Science

'Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world.' Louis Pasteur

Summerhill students will be
valuable members of society

Science students will become informed and inquisitive members of society, having an insightful understanding of the world around them. This will enable them to engage fully with developments that will help them to be part of local, national and global communities.

As critical thinkers, our students will be equipped to challenge bias and to value evidence as a basis of opinion, lending their understanding to the wealth of ideas generated by all aspects of society.

The Science curriculum will support the pathways necessary for students to flourish in a range of scientific and non-scientific careers, adding to the development of innovation.

Summerhill students will be
skilled communicators

Science students will be scientifically literate allowing them to critically evaluate and refine methodologies, judging the validity of scientific conclusions that are presented to them in the media.

To build confidence in communication, opportunities to present conclusions and research to their peers are supported by the curriculum. These provide transferable skills to wider life experiences, now and in the future.

Students will develop team and interpersonal skills reliant on effective communication when working together during investigations and group work to ensure safe and enjoyable learning experiences.

Summerhill students will be
knowledgeable

Students will become scientifically knowledgeable by a fostered spirit of independent inquiry, curiosity and using current, real world science in the classroom.

Students will learn underlying concepts that influence all of the key aspects the Science curriculum: Our own bodies – how to make healthy decisions; the world's resources – how to make sustainable decisions.

They will have an ability to use gained scientific knowledge and inquiry skills to identify questions and explain science phenomena, enriching not only their own understanding but that of those around them.

Our curriculum is underpinned by four key values:

Courage – doing what is right; being truthful; trying new experiences; taking risks in the pursuit of personal development

Ambition – having the highest aspirations and expectations of ourselves / others; being brilliant in all we do; having belief that challenges can be overcome with the right attitude and hard work

Respect – thinking about the way we interact with others; being considerate to ourselves, others and the environment; responding to expectations and working together in teams

Effort – investing time and energy to achieve success; always giving our best in everything we do; demonstrating resilience

Science Curriculum Overview

Year	Key Features	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
7	All students 3 single periods per week Taught in mixed ability groups	**How Science Works** Students are introduced to Secondary School Science. They will understand the importance of laboratory safety and develop key investigative skills. **Crime Scene** Students step into the life of a forensic scientist, learning and applying techniques to analyse a variety of samples. Students learn about: • Cells and organisation • Microscopes • Chromatography Flame tests • pH testing • Revealing fingerprints • Discussing limitations and drawing conclusions	**Prosthetics** The differences between each of us should be not only accepted but also celebrated. S Students learn about: • The skeletal and muscular systems • The particulate nature of matter • Metals and non-metals • Forces and motion	**Desert Island** In this unit, students' science skills are used to find effective ways to find food, shelter, energy and a water supply on a desert island. Students learn about: • Separation techniques • Plant reproduction • Changes of state • Electricity	**Life on Titan** What would life be like on Titan? Saturn's largest moon and the only known body in space, other than Earth, where clear evidence of stable bodies of surface liquid has been found. Students learn about: • Weight, mass and gravity • The solar system • Days and seasons • Plant growth	**Renewable Energy** With Climate Scientists agreeing that human activity is driving a climate crisis across the Earth, this unit considers various alternative methods to supply populations with electricity, without having the same damaging effects to our environment as burning fossil fuels. Students learn about: • Renewable energy resources • The structure of the Earth • Rock formation	**Global Links in Science** Cross-curricular links with Global Learning lessons are explored. Students learn about: • Human reproduction • Puberty • Menstrual cycle • Foetal development • IVF **Crest Award** The CREST Bronze Awards empower students to work like real scientists. Students work independently or in groups to plan and run a project, choosing their own topic and methodologies to address a real-world STEM problem. This process develops enquiry, problem-solving and communication skills.

Year	Key Features	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
8	All students 3 single periods per week	**The Periodic Table and Reactions** The periodic table is fundamental for providing information on elements and how they relate to one another. We can then use this information in chemical equations. Students learn about: • Atoms, elements and compounds • The periodic table • Chemical reactions • Materials	**Jurassic Life** Approximately 240 million years ago, dinosaurs ruled the Earth. The conditions of Jurassic times are explored. Students learn about: • Photosynthesis Structure of a leaf. • Role of stomata Pressure • Theories of evolution and natural selection Inheritance • Fossils.	**Sport** The details of Sport and Exercise Sciences are explored within this topic, with an emphasis on the benefits of regular exercise and a balanced diet. Students learn about: • Diets of different athletes • Food tests • Nutrition and digestion • Breathing • The heart • Response to exercise Respiration • Work done	**Environment** Humans affect the environment in many ways. Students will learn about: • Composition of the atmosphere • Earth's resources Deforestation • Pollution • Climate change • Carbon cycle and carbon • Reducing, reusing and recycling	**Natural Disasters** This topic explores into the science behind natural disasters. Students learn about: • Waves • Earth's structure and resources • Heating and cooling Forces and pressure	**Investigating Electricity** Students put their investigative skills to the test. Students will be given a hypothesis, which then needs to be tested. Possible methods will be considered before a detailed plan is written. Students will decide which variables need to be controlled in order to investigate the hypothesis and ensure they consider associated hazards. Students then carry out their investigations to obtain their results and form conclusions.
9	All students 4 single periods per week Taught in sets	**Atoms and the Periodic table** Evaluation of atomic models and their development: separation techniques for mixtures; development of theories and ideas relating to the Periodic table	**Energy** Applying knowledge to real world situations for a range of electronics; application of mathematical skills to calculate energy changes; consider the sustainability of a range of alternative energy generation methods	**Cells** Using cell diagrams to relay information; using experimental measurements and calculations in magnification; evaluating ethical issues relating to stem cells; applying knowledge to unfamiliar cells and organs	**Chemical reactions** Fundamental chemical reactions are looked at and used as a basis for not only how and why reactions happen but how we can interpret the collected data and observations.	**Forces** Forces that affect every aspect of our lives are explored and analysed. Hands on work shows how forces can be applied in a number of scenarios and applied to a range of systems.	**Ecology** How organisms interact and survive in a wide range of ecosystems is investigated. Experiences of assessing ecosystems is a fundamental part of the unit.

<table>
<tr><th>Year</th><th>Key Features</th><th>Autumn 1</th><th>Autumn 2</th><th>Spring 1</th><th>Spring 2</th><th>Summer 1</th><th>Summer 2</th></tr>
<tr><td rowspan="3">10 GCSE

Most students follow the GCSE Combined Science (AQA 8464) course.

Some students opt to take “Triple Science”:

GCSE Biology (AQA 8461)

GCSE Chemistry (AQA 8462)

GCSE Physics (AQA 8463)</td><td rowspan="3">All students

6 periods per week for students studying Combined Science

9 periods per week for students studying Triple Science

Items in italics/ brackets are only applicable to students following the Triple Science course</td><td colspan="2">B1: Cell Biology
Cell structure
Cell division
Transport in cells</td><td colspan="2">B2: Organisation
Principles of organisation Animal tissues, organs and organ systems
Plant tissues, organs and systems</td><td colspan="2">B2: Organisation
Principles of organisation
Animal tissues, organs and organ systems
Plant tissues, organs and systems

B3: Infection and Response
Communicable diseases
(Monoclonal antibodies)
(Plant disease)</td><td colspan="2">B4: Bioenergetics
Photosynthesis;
Respiration

B7: Ecology
Adaptations, interdependence and competition
Organisation of an ecosystem
Biodiversity and the effect of human interaction
(Trophic levels in an ecosystem)
(Food production)</td></tr>
<tr><td>C1: Atomic structure and the periodic table
Symbols, mass, electronic charge and isotopes
The periodic table;
Transition metals</td><td>C2: Bonding, structure and properties of matter
Chemical bonds: ionic, covalent and metallic
How bonding and structure are related to properties;
Nanoparticles</td><td>C3: Quantitative Chemistry
Conservation of mass
Quantitative interpretation of chemical equations
Concentration
(Moles),
(Yield);
(Atom economy)</td><td>C4: Chemical Changes
Reactivity of metals
Reactions of acids
Electrolysis
(Titrations)</td><td>C5: Energy Changes
Exothermic and endothermic reactions
(Chemical cells and fuel cells)</td><td colspan="2">C6: The rate and extent of chemical change
Rate of reaction
Reversible reactions and dynamic equilibrium
(The Haber process and NPK fertilisers)</td></tr>
<tr><td colspan="2">P4: Atomic Structure
Atoms and isotopes
Atoms and nuclear radiation
(Hazards and uses of radioactive emissions and of background radiation)
(Nuclear fissions and fusion)</td><td colspan="2">P1: Energy
Energy changes in a system
Conservation and dissipation of energy
National and global energy resources

P3: Particle Model of Matter
Changes of state and the particle model and pressure
Internal energy and energy transfers</td><td colspan="2">P2: Electricity
Current, potential difference and resistance
Series and parallel circuits
Domestic use of electricity and safety
Energy transfers
Static electricity</td><td colspan="2">P5: Forces
Forces and their interactions
Work done and energy transfer
Forces and elasticity
Forces and motion
(Moments, levers and gears)
(Pressure and pressure differences in fluids)
(Momentum)</td></tr>
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11 GCSE Most students follow the GCSE Combined Science (AQA 8464) course. Some students opt to take "Triple Science": GCSE Biology (AQA 8461) GCSE Chemistry (AQA 8462) GCSE Physics (AQA 8463)	All students 6 periods per week for students studying Combined Science 9 periods per week for students studying Triple Science Items in italics/ brackets are only applicable to students following the Triple Science course	**B5: Homeostasis and Response** Homeostasis Human nervous system Hormonal coordination *(Plant hormones)*		**B6: Inheritance, variation and evolution** Reproduction Variation and evolution History of understanding of genetics and evolution Classification of living organisms	Review of content		
		C7: Organic Chemistry Carbon compounds as fuels and feedstock *(Reactions of alkenes and alcohols)* *(Synthetic and naturally occurring polymers)*	**C8: Chemical Analysis** Purity, formulations and chromatography Identification of common gases *(Identification of ions by chemical, spectroscopic means)*	**C9: Chemistry of the atmosphere** Composition and evolution of the Earth's atmosphere Greenhouse gases Atmospheric pollutants **C10: Using resources** Using the Earth's resources Obtaining potable water Life cycle assessment and recycling	Review of content		
		P6: Waves Waves in air, fluids and solids Electromagnetic waves *(Black body radiation)*	**P7: Magnetism,** Electromagnetism Permanent and induced magnetism, magnetic forces and fields The motor effect *(Induced potential, transformers and the National Grid)*	*(**P8: Space Physics**)* *(Solar system)* *(Orbits and satellites)* *(Red shift)* Review of content	Review of content		