to medical personnel	

Lesson 1 | Lesson 2 | Lesson 3 | Lesson 4 | Lesson 5 | Lesson 6 | Lesson 7

1	**Arithmetic and numerical computation**
a	Recognise and use expressions in decimal form
b	Recognise and use expressions in standard form
c	Use ratios, fractions and percentages
d	Make estimates of the results of simple calculations
2	**Handling data**
a	Use an appropriate number of significant figures
b	Find arithmetic means
c	Construct and interpret frequency tables and diagrams, bar charts and histograms
d	Understand the principles of sampling as applied to scientific data
e	Understand simple probability
f	Understand the terms mean, mode and median
g	Use a scatter diagram to identify a correlation between two variables
h	Make order of magnitude calculations
3	**Algebra**
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
b	Change the subject of an equation
c	Substitute numerical values into algebraic equations using appropriate units for physical quantities
d	Solve simple algebraic equations
4	**Graphs**
a	Translate information between graphical and numeric form
b	Understand that $y = mx + c$ represents a linear relationship
c	Plot two variables from experimental or other data
d	Determine the slope and intercept of a linear graph
e	Draw and use the slope of a tangent to a curve as a measure of rate of change
f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate
5	**Geometry and trigonometry**
a	Use angular measures in degrees
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects
c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes

10J Electrical Circuits

Key vocabulary

- Circuit
- Series
- Parallel
- Resistance / Ohms
- Charge / Coulombs
- Potential difference
- LDR
- Thermistor
- Diode

Common Misconceptions

- Batteries store electrons
- Current is used up by circuits
- Batteries are constant current sources

Prior Learning

Year 6 - Recall simple circuit symbols & associate bulb brightness with voltage

7I - Energy - Recall energy stores and transfers

7J - Electricity - Recall basic circuit symbols and describe parallel and series circuits

9M - Energy - Recall energy stores and transfers

Cross curricular links

- Engineering - Electronics
- Chemistry - Sub atomic particles

Assessment Strategies

- 10J - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 11E induced magnetic fields & transformers
- **A-level Physics**
- Electricity, electronics fields & consequences

Disciplinary Science

- P1 – P5 / E1 – E4 / A1 – A7 / A9 – A11 / A13 / T1 / T3 / T4

	10J – Electricity and Circuits What you need to be able to do:	Maths
Developing	**10.2** Draw and use electric circuit diagrams representing them with the conventions of positive and negative terminals, and the symbols that represent cells, including batteries, switches, voltmeters, ammeters, resistors, variable resistors, lamps, motors, diodes, thermistors, LDRs and LEDs	5b
	10.4 Recall that a voltmeter is connected in parallel with a component to measure the potential difference (voltage), in volt, across it	
	10.6 Recall and use the equation: energy transferred (joule, J) = charge moved (coulomb, C) × potential difference (volt, V) $E = Q \times V$	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	10.7 Recall that an ammeter is connected in series with a component to measure the current, in amp, in the component	
	10.9 Recall and use the equation: charge (coulomb, C) = current (ampere, A) × time (second, s) $Q = I \times t$	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	10.11 Recall that current is conserved at a junction in a circuit	
	10.13 Recall and use the equation: potential difference (volt, V) = current (ampere, A) × resistance (ohm, Ω) $V = I \times R$	1a, 1d, 2a, 3a, 3c, 3d
Secure	**10.1** Describe the structure of the atom, limited to the position, mass and charge of protons, neutrons and electrons	5b
	10.3 Describe the differences between series and parallel circuits	
	10.10 Describe that when a closed circuit includes a source of potential difference there will be a current in the circuit	
	10.15 Calculate the currents, potential differences and resistances in series circuits	1a, 1d 2a 3a, 3c, 3d
	10.19 Describe how the resistance of a light-dependent resistor (LDR) varies with light intensity	4c, 4d
	10.20 Describe how the resistance of a thermistor varies with change of temperature (negative temperature coefficient thermistors only)	4c, 4d
Exceeding	**10.5** Explain that potential difference (voltage) is the energy transferred per unit charge passed and hence that the volt is a joule per coulomb	
	10.8 Explain that an electric current as the rate of flow of charge and the current in metals is a flow of electrons	
	10.12 Explain how changing the resistance in a circuit changes the current and how this can be achieved using a variable resistor	
	10.14 Explain why, if two resistors are in series, the net resistance is increased, whereas with two in parallel the net resistance is decreased	
	10.16 Explain the design and construction of series circuits for testing and measuring	
	10.18 Explain how current varies with potential difference for the following devices and how this relates to resistance a) filament lamps b) diodes c) fixed resistors	2g, 4a, 4b, 4c, 4d, 4e
	10.21 Explain how the design and use of circuits can be used to explore the variation of resistance in the following devices a) filament lamps b) diodes c) thermistors d) LDRs	5b
	10.17 Core Practical: Construct electrical circuits to: a investigate the relationship between potential difference, current and resistance for a resistor and a filament lamp b test series and parallel circuits using resistors and filament lamps	1a, 1c, 1d 2a, 2b, 2f 3a, 3b, 3c, 3d 4a, 4b, 4c, 4d, 4e

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	1 Arithmetic and numerical computation
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d	Make estimates of the results of simple calculations
	2 Handling data
a	Use an appropriate number of significant figures
b	Find arithmetic means
c	Construct and interpret frequency tables and diagrams, bar charts and histograms
d	Understand the principles of sampling as applied to scientific data
e	Understand simple probability
f	Understand the terms mean, mode and median
g	Use a scatter diagram to identify a correlation between two variables
h	Make order of magnitude calculations
	3 Algebra
a	Understand and use the symbols: =, <, <<, >>, >, ∝, ~
b	Change the subject of an equation
c	Substitute numerical values into algebraic equations using appropriate units for physical quantities
d	Solve simple algebraic equations
	4 Graphs
a	Translate information between graphical and numeric form
b	Understand that $y = mx + c$ represents a linear relationship
c	Plot two variables from experimental or other data
d	Determine the slope and intercept of a linear graph
e	Draw and use the slope of a tangent to a curve as a measure of rate of change
f	Understand the physical significance of area between a curve and the x-axis and measure it by counting squares as appropriate
	5 Geometry and trigonometry
a	Use angular measures in degrees
b	Visualise and represent 2D and 3D forms, including two dimensional representations of 3D objects
c	Calculate areas of triangles and rectangles, surface areas and volumes of cubes

10J Electrical Transfers

Key vocabulary

- Power
- Direct current D.C.
- Alternating current A.C.
- Fuse
- Live
- Neutral
- Earth
- Circuit Breaker

Disciplinary Science

- P1 – P5 / E1 – E4 / A1 – A7 / A9 – A11 / A13 / T1 / T3 / T4

Assessment Strategies

- 10J - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 11E induced magnetic fields
- P2.2. National Grid
- **A-level Physics**
- Electricity, electronics fields & consequences

Common Misconceptions

- Current is used as it passes through different components
- Thicker wires have lower resistance due to more space
- Charges slow down in thinner wires

Prior Learning

Year 6 - Recall simple circuit symbols & associate bulb brightness with voltage

7I - Energy - Recall energy stores and transfers

7J - Electricity - Recall basic circuit symbols and describe parallel and series circuits

9M - Energy - Recall energy stores and transfers

Cross curricular links

- Engineering - Electronics
- Chemistry - Sub atomic particles

	10J – Electricity and Energy Transfers What you need to be able to do:	Maths
Developing	**10.22** Recall that, when there is an electric current in a resistor, there is an energy transfer which heats the resistor	
	10.29 Recall and use the equation: power (watt, W) = energy transferred (joule, J) ÷ time taken (second, s)	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	10.31 Recall and use the equations: electrical power (watt, W) = current (ampere, A) × potential difference (volt, V) P = I × V electrical power (watt, W) = current squared (ampere^2, A^2) × resistance (ohm, Ω) P = I × R	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	10.36 Recall that in the UK the domestic supply is a.c., at a frequency of 50 Hz and a voltage of about 230 V	
	10.40 Recall the potential differences between the live, neutral and earth mains wires	
	10.42 Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use	1c, 2c
Secure	**10.26** Describe the advantages and disadvantages of the heating effect of an electric current	
	10.27 Use the equation: energy transferred (joule, J) = current (ampere, A) × potential difference (volt, V) × time (second, s) E = I ×V ×t	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	10.28 Describe power as the energy transferred per second and recall that it is measured in watt	1c
	10.32 Describe how, in different domestic devices, energy is transferred from batteries and the a.c. mains to the energy of motors and heating devices	
	10.34 Describe direct current (d.c.) as movement of charge in one direction only and recall that cells and batteries supply direct current (d.c.)	
	10.35 Describe that in alternating current (a.c.) the movement of charge changes direction	
Exceeding	**10.23** Explain that electrical energy is dissipated as thermal energy in the surroundings when an electrical current does work against electrical resistance	
	10.25 Explain ways of reducing unwanted energy transfer through low resistance wires	
	10.30 Explain how the power transfer in any circuit device is related to the potential difference across it and the current in it	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	10.33 Explain the difference between direct and alternating voltage	4c
	10.37 Explain the difference in function between the live and the neutral mains input wires	
	10.38 Explain the function of an earth wire and of fuses or circuit breakers in ensuring safety	
	10.39 Explain why switches and fuses should be connected in the live wire of a domestic circuit	
	10.41 Explain the dangers of providing any connection between the live wire and earth	

Lesson 1 | Lesson 2 | Lesson 3 | Lesson 4 | Lesson 5 | Lesson 6 | Lesson 7

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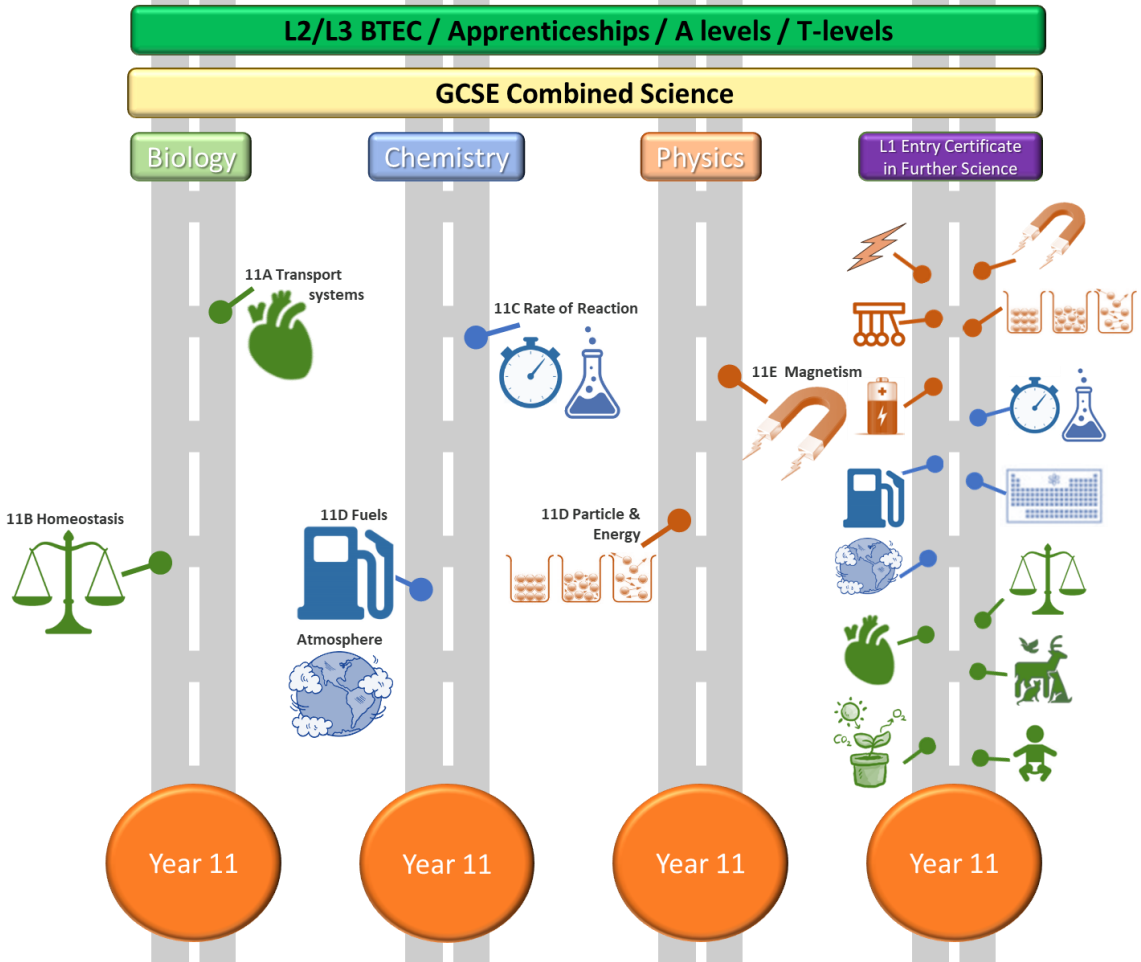
Winifred Holtby Academy

Aspiration | Achievement | Respect

THE CONSORTIUM ACADEMY TRUST

Year 11 Science Scheme of Work



Year 11 Combined Science Outline Scheme of Work

Week	W/C	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
1	1-Sep-25					
2	8-Sep-25	Rotation 1.1	Rotation 1.2	Rotation 1.3	Rotation 1.4	Rotation 1.5
3	15-Sep-25	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9	
4	22-Sep-25	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13	Rotation 1.14
5	29-Sep-25	Rotation 1.15	Rotation 1.16	Rotation 1.17	Rotation 1.18	
6	6-Oct-25	REVISION 1				
7	13-Oct-25	Year 11 PPE Paper 1				
8	20-Oct-25	Rotation 1.19	Rotation 1.20	Rotation 1.21	Rotation 1.22	Rotation 1.23
	27-Oct-25					
9	3-Nov-25	Rotation 1.24	Rotation 1.25	Rotation 1.26	Rotation 1.27	Rotation 1.28
10	10-Nov-25	Rotation 1.1	Rotation 1.2	Rotation 1.3	Rotation 1.4	
11	17-Nov-25	Rotation 1.5	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9
12	24-Nov-25	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13	
13	1-Dec-25	Rotation 1.14	Rotation 1.15	Rotation 1.16	Rotation 1.17	Rotation 1.18
14	8-Dec-25	Rotation 1.19	Rotation 1.20	Rotation 1.21	Rotation 1.22	
15	15-Dec-25	Rotation 1.23	Rotation 1.24	Rotation 1.25	Rotation 1.26	Rotation 1.27
	22-Dec-25					
	29-Dec-25					
16	5-Jan-26	Rotation 1.1	Rotation 1.2	Rotation 1.3	Rotation 1.4	
17	12-Jan-26	Rotation 1.5	Rotation 1.6	Rotation 1.7	Rotation 1.8	Rotation 1.9
18	19-Jan-26	Rotation 1.10	Rotation 1.11	Rotation 1.12	Rotation 1.13	
19	26-Jan-26	Rotation 1.14	Rotation 1.15	Rotation 1.16	Rotation 1.17	Rotation 1.18
20	2-Feb-26	Year 11 PPE 2				
21	9-Feb-26					
	16-Feb-26					
22	23-Feb-26	Rotation 1.19	Rotation 1.20	Rotation 1.21	Rotation 1.22	
23	2-Mar-26	Rotation 1.23	Rotation 1.24	Rotation 1.25	Rotation 1.26	Rotation 1.27
24	9-Mar-26	Revision				
25	16-Mar-26	Revision				
26	23-Mar-26	Revision				
	30-Mar-26					
	6-Apr-26					
27	13-Apr-26	Revision				
28	20-Apr-26	Revision				
29	27-Apr-26	Revision				
30	4-May-26	Revision				
31	11-May-26	GCSE Week				
32	18-May-26	GCSE Week				
	25-May-26					
33	1-Jun-26	GCSE Week				
34	8-Jun-26	GCSE Week				
35	15-Jun-26	GCSE Week				

	Lesson	Biology	Chemistry	Physics
Rotation 1	1	Transport & Exchange	Rates of Reaction Introduction	Magnets and Magnetic Fields
	2	Recall: cells	ore Practical: Inv rates (volume of gase	Electromagnetism
	3	The Circulatory System	Core Practical: Inv rates (colour change	Magnetic Forces (HIGHER)
	4	The Heart	Rates - Data processing	Transformers
	5	Recall: Enzymes	Collision Theory	Energy
	6	Respiration	Catalysts and activation energy	Science literacy 11E
	7	Maths for Scientists - Data	Endo & Exothermic reactions	11E Magnetism Revision
	8	Core Practical: Respiration	HT: Average bond energy calculations	11E Magnetism Test
	9	Literacy 11A	C7 Rates & Energy Changes revision	11E Magnetism Intervention
	10	11A Revision	C7 Rates & Energy Changes Test	maths mastery
	11	11A Test	C7 Rates & Energy Changes Intervention	Particles and Density
	12	11A Intervention	Hydrocarbons	Core Practical: Densities
	13	hormone control & metabolic rate	Fractional Distillation	Recall lessons -Nuclear radiation
	14	hormone control & metabolic rate	Properties of different fractions	specific latent heat
	15	mentral cycle	Complete combustion	specific heat capacity
	16	mentral cycle	Incomplete combustion/ pollutants	Core Practical: Investigating
	17	Maths for Scientists - Probabilities	Acid rain	latent and specific heat
	18	controlling fertility	Cracking	Gas Temperature and Pressure
	19	Recall - seletive breeding	Hydrogen fuel cells	Bending and Streching
	20	Blood glucose and diabetes	Changes in the atmosphere	Core Practical: Investigating
	21	Literacy 11B	Global warming	Extensions and Energy Transfers
	22	11B Revision	Greenhouse effect	Science literacy 11F
	23	11B Test	C8 Fuels & Earth Revision	11F Revision
	24	11B Intervention	C8 Fuels & Earth Test	11F Particles and Energy Test
	25	Bio Interrupt Lesson1	C8 Fuels & Earth Intervention	11F Particles and Energy Intervention
	26	Bio Interrupt Lesson 2	Chem Interrupt Lesson 1	maths mastery
	27	Bio Interrupt Lesson 2	Chem Interrupt Lesson 1	

Bio paper 1 - 12th May PM	Chem paper 1 - 18th May AM	Phy paper 1 - 2nd June AM
Bio paper 2 - 8th June AM	Chem paper 2 - 12th June AM	Phy paper 2 - 15th June AM

11A Exchange & Transport

Key vocabulary

- Haemoglobin
- Artery
- Vein
- Capillary
- Biconcave
- Erythrocyte
- Lymphocyte
- Phagocyte
- Plasma
- Mitochondria
- Platelet

Disciplinary Science

- T4

Assessment Strategies

- 11A - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A level Biology**
- Exercise
- Responding to the environment
- Muscles and respiration

Common Misconceptions

- Breathing & Respiration are the same processes
- Blood is pumped around the body from the heart rather than twice - to the lungs followed by around the body

Prior Learning

7A - Recall cells, tissues, organs and organ systems
8A - Describe absorption of nutrients in the small intestine
8C - Describe processes of breathing and respiration
9A - Describe transport mechanisms
10A - Recall Cardiovascular diseases

Cross curricular links

- Chemistry - Combustion
- PE – Cellular Respiration

	11A - Exchange and Transport Systems What you need to be able to do:	Maths
Developing	**8.12** Calculate heart rate, stroke volume and cardiac output using the equation cardiac output = stroke volume x heart rate	1a, 2a, 2c, 3a, 3b, 4a, 4c
Secure	**8.1** Describe the need to transport substances into and out of a range of organisms	
	8.10 Compare aerobic and anaerobic respiration	
Exceeding	**8.2** Explain the need for exchange surfaces and a transport system in multicellular organisms including the calculation of surface area: volume ratio	1a, 1c, 5c
	8.3 Explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries	
	8.8 Explain how the structure of the heart and the circulatory system is related to its function, including the role of the major blood vessels, the valves and the relative thickness of chamber walls	
	8.7 Explain how the structure of blood vessels is related to their function	1a
	8.6 Explain how the structure of blood is related to its function: a) RBCs b) WBCs c) plasma d) platelets	1b, 2h
	8.11 Core Practical: Investigate the rate of respiration in living organisms	1a, 2c, 2g, 4a, 4c, 4e

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11B Homeostasis

Key vocabulary

- Endocrine system
- Progesterone
- FSH
- LH
- Oestrogen
- Fertilisation
- Ovulation
- Glycogen
- Glucagon
- Insulin

Common Misconceptions

- Confusing processes caused by glycogen and glucagon
- Insulin raises blood sugar levels

Prior Learning

7A – Recall cells, tissues, organs and organ systems
8C – Describe processes of breathing and respiration
9A – Describe cells transport mechanisms
9C - Describe CNS and response to stimuli
10A – Describe issues of health and disease relating to diet

Cross curricular links

- Health & Social care - Health
- Food Technology - diabetes

Assessment Strategies

- 11B - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A level Biology**
- Organism response to changes in internal & External environments

Disciplinary Science

- P2 / E1 / E2 / E3 / A7 / A10 / T5

	11B - Homeostasis What you need to be able to do:	Maths
Developi	**7.1** Describe where hormones are produced and how they are transported from endocrine glands to their target organs, including the pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes	
	7.6 Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy	
	7.7 Evaluate hormonal and barrier methods of contraception	
Secure	**7.2** Explain that adrenalin is produced by the adrenal glands to prepare the body for fight or flight, including: a increased heart rate b increased blood pressure c increased blood flow to the muscles d raised blood sugar levels by stimulating the liver to change glycogen into glucose	
	7.4 Describe the stages of the menstrual cycle, including the roles of the hormone's oestrogen and progesterone, in the control of the menstrual cycle	2c, 4a
	7.8 Explain the use of hormones in Assisted Reproductive Technology (ART) including IVF and clomifene therapy	
	7.9 Explain the importance of maintaining a constant internal environment in response to internal and external change	
	7.14 Explain how blood glucose concentration is regulated by glucagon	
	7.13 Explain how the hormone insulin controls blood glucose concentration	
	7.15 Explain the cause of type 1 diabetes and how it is controlled	
	7.16 Explain the cause of type 2 diabetes and how it is controlled	
	7.17 Evaluate the correlation between body mass and type 2 diabetes including waist: hip calculations and BMI, using the BMI equation.	3b, 3c, 4a
Exceeding	**7.3** Explain how thyroxine controls metabolic rate as an example of negative feedback, including: a low level of thyroxine stimulates production of TRH in hypothalamus b this causes release of TSH from the pituitary gland c TSH acts on the thyroid to produce thyroxine d when thyroxine levels are normal thyroxine inhibits the release of TRH and the production of TSH	2c
	7.5 Explain the interactions of oestrogen, progesterone, FSH and LH in the control of the menstrual cycle, including the repair and maintenance of the uterus wall, ovulation and menstruation	2c, 4a

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11C Rate

Key vocabulary

- Rate
- Concentration
- Surface area
- Pressure
- Frequency
- Collision
- Activation energy
- Exothermic
- Endothermic

Disciplinary Science

- P1 / P3 / P5 / P6 / E1 / E2 / E3 / A1 / A2 / A3 / A4 / A7 / A8 / A10 / A11 / T4

Assessment Strategies

- 11C - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- 11D - Combustion
- **A level Chemistry**
- Energetics, Kinetics, Thermodynamics & Rate

Common Misconceptions

- Larger particles have a larger surface area
- Faster reactions produce more products
- Activation energy is the maximum energy change

Prior Learning

7G- Describe chemical reactions occur when particles collide
8E - Identify reactions as being Endothermic or Exothermic
9F - Describe chemical reactions using balanced equations
10D - Describe neutralisation reactions as exothermic
10F - Describe Factors affecting reversible reactions

Cross curricular links

- Biology – Enzymes speed up biological reactions

	11C – Rate of reaction and energy changes What you need to be able to do:	Maths
Developing	**7.13** Recall that the overall heat energy change for a reaction is: Exothermic if more heat energy is released in forming bonds in the products than is required in breaking bonds in the reactants Endothermic if less heat energy is released in forming bonds in the products than is required in breaking bonds in the reactants	1d
Developing	**7.16** Draw and label reaction profiles for endothermic and exothermic reactions, identifying activation energy	
Developing	**7.8** Recall that enzymes are biological catalysts and are used in the production of alcoholic drinks	
Secure	**7.10** Describe an exothermic change or reaction as one in which heat energy is given out	
Secure	**7.11** Describe an endothermic change or reaction as one in which heat energy is taken in	
Secure	**7.12** Recall that the breaking of bonds is endothermic and the making of bonds is exothermic	1d
Secure	**7.14** Calculate the energy change in a reaction given the energies of bonds (in kJ mol^{-1})	1d
Secure	**7.2** Suggest practical methods for determining the rate of a given reaction	4c
Secure	**7.6** Describe a catalyst as a substance that speeds up the rate of a reaction without altering the products of the reaction, being itself unchanged chemically and in mass at the end of the reaction	
Secure	**7.5** Interpret graphs of mass, volume or concentration of reactant or product against time	4a,4b,4c,4d, 4e
Exceeding	**7.4** Explain the effects on rates of reaction of changes in temperature, concentration, surface area to volume ratio of a solid and pressure (in reactions involving gases) in terms of frequency and/or energy of collisions between particles	
Exceeding	**7.3** Explain how reactions occur when particles collide and that rates of reaction are increased when the frequency and/or energy of collisions is increased	
Exceeding	**7.7** Explain how the addition of a catalyst increases the rate of a reaction in terms of activation energy	
Exceeding	**7.15** Explain the term activation energy	1d

7.1 Core Practical: Investigate the effects of changing the conditions of a reaction on the rates of chemical reactions by measuring the production of a gas in the reaction between hydrochloric acid and marble chips

7.1 Core Practical: Observe a colour change in the reaction between sodium thiosulfate and hydrochloric acid

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11D Fuels & Atmosphere

Key vocabulary

- Hydrocarbon
- Fractional distillation
- Non-renewable
- Combustion
- Homologous series
- Toxic
- Cracking
- Condensation
- Greenhouse effect

Common Misconceptions

- Fossil fuels formed in in only a few thousand years
- Global warming is linked to ozone layer depletion
- Atmosphere is mostly oxygen and carbon dioxide

Prior Learning

8E – Describe combustion reactions, formation of acid rain and cause of global warming

9G – Explain properties of covalent substances and formation of covalent bonds

9H - Describe use of Fractional distillation to separate mixtures

11C – Recall use of catalysts to speed up reactions

Cross curricular links

- Geography – Climate change

Assessment Strategies

- 11D - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A level Chemistry**
- Physical Chemistry - Bonding
- Organic Chemistry, Polymers & isomerism

