

Science

We believe 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.



What is studied at KS3

Year 7

- Planning investigations
- Cells, systems and organisms
- Matter
- Forces
- Periodic table
- Waves
- Reproduction
- Understanding investigations
- Acids and alkalis
- Earth science
- Thermal physics
- House Science

Year 8

- Photosynthesis
- Mechanics
- Chemical reactions
- Light and vision
- Food and digestion
- Elements, mixtures and compounds

- Energy
- How my body works
- Periodic table
- Electricity
- Ethics
- Earth's resources
- Magnetism
- House science

Year 9

At the start of Year 9 we teach the **OCR Gateway GCSE (9-1) Triple and Combined Science**



Why GCSE Science....

Biology:

Biology is the study of all aspects of life in all its awe inspiring complexity. Starting with the human body, explore key systems and how these are similar or different to those in other organisms. How

we developed similarities and differences that allow organisms to thrive in every ecosystem on earth is considered in the study of evolution. The importance of understanding and maintaining biodiversity is crucial to the human race if we are to live sustainably in the future. Understanding life on earth and all of the interactions between organisms and their environments has helped us to advance technology but also shows us how we can continue to live and maintain our planet.

Chemistry:

Chemistry is everywhere in the world around you! It's in the food you eat, clothes you wear, water you drink, medicines, air, cleaners... you name it. Chemistry sometimes is called the "central science" because it connects other sciences to each other, such as biology, physics, geology, and environmental science- it explains the world around you at the atomic level.

Physics:

The dictionary definition of Physics is “the study of matter, energy, and the interaction between them”, but what that really means is that Physics is about asking fundamental questions and trying to answer them by observing and experimenting. It also lacks the awe and wonder that can be felt from studying the subject and really understanding the Universe workings in depth; from the motions of the tiny particles in atoms, to you sitting looking at this screen or page and the

interactions with matter around you, up to the spinning planets and galaxies in space....Physics has it all!

Biology

Inheritance

- Basic structure of DNA
- Variation

Module 1

- Cells –structure, prokaryotes, eukaryotes, cell differentiation and stem cells
- Microscopes
- DNA
- Mitosis

Module 2

- Enzymes – how they work and investigations relating to this
- Respiration – aerobic and anaerobic
- Photosynthesis – the process and factors that affect photosynthesis, with investigations relating to this

Chemistry

Module 1 Particles

- The particle model – chemical and physical changes, size of atoms and limitations of the atomic model
- Atomic structure – isotopes, developing the atomic model

Module 2 Elements, compounds and mixtures

- Purity and separating mixtures- Formula masses, distillation, chromatography, checking the purity
- Bonding- ionic, covalent and metallic bonding and structures, development of the Periodic Table
- Properties of materials- changing state, Bulk properties, nanoparticles (Triples only)

Physics

Module 1 Matter

- The particle model
- Changes of state
- Pressure

Module 2 Forces

- Motion
- Newton's Laws

- Forces in action

What is studied at KS4

OCR Gateway GCSE (9-1) Triple and Combined Science

Foundation Tier, grades 5–5 to 1–1		
<ul style="list-style-type: none"> • Topic B1: Cell level systems • Topic B2: Scaling up • Topic B3: Organism level systems • Topic CS7: Practical skills (PAGs B1-B5) 	Paper 1 (Biology) J250/01 1 hour 10 minutes 60 mark written paper	16.7% of total GCSE
<ul style="list-style-type: none"> • Topic B4: Community level systems • Topic B5: Interaction between systems • Topic B6: Global challenges • Topic CS7: Practical skills (PAGs B1-B5) With assumed knowledge of B1–B3	Paper 2 (Biology) J250/02 1 hour 10 minutes 60 mark written paper	16.7% of total GCSE
<ul style="list-style-type: none"> • Topic C1: Particles • Topic C2: Elements, compounds and mixtures • Topic C3: Chemical reactions • Topic CS7: Practical skills (PAGs C1-C5) 	Paper 3 (Chemistry) J250/03 1 hour 10 minutes 60 mark written paper	16.7% of total GCSE
<ul style="list-style-type: none"> • Topic C4: Predicting and identifying reactions and products • Topic C5: Monitoring and controlling chemical reactions • Topic C6: Global challenges • Topic CS7: Practical skills (PAGs C1-C5) With assumed knowledge of C1–C3	Paper 4 (Chemistry) J250/04 1 hour 10 minutes 60 mark written paper	16.7% of total GCSE
<ul style="list-style-type: none"> • Topic P1: Matter • Topic P2: Forces • Topic P3: Electricity and magnetism • Topic CS7: Practical skills (PAGs P1-P6) 	Paper 5 (Physics) J250/05 1 hour 10 minutes 60 mark written paper	16.7% of total GCSE
<ul style="list-style-type: none"> • Topic P4: Waves and radioactivity • Topic P5: Energy • Topic P6: Global challenges • Topic CS7: Practical skills (PAGs P1-P6) With assumed knowledge of P1–P3.	Paper 6 (Physics) J250/06 1 hour 10 minutes 60 mark written paper	16.7% of total GCSE

J250/02, J250/04 and J250/06 include synoptic assessment.

