

NCC Science Curriculum Provision

Vision & Rational

We aim to foster the intellectual, social, creative, physical, moral and spiritual development of all our pupils. We will foster confident individuals and responsible citizens who display the following attributes:

TEAM PLAYERS

- Able to work cooperatively as part of a team.
- Able to work towards a shared goal.

ASPIRATIONAL LEARNERS

- Realistically ambitious.
- Confident and believe they can achieve.

REFLECTIVE LEARNERS

- Enjoys creative, dynamic and reflective learning.
- Able to learn from mistakes and experiences.
- Able to set SMART targets (SPECIFIC, MEASURABLE, ACHIEVABLE, REALISTIC/RELEVANT, TIME-RELATED)
- Able to stay calm and think things through.

SKILLFUL LEARNERS

- Competent in basic skills of literacy, numeracy and ICT.
- Have a range of transferable skills including independent study skills, organisation and communication.
- Critical thinkers.

RESPONSIBLE LEARNERS

- Supported, challenged and equipped for the future.
- Take responsibility for their actions, their education and for others.
- Are self-motivated and will persevere to reach personal goals and aspirations.

SCIENCE STRATEGIC INTENT:	IMPLEMENTATION
<p>We aim to ensure that the curriculum is broad, balanced, relevant and personalised.</p> <p>We have developed a high quality Science curriculum that Prioritises pupils building knowledge of key concepts in a meaningful way that reflects how knowledge is organised in the science disciplines:</p> <ol style="list-style-type: none"> 1. Delivers high quality of education through powerful knowledge (This knowledge is specialised knowledge that gives students the ability to think about, and do things, that otherwise they could not). 2. Creates an aspirational high achievement culture. 3. Takes into account individual needs and styles. 4. Enables students to learn and make connections, using concrete, pictorial and abstract approach to learning. 5. Allows everyone to experience success and to develop scientific language and literacy throughout the curriculum. 6. Raises standards of attainment. 7. Create a culture capital and spiritual development in a caring supportive environment. 8. To equip students with scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. 	<ul style="list-style-type: none"> • High Quality Teaching and Pedagogical practices (Substantial and disciplinary knowledge) <ul style="list-style-type: none"> ○ Precision Teaching including retrieval practice ○ Blended learning • Curriculum sequencing and coverage • Attendance and Punctuality meetings • High Standards and Behaviour Expectations • Assessment systems – both formative and summative • Identification, mentoring and support of focus groups • Wrap around curriculum provision • TAG preparation <ul style="list-style-type: none"> ○ Assessment ○ Marking ○ Moderation and Standardization ○ CPD for teachers

Curriculum Provision

Curriculum Design

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.

Our curriculum has science enquiry at its heart. We encourage our pupils to be enquiry-based learners; our science teaching ensures our pupils develop the necessary disciplinary knowledge as they progress through the key stages, enabling them to become the scientists of the future.

As scientists, pupils throughout NCC work collaboratively to develop their research, communication and critical-thinking skills. We encourage curiosity about natural phenomena and encourage our pupils to ask questions about the world around them.

Science teaching is carefully sequenced to ensure a clear progression of substantive knowledge and disciplinary knowledge. Each lesson is designed to explore and build on pupils' prior knowledge, allowing misconceptions to be addressed effectively.

The substantive knowledge builds progressively to develop pupils' understanding of concepts, models, laws and theories. It is organised into the main areas of biology, chemistry and physics.

Substantive knowledge has been organised around a set of key concepts, which are revisited as pupils' progress through key stages.

- **The national curriculum for science aims to ensure that all pupils:**
- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics (**Intent 1,5,6,8**)
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them (**Intent 1, 4,6**)
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future (**Intent 2,3,7**)

Wrap around curriculum:

Enrichment (Intent7)

An additional after school enrichment programme includes a range of activities, Science Club, after school study skills club. There is daily support for homework in the library. Extra Study Support is also in place especially for Year 10 and Year 11 depending on the individuals learning needs.

Year 7-11 DROP-DOWN Learning Days

DROP-DOWN Learning Days, when the normal lesson timetable is suspended, take place during the year. These days allow students to learn in different ways such as off site, with external providers and a range of students. These days cover Staying Safe, British Values, Study Skills, Pathways and work ready skills.

Pupil Premium, BCRB, Refugees and MAS

Science fair competition and Biomedica meltdown competition.

Russel Group University mentored projects- enrichment trips-enrichment days.

Deliver Science in the context of black Caribbean, African and other minority scientists and refer to the countries of origin in terms of resources, discoveries, diseases and climate.

Curriculum Pathway

Key stage 3 Curriculum: The principal focus of the key stage 3 Science curriculum is to develop a deeper understanding of a range of scientific ideas in the subject disciplines of biology, chemistry and physics. Pupils

should begin to see the connections between these subject areas and become aware of some of the big ideas underpinning scientific knowledge and understanding. Key concepts are tracked from KS2 into KS4, following these key spiral threads.

E.g links between structure and function in living organisms, the particulate model as the key to understanding the properties and interactions of matter in all its forms, and the resources and means of transfer of energy as key determinants of all of these interactions.

Pupils should understand that science is about working objectively, modifying explanations to take account of new evidence and ideas and subjecting results to peer review. Pupils will go through a process of experimentation or investigation to prove/disprove a hypothesis or theory.

Our KS3 curriculum follows the AQA KS3 programme of study using the Kerboodle Oxford as platform.

Y7 autumn 1	Y8 autumn1	Y9 autumn1
<p>Cells Animal and plant cells Microscopes Observing cells (P) Specialised cells Movement of substances Unicellular organisms</p> <p>Scientific Skills Safety in the lab Scientific equipment Measurements Using a Bunsen Burner Planning an investigation</p> <p>Forces Forces Balanced and Unbalanced forces Speed Investigation speed (P) Distance time graphs Gravity</p>	<p>Digestion Nutrition Testing for nutrients (P) Unhealthy diets The digestive system Bacteria and enzymes</p> <p>Elements Atoms, Elements and Compounds Making compounds (P) Chemical Formulae Polymers Ceramics Composites</p> <p>FORCES Friction and drag Investigating drag (P) Investigating friction (P) Squashing and stretching Hooks' Law Investigation (P) Turning forces</p>	<p>Cell Structure The world of the microscope Using Microscopes Animal and plant cells Eukaryotic and prokaryotic cells Specialised cells</p> <p>Atoms, elements, compounds & mixtures Atoms, elements, compounds and mixtures Pure substances and mixtures. Melting point of stearic acid Practical Separating mixtures Analysing chromatograms Practical</p> <p>Energy Energy stores and transfers Energy dissipation and efficiency Which material will keep my cup of tea hot the longest? Practical Energy and power Which is the best electrical kettle? Practical Conduction and convection Energy resources</p>
Y7 autumn 2	Y8 autumn2	Y9 autumn2
<p>Movement Levels of organisation The skeleton Movement: Joints Movement: Muscles</p> <p>Particle Model The particle model States of matter Melting and Freezing Boiling and practical (P) More changes of state Diffusion Gas Pressure Checkpoint Retrieval</p> <p>Electromagnets Circuit Components Potential difference Current Resistance Series and parallel circuits Building circuits (P) Charging up</p>	<p>Breathing Gas exchange Breathing Drugs Alcohol Smoking</p> <p>Atomic structure and Periodic Table Metals and Non-metals The periodic table and development Group 1 metals Group 7 elements Displacement Investigation (P) Group 0 elements</p> <p>PRESSURE Pressure in gases What makes a ball bouncy? Pressure in solids Pressure in liquids</p>	<p>Organs & the digestive system Tissues and organs Nutrients and Healthy eating Burning food practical The human digestive system</p> <p>Structure & properties of matter Metallic bonding and alloys State of matter Structure of simple molecules Giant covalent structures Graphene and Fullerenes</p> <p>Electricity Current and charge Potential difference and resistance (Ohm's law) Series circuits Parallel circuits AC DC and National grid Cables and Plugs</p>
Y7 spring 1	Y8 spring 1	Y9 spring 1
<p>Human Reproduction Adolescence Reproductive systems Fertilisation and Implantation Development of a foetus The menstrual cycle</p> <p>Separating Mixtures Pure substances and mixtures Solutions and Solubility Investigating Solubility (P) Filtration Evaporation and Distillation Chromatography Checkpoint Retrieval</p> <p>Energy Food and Fuels Energy resources Energy and power Energy adds up Energy dissipation</p>	<p>Respiration Aerobic Respiration Effect of Exercise Investigation (P) Anaerobic Respiration Biotechnology</p> <p>Reactions Combustion Thermal decomposition Conservation of mass (P) Endothermic and Exothermic reactions Investigating endothermic and exothermic reactions (P)</p> <p>ELECTROMAGNETS Magnets and Magnetic fields Electromagnets Using electromagnets (P)</p>	<p>Communicable Disease Health and disease Pathogens and diseases Preventing infections</p> <p>Preventing and treating disease Vaccination Antibiotics and painkillers Discovering drugs</p> <p>The Earth's atmosphere The history and evolution of our atmosphere Greenhouse gases Global climate change atmospheric pollution Land and water pollution Practical: is there more pollution near a road? Air pollution</p> <p>Particle model of matter (physics) Density States of matter and changes of state</p>

Y7 spring 2	Y8 spring 2	Y9 spring 2
<p><u>Plant reproduction</u> Flowers and pollination Fertilisation and germination Seed Dispersal</p> <p><u>Acids and Alkalis</u> Chemical reactions Acids and Alkalis Indicators and pH Investigating acids and alkalis (P) Neutralisation Making salts Checkpoint Retrieval</p> <p><u>Waves</u> Sound Waves and Speed Loudness and amplitude Frequency and pitch The ear and hearing</p>	<p><u>Photosynthesis</u> Photosynthesis Looking at leaves Investigating photosynthesis (P) Plant minerals Chemosynthesis</p> <p><u>Climate</u> Greenhouse gases Global warming and its effects The carbon cycle Climate change Extracting metals Recycling Checkpoint Retrieval</p> <p><u>Energy</u> Work, energy and machines Energy and temperature Energy transfer: particles Energy transfer: radiation and insulation</p>	<p><u>Photosynthesis and Respiration</u> Photosynthesis How plants use glucose Aerobic respiration The response to exercise</p> <p><u>Inheritance</u> Types of reproduction DNA and the genome Evolution by Natural selection Selective breeding</p> <p><u>Chemical changes</u> Extracting metals Salts from metals Insoluble salts Making more salts (metals with acids and carbonates) Neutralisation. Strong/Weak acids</p> <p><u>Balanced forces</u> Vectors and scalars, contact and non-contact Resultant forces Work done and energy transfer Mass and weight Forces and elasticity RP</p>
Y7 summer 1	Y8 summer 1	Y9 summer 1
<p><u>Interdependence</u> Ecosystems Competition Food chains and webs Disruption to food chains and webs</p> <p><u>Earth</u> Structure of the earth Sedimentary Igneous rocks Metamorphic rocks Rock cycle</p> <p><u>Waves</u> Light Reflection Refraction The eye and vision Colour</p>	<p><u>Inheritance</u> Inheritance DNA Genetic Cross Diagrams Genetic modification</p> <p><u>New Technology</u> Nanoparticles Nanoparticles in medicine Nanoparticle safety New Fuels Hybrid electric cars</p> <p><u>Waves</u> Sound waves, water waves and energy The electromagnetic Spectrum Transverse and longitudinal waves</p>	<p><u>Adaptation, interdependence and competition</u> The importance of communities Organisms in their environment Competition in animals & plants Adapt and survive- Adaptation in animals & plants Feeding Relationships</p> <p><u>Energy in reactions</u> Exothermic and endothermic reactions Practical- endothermic and exothermic reactions.</p> <p><u>The Earth's Resources</u> Finite and renewable resources Water treatment- Portable water practical Extracting metal from ores Life cycle assessments - reduce, reuse and recycle</p> <p><u>Motion</u> Distance/displacement and speed/velocity. Acceleration Distance time graphs- Velocity time graphs Forces and braking - Reaction time RP</p>
Y7 summer 2	Y8 summer 2	Y9 summer 2
<p><u>Variation</u> Variation Continuous & discontinuous variation Adaptations</p> <p><u>Metals and non-metals</u> More about elements Reactions of metals and non-metals Metals and acids Metals and Oxygen Metals and water Metal displacement reactions</p> <p><u>Earth and Universe</u> The night sky The Solar system The Earth The Moon</p> <p>Build a solar system model BIOMEDIA MELTDOWN project</p>	<p><u>Evolution</u> Natural Selection Charles Darwin Extinction Preserving Biodiversity</p> <p><u>Forensics</u> Message in a bottle Blood Alcohol Body! Clues in the carpet A week in court</p> <p><u>Space</u> The Solar System Spacecraft and satellites Mission to the moon Detecting planets Detecting alien life</p> <p>Building a mars rover project BIOMEDIA MELTDOWN PROJECT</p>	<p><u>Nervous and Hormonal coordination</u> Principles of homeostasis The structure and function of the human nervous system Principles of hormonal control Human reproduction The artificial control of fertility</p> <p><u>Rates of reactions</u> Rate of a reaction Factors affecting the rate of reaction - RP rates of reactions.</p> <p><u>Crude oil and fuels</u> Hydrocarbons Fractional distillation Burning Hydrocarbon fuels</p> <p><u>Waves</u> Transverse and longitudinal waves The properties of waves Electromagnetic Waves-Uses of electromagnetic waves</p> <p><u>Magnetism & electromagnetism</u> Magnetism- Electromagnets</p>

SEQUENCE OF LEARNING

The Science curriculum describes a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. An equal diet of Biology, Chemistry and Physics is encouraged as an ongoing block system as follows:

Progress over time KS3 from Year 7 to Year 9				
Forces	Balanced/unbalanced /speed	Gravity	Contact forces/Pressure	Motion
Electro-magnets	Potential difference and resistance	Current	Magnetism	Electro-magnets
Energy	Energy & Fuels	Energy transfer	Work	Heating and cooling
Waves	Sound	Light	Wave effects	Wave properties
Matter	Particle model	Separating mixtures	Elements	Periodic Table
Reactions	Acids and alkalis	Metals and non-metals	Types of reaction	Chemical energy
Earth	Earth Structure	Universe	Climate	Earth resources
Organisms	Cells	Movement	Breathing	Digestion
Ecosystem	Inter-dependence	Plant reproduction	Respiration	Photo-synthesis
Genes	Human reproduction	Variation	Inheritance	Evolution

Key Stage 4 Curriculum

All students at NCC will continue to study all three sciences, i.e. a balanced science course, through to GCSE. It is envisaged that all pupils who are more science focused will study three separate sciences (Biology, Chemistry and Physics) in three, 60-minute periods per week, per subject, gaining three separate GCSE qualifications. This is certainly the best route for all who may eventually study one or more science subjects in the Sixth Form.

Combined Science Award (AQA Trilogy)

The combined science course is also offered for those whose interests or strengths lie away from the sciences. Based on three, 60 minute periods per fortnight, per subject, this will lead to a Science qualification that is equivalent to two full GCSEs. The syllabus is separated into discrete areas of Biology, Chemistry and Physics, all of which are taught by subject specialists from the Department.

Biology

Cell Biology, Organisation and Bioenergetics. Infection and Response. Homeostasis and Response. Inheritance, Variation and Evolution. Ecology

Chemistry

Atomic Structure and the Periodic Table. Bonding, Structure, and the Properties of Matter. Quantitative Chemistry, Chemical Changes and Energy Changes. The Rate and Extent of Chemical Change. Organic Chemistry, Chemical Analysis and Chemistry of the Atmosphere. Using Resources.

Physics

Forces, Waves, Magnetism and Electromagnetism. Energy, Electricity, Particle Model of Matter and Atomic Structure.

Examinations

There are six examinations: Two Biology, Two Chemistry and Two Physics. Each exam is 1 hour and 15 minutes long and worth 70 marks.

Separate Sciences Awards

Biology

This subject encourages pupils to ask questions about themselves and the world in which they live. Students will develop a concerned and informed awareness of relationships between living organisms, of Relationships between organisms and their environment, and the effect of human activities on these relationships. Above all, the aim is to promote a respect for all forms of life.

Summary of Content

Cell Biology, Organisation and Infection and Response.
Bioenergetics, Homeostasis and Response. Inheritance, Variation and Evolution. Ecology

Practical Component

There will be ten required practicals conducted throughout the course to develop pupils' practical skills. Questions in the written exams will draw on the knowledge and understanding pupils have gained by Carrying out the practical activities. These questions will count for at least 15% of the overall marks for the qualification.

Examinations

There are two examinations, Paper 1 and Paper 2, each is 1 hour 45 minutes - 100 marks.

Teaching

This single subject is taught in three 60-minute periods per fortnight. It must be studied with single subject Chemistry and Physics leading to three full Science GCSEs.

Careers

Many higher education courses require a qualification at Key Stage 4 in Science, and Biology usually satisfies this requirement if grade 5 or better is obtained. This course will provide important foundation material supporting further study of Biology at A Level.

Separate Sciences Awards

Chemistry

Increasingly, modern chemistry is focusing on a detailed understanding of the processes at a molecular level, in living systems on the one hand and the structure and properties of exciting new materials on the other.

Knowledge of a wide range of everyday chemicals and materials used in the home, in agriculture and in industry is still required and plenty of practical experience is provided during the course.

Summary of Content

Atomic Structure and the Periodic Table. Bonding, Structure, and the Properties of Matter.
Quantitative Chemistry, Chemical Changes and Energy Changes. The Rate and Extent of Chemical Change.
Organic Chemistry, Chemical Analysis and Chemistry of the Atmosphere. Using Resources

Practical Component

There will be ten required practicals conducted throughout the course to develop pupils' practical skills. Questions in the written exams will draw on the knowledge and understanding pupils have gained by Carrying out the practical activities. These questions will count for at least 15% of the overall marks for the qualification.

Examinations

There are two examinations, Paper 1 and Paper 2, each is 1 hour 45 minutes - 100 marks.

Teaching

This single subject is taught in three 60-minute periods per fortnight. It must be studied with single subject Biology and Physics leading to three full Science GCSEs.

Careers

Chemistry occupies a central position between the physical and biological sciences, and is an essential requirement at A Level for many courses such as Medicine, Veterinary Science, Chemical Engineering and some life sciences.

Separate Sciences Awards

Physics

The new Physics GCSE is a fascinating introduction to the fundamental study of the universe, matter and interactions. It is easy to be left behind in a technological world that is changing fast. A grasp of basic Physics provides the necessary understanding that will enable active participation in this dynamic world. The AQA Physics course at NCC makes full use of the latest applications to make physics a highly up-to-date and more relevant subject.

Summary of Content

Forces, Energy and Waves.

Electricity, Magnetism and Electromagnetism. Particle Model of Matter, Atomic Structure.

Space Physics.

Examinations

There are two examinations, Paper 1 and Paper 2, each is 1 hour 45 minutes - 100 marks.

Teaching

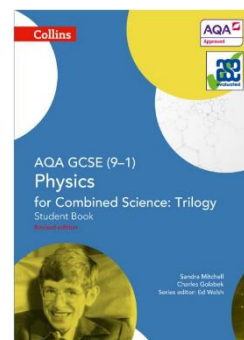
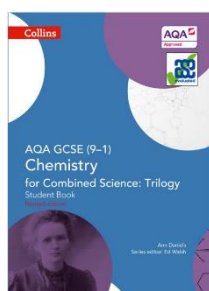
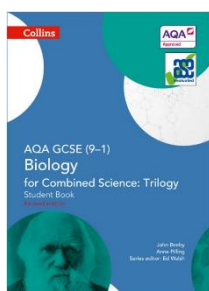
This single subject is taught in three 60-minute periods per fortnight. It must be studied with single subject Biology and Chemistry leading to three full Science GCSEs.

Careers

This course enable pupils to gain a better understanding of our world and the laws of physics, while also providing a better preparation for A Level for those pupils who are considering this option.

To buy textbooks for Key Stage 4 please use the following ISBN details GCSE - AQA Trilogy combined

BIOLOGY ISBN: 978-0-00-817504-7 CHEMISTRY ISBN: 978-0-00-817505-4 PHYSICS ISBN: 978-0-00-817506-1



AQA separate sciences

BIOLOGY ISBN: 978-0-00-815875-0

CHEMISTRY ISBN: 978-0-00-815876-7

PHYSICS ISBN: 978-0-00-815877-4