Disciplinary Science

- T3 / T5

	11D –The Earth, Fuels and Atmosphere What you need to be able to do:	Met
Developing	**8.7** Recall combustion reactions produce energy, carbon dioxide and water	
	8.15 Recall that petrol, kerosene and diesel oil are non-renewable fossil fuels obtained from crude oil	
	8.4 Recall the names and uses of fractions of crude oil	1d
	8.1 Recall that hydrocarbons are compounds containing carbon and hydrogen only	
	8.18 Recall that the gases produced by volcanic activity formed the Earth's early atmosphere	
	8.23 Describe the chemical test for oxygen	
	8.26 Recall the current composition of the atmosphere	1d
Secure	**8.26** Describe the potential effects on the climate of increased levels of carbon dioxide and methane generated by human activity,	
	8.24 Describe how various gases in the atmosphere cause the greenhouse effect	
	8.20 Explain how condensation of water vapour formed oceans	
	8.10 Describe the problems caused by incomplete combustion	
	8.11 / 8.12 / 8.13 Explain the causes of acid rain and some problems associated with acid rain caused when SO_2 or NOx gases dissolve in rain water	
	8.3 Describe and explain the separation of crude oil into simpler, more useful mixtures by the process of fractional distillation	
	8.2 Describe what crude oil contains and its importance as a fuel source	
	8.19 Describe the composition of Earth's early atmosphere	
Exceeding	**8.22** Explain how the growth of primitive plants used carbon dioxide and released oxygen by photosynthesis	
	8.25 Evaluate the evidence for human activity causing climate change and the uncertainties due how measurements were taken	
	8.16 Explain how cracking involves the breaking down of larger, saturated hydrocarbon molecules (alkanes) into smaller, more useful ones	1d
	8.14 Evaluate the advantages and disadvantages of using hydrogen, rather than petrol, as a fuel in cars	
	8.8 / 8.9 Explain why the incomplete combustion of hydrocarbons can produce carbon and carbon monoxide which is toxic	
	8.5 Explain how hydrocarbons in different fractions differ from each other in terms of physical properties	
	8.6 Explain a homologous series as a series of compounds which have a similar structure, similar chemical properties and varying physical properties	
	8.21 Explain how the amount of carbon dioxide in the atmosphere has decreased due to dissolving into oceans	

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11E Magnetism

Key vocabulary

- Magnetic
- Field
- Induced
- Solenoid
- Magnetic poles
- Attraction
- Repulsion
- Transformer
- Power

Common Misconceptions

- All metals are attracted to magnets
- All metals are made from iron
- Size of magnet determines strength of magnetic field

Prior Learning

7J - Describe current, voltage & Resistance in series & parallel circuits

8L - Describe magnetic fields

10H - Describe effects of electrostatic & magnetic fields on objects

10J - Explain differences between A.C. and D.C. current

Cross curricular links

- Chemistry – physical properties
- Engineering – select materials

Assessment Strategies

- 11E - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A level Chemistry**
- Transition metals, bonding & NMR
- **A level Physics**
- Particles & Radiation & Thermal Physics

Disciplinary Science

- P1 – P5 / E2 / A1 / A7 / A9 / A10 / T1 / T3 / T4

	11E – Magnetism What you need to be able to do:	Maths
Developing	**12.1** Recall that unlike magnetic poles attract and like magnetic poles repel	
	12.8 Recall that the strength of the field depends on the size of the current and the distance from the long straight conductor	
	12.10 Recall that a current carrying conductor placed near a magnet experiences a force and that an equal and opposite force acts on the magnet	5b
	12.12 Recall and use Fleming's left-hand rule to represent the relative directions of the force, the current and the magnetic field for cases where they are mutually perpendicular	5b
	13.2 Recall the factors that affect the size and direction of an induced potential difference, and describe how the magnetic field produced opposes the original change	5b
	13.6 Recall that a transformer can change the size of an alternating voltage	
Secure	**12.2** Describe the uses of permanent and temporary magnetic materials including cobalt, steel, iron and nickel	
	12.4 Describe the shape and direction of the magnetic field around bar magnets and for a uniform field, and relate the strength of the field to the concentration of lines	5b
	12.5 Describe the use of plotting compasses to show the shape and direction of the field of a magnet and the Earth's magnetic field	5b
	12.7 Describe how to show that a current can create a magnetic effect and relate the shape and direction of the magnetic field around a long straight conductor to the direction of the current	5b
	12.13 Use the equation: force on a conductor at right angles to a magnetic field carrying a current (newton, N) = magnetic flux density (tesla, T or newton per ampere metre, N/A m) × current (ampere, A) × length (metre, m) F = B × I × l	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
	13.10 Use the power equation (for transformers with 100% efficiency): potential difference across primary coil (volt, V) × current in primary coil (ampere, A) = potential difference across secondary coil (volt, V) × current in secondary coil (ampere, A)	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
Exceeding	**12.3** Explain the difference between permanent and induced magnets	
	12.6 Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic	5b
	12.9 Explain how inside a solenoid (an example of an electromagnet) the fields from individual coils a add together to form a very strong almost uniform field along the centre of the solenoid b cancel to give a weaker field outside the solenoid	5b
	12.11 Explain that magnetic forces are due to interactions between magnetic fields	
	13.5 Explain how an alternating current in one circuit can induce a current in another circuit in a transformer	
	13.8 Explain why, in the national grid, electrical energy is transferred at high voltages from power stations, and then transferred at lower voltages in each locality for domestic uses as it improves the efficiency by reducing heat loss in transmission lines	
	13.9 Explain where and why step-up and step-down transformers are used in the transmission of electricity in the national grid	