Triple Biology

Higher Tier, grades 9 to 4

Content is split into six teaching topics B1-B6 and a practical activity skills topic B7:

- Topic B1: Cell level systems
- Topic B2: Scaling up
- Topic B3: Organism level systems
- Topic B4: Community level systems
- Topic B5: Genes, inheritance and selection
- Topic B6: Global challenges
- Topic B7: Practical skills

Paper 3 assesses content from Topics B1–B3 and B7

Paper 4 assesses content from Topics B4–B6 and B7, with assumed knowledge of Topics B1–B3.

Paper 3

J247/03

90 marks

1 hour 45 minutes

Written paper

**50%
of total
GCSE**

Paper 4

J247/04

90 marks

1 hour 45 minutes

Written paper

**50%
of total
GCSE**

J247/02 and J247/04 include synoptic assessment.

Chemistry

Higher Tier, grades 9 to 4		
<p>Content is split into six teaching topics C1-C6 and a practical activity skills topic C7:</p> <ul style="list-style-type: none">• Topic C1: Particles• Topic C2: Elements, compounds and mixtures• Topic C3: Chemical reactions• Topic C4: Predicting and identifying reactions and products• Topic C5: Monitoring and controlling chemical reactions• Topic C6: Global challenges <p>Paper 3 assesses content from Topics C1–C3 and C7.</p> <p>Paper 4 assesses content from Topics C4–C6 and C7, with assumed knowledge of Topics C1–C3.</p>	<p>Paper 3 J248/03</p> <p>90 marks</p> <p>1 hour 45 minutes</p> <p>Written paper</p>	<p>50% of total GCSE</p>
	<p>Paper 4 J248/04</p> <p>90 marks</p> <p>1 hour 45 minutes</p> <p>Written paper</p>	<p>50% of total GCSE</p>

J248/02 and J248/04 include synoptic assessment.

Physics

Higher Tier, grades 9 to 4

Content is split into eight teaching topics P1-P8 and a practical activity skills topic P9:

- Topic P1: Matter
- Topic P2: Forces
- Topic P3: Electricity
- Topic P4: Magnetism and magnetic fields
- Topic P5: Waves in matter
- Topic P6: Radioactivity
- Topic P7: Energy
- Topic P8: Global challenges
- Topic P9: Practical skills

Paper 3 assesses content from Topics P1-P4 and P9

Paper 4 assesses content from Topics P5-P8, with assumed knowledge of Topics P1-P4 and P9

Paper 3

J249/03

90 marks

1 hour 45 minutes

Written paper

50%
of total
GCSE

Paper 4

J249/04

90 marks

1 hour 45 minutes

Written paper

50%
of total
GCSE

J249/02 and J249/04 include synoptic assessment.

Biology

B1 – cell level systems

- Plant and animal cells and microscopy
- DNA
- Biological molecules and respiration
- Photosynthesis and limiting factors

B2 – Scaling up

- Diffusion, active transport and osmosis
- Mitosis and cell differentiation
- Circulatory system and animal transport
- Plant transport – transpiration and translocation

B3 – Organism-level systems

- The nervous system – reflexes, eye and brain
- The endocrine system – hormones, controlling fertility and plant hormones
- Maintaining internal environments – homeostasis, controlling temperature and blood sugar

B4 – Community level systems

- Ecosystems

- Nutrient cycling – carbon, water and nitrogen cycles
- Efficiency of biomass transfer

B5 – Genes, inheritance and selection

- Inheritance - variation, genetic crosses and mutation
- Natural selection
- Evolution and classification systems

B6 – Global challenges

- Monitoring and maintaining the environment – sampling and biodiversity
- Feeding the human race – food security and genetic engineering
- Monitoring and maintaining health - Communicable diseases and the immune system
 - Plant disease and defences
 - Prevention and treatment of disease
 - Non-communicable diseases

Chemistry

Module 3 Chemical Reactions

- Introducing chemical reactions- The mole, balancing equations, half and ionic equations
- Energetics – exothermic and endothermic reactions, calculating energy changes
- Types of chemical reaction- Redox reactions, acids and alkalis, p H scale

- Electrolysis- Electrolysis of molten salts and solutions, electroplating

Module 4 Predicting and Identifying reactions and products

- Predicting chemical reactions- Group 1, group 7 , group 0, Transition metals (Triples only)
- Identifying the products of chemical reactions- Detecting gases, detecting cations and anions (Triples only)

Module 5 Monitoring and controlling chemical reactions

- Monitoring chemical reactions – theoretical and percentage yield (Triple only), concentration calculations, Titrations(Triple only)
- Controlling reactions- Collision theory and factors that affect the rate of a reaction
- Equilibria- Reversