# **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.

# 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.

# ASPIRATIONAL LEARNERS

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

# **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.

## **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.

SCIENCE STRATEGIC INTENT:	IMPLEMENTATION
<ul> <li>We aim to ensure that the curriculum is broad, balanced, relevant and personalised.</li> <li>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: <ol> <li>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).</li> <li>Creates an aspirational high achievement culture.</li> <li>Takes into account individual needs and styles.</li> <li>Enables students to learn and make connections, using concrete, pictorial and abstract approach to learning.</li> <li>Allows everyone to experience success and to develop scientific language and literacy throughout the curriculum.</li> <li>Raises standards of attainment.</li> <li>Create a culture capital and spiritual development in a caring supportive environment.</li> </ol> </li> <li>To equip students with scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.</li> </ul>	<ul> <li>High Quality Teaching and Pedagogical practices (Substantial and disciplinary knowledge)         <ul> <li>Precision Teaching including retrieval practice</li> <li>Blended learning</li> </ul> </li> <li>Curriculum sequencing and coverage</li> <li>Attendance and Punctuality meetings</li> <li>High Standards and Behaviour Expectations</li> <li>Assessment systems – both formative and summative</li> <li>Identification, mentoring and support of focus groups</li> <li>Wrap around curriculum provision</li> <li>TAG preparation         <ul> <li>Assessment</li> <li>Marking</li> <li>Moderation and Standardization</li> <li>CPD for teachers</li> </ul> </li> </ul>

# 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 criticalthinking 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 Biomedia 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.

# <u>Curriculum Pathway</u>

**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	study using the Kerboodle Oxford as platform. Y9 autumn1	
Cells Animal and plant cells	Digestion Nutrition	Cell Structure The world of the microscope	
Microscopes	Testing for nutrients (P)	Using Microscopes	
Observing cells (P)	Unhealthy diets	Animal and plant cells	
Specialised cells	The digestive system	Eukaryotic and prokaryotic cells	
Movement of substances	Bacteria and enzymes	Specialised cells	
Unicellular organisms	Elements	Atoms, elements, compounds & mixtures	
Scientific Skills	Atoms, Elements and Compounds	Atoms, elements, compounds and mixtures	
Safety in the lab	Making compounds (P)	Pure substances and mixtures.	
Scientific equipment	Chemical Formulae	Melting point of stearic acid Practical	
Measurements	Polymers	Separating mixtures	
Using a Bunsen Burner	Ceramics	Analysing chromatograms Practical	
Planning an investigation	Composites	Energy	
Forces	FORCES	Energy stores and transfers	
Forces	Friction and drag	Energy dissipation and efficiency	
Balanced and Unbalanced forces Speed	Investigating drag (P) Investigating friction (P)	Which material will keep my cup of tea hot the longest? Practical	
Investigation speed (P)	Squashing and stretching	Energy and power	
Distance time graphs	Hooks' Law Investigation (P)	Which is the best electrical kettle? Practical	
Gravity	Turning forces	Conduction and convection	
,	5	Energy resources	
Y7 autumn 2	Y8 autumn2	Y9 autumn2	
Movement	Breathing	Organs & the digestive system	
Levels of organisation	Gas exchange	Tissues and organs	
The skeleton	Breathing	Nutrients and Healthy eating	
Movement: Joints	Drugs	Burning food practical	
Movement: Muscles	Alcohol	The human digestive system	
Particle Model	Smoking	Structure & properties of matter	
The particle model	Atomic structure and	Metallic bonding and alloys	
States of matter	Periodic Table	State of matter	
Melting and Freezing	Metals and Non-metals	Structure of simple molecules Giant covalent structures	
Boiling and practical (P) More changes of state	The periodic table and development	Graphene and Fullerenes	
Diffusion	Group 1 metals Group 7 elements	Electricity	
Gas Pressure	Displacement Investigation (P)	Current and charge	
Checkpoint Retrieval	Group 0 elements	Potential difference and resistance (Ohm's law)	
Electromagnets	PRESSURE	Series circuits	
Circuit Components	Pressure in gases	Parallel circuits	
Potential difference	What makes a ball bouncy?	AC DC and National grid	
Current	Pressure in solids	Cables and Plugs	
Resistance	Pressure in liquids		
Series and parallel circuits			
Building circuits (P)			
Charging up	Y8 spring 1	V0 corring 1	
Y7 spring 1 Human Reproduction	Respiration	Y9 spring 1 Communicable Disease	
Adolescence	Aerobic Respiration	Health and disease	
Reproductive systems	Effect of Exercise Investigation (P)	Pathogens and diseases	
Fertilisation and Implantation	Anaerobic Respiration	Preventing infections	
Development of a foetus	Biotechnology	Preventing and treating disease	
The menstrual cycle	Reactions	Vaccination	
Separating Mixtures	Combustion	Antibiotics and painkillers	
Pure substances and mixtures	Thermal decomposition	Discovering drugs	
Solutions and Solubility	Conservation of mass (P)	The Earth's atmosphere	
Investigating Solubility (P)	Endothermic and Exothermic	The history and evolution of our atmosphere	
Filtration	reactions	Greenhouse gases	
Evaporation and Distillation	Investigating endothermic and	Global climate change	
Evaporation and Distillation Chromatography	Investigating endothermic and exothermic reactions (P)	Global climate change atmospheric pollution	
Evaporation and Distillation Chromatography Checkpoint Retrieval	Investigating endothermic and exothermic reactions (P) ELECTROMAGNETS	Global climate change atmospheric pollution Land and water pollution	
Evaporation and Distillation Chromatography Checkpoint Retrieval Energy	Investigating endothermic and exothermic reactions (P) <u>ELECTROMAGNETS</u> Magnets and Magnetic fields	Global climate change atmospheric pollution Land and water pollution Practical: is there more pollution near a road?	
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Evaporation and Distillation Chromatography Checkpoint Retrieval <u>Energy</u> Food and Fuels	Investigating endothermic and exothermic reactions (P) <u>ELECTROMAGNETS</u> Magnets and Magnetic fields Electromagnets	Global climate change atmospheric pollution Land and water pollution Practical: is there more pollution near a road? Air pollution	

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# SEQUENCE OFLEARNING

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 Chemistry 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 Mater.

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

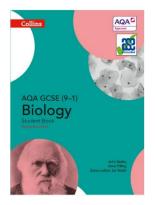
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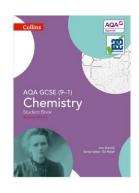
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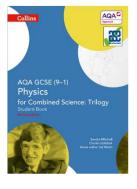


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