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11F Particles & Energy

Key vocabulary

- Kelvin scale
- Density
- Kinetic
- Specific heat capacity
- Specific latent heat
- Elastic limit
- Limit of proportionality
- Plastic
- Elastic

Common Misconceptions

- Particles in solids are motionless
- Larger negative numbers are closer to 0°C
- State changes can occur below 0°C

Prior Learning

7H - Atoms, Elements & Compounds – Recall matter is made from particles called atoms

7K - Recall energy stores - magnetism

8I – Calculate density

8K - Describe heat transfers

9F & 9G - Describe matter as consisting of vibrating particles

Cross curricular links

- Chemistry – states of matter

Assessment Strategies

- 11F - End of Topic Test
- Extended writing (Peer Assessed)
- Response to verbal feedback (PASA)
- Educake Homework task

Linked Future Topics

- **A level Chemistry**
- Energetics & Thermodynamics
- **A level Physics**
- Fields & consequences & Medical Physics

Disciplinary Science

- P1 – P4 / P6 – P7 / E1 – E4 / A1 – A13 / T1 / T3 / T4

	11F – Particles & Energy What you need to be able to do:	Math
Developing	**14.2** Recall and use the equation: density (kilogram per cubic metre, kg/m^3) = mass (kilogram, kg) ÷ volume (cubic metre, m^3) $\rho = m \div V$	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d 5c
	14.7 Define the terms specific heat capacity and specific latent heat and explain the differences between them	
	15.3 Recall and use the equation for linear elastic distortion including calculating the spring constant: force exerted on a spring (newton, N) = spring constant (newton per metre, N/m) × extension (metre, m) $F = k \times x$	1a, 1c, 1d 2a 3a, 3b, 3c, 3d
Secure	**14.1** Use a simple kinetic theory model to explain the different states of matter (solids, liquids and gases) in terms of the movement and arrangement of particles	
	14.5 Describe that when substances melt, freeze, evaporate, boil, condense or sublimate mass is conserved and that these physical changes differ from some chemical changes because the material recovers its original properties if the change is reversed	
	14.8 Use the equation: change in thermal energy (joule, J) = mass (kilogram, kg) × specific heat capacity (joule per kilogram degree Celsius, J/kg °C) × change in temperature (degree Celsius, °C) $\Delta Q = m \times c \times \Delta\theta$	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	14.9 Use the equation: thermal energy for a change of state (joule, J) = mass (kilogram, kg) × specific latent heat (joule per kilogram, J/kg) $Q = m \times L$	1a, 1b, 1c, 1d 2a 3a, 3b, 3c, 3d
	14.14 Describe the term absolute zero, −273 °C, in terms of the lack of movement of particles	
	14.15 Convert between the kelvin and Celsius scales	1a, 2a
	15.2 Describe the difference between elastic and inelastic distortion	
	15.4 Use the equation to calculate the work done in stretching a spring: energy transferred in stretching (joule, J) = 0.5 × spring constant (newton per metre, N/m) × (extension (metre, m))2 2 2 1 $E = \times k \times x$	1a, 1c, 1d 2a 3a, 3b, 3c, 3d 4c, 4e, 4f
	15.5 Describe the difference between linear and non-linear relationships between force and extension	4c, 4e
Exceeding	**14.4** Explain the differences in density between the different states of matter in terms of the arrangements of the atoms or molecules	5b
	14.6 Explain how heating a system will change the energy stored within the system and raise its temperature or produce changes of state	
	14.10 Explain ways of reducing unwanted energy transfer through thermal insulation	
	14.12 Explain the pressure of a gas in terms of the motion of its particles	5b
	14.13 Explain the effect of changing the temperature of a gas on the velocity of its particles and hence on the pressure produced by a fixed mass of gas at constant volume (qualitative only)	5b
	15.1 Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force	

14.3 Core Practical: Investigate the densities of solid and liquids	1a, 1b, 1c, 1d 2a, 2c, 2f 3a, 3b, 3c, 3d 4a, 4c 5c
14.11 Core Practical: Investigate the properties of water by determining the specific heat capacity of water and obtaining a temperature-time graph for melting ice	1a, 1b, 1c, 1d 2a, 2b, 2f 3a, 3b, 3c, 3d 4a, 4c, 4e
15.6 Core Practical: Investigate the extension and work done when applying forces to a spring	1a, 1c, 1d 2a, 2b, 2c, 2f 3a, 3b, 3c, 3d 4a, 4b, 4c, 4d

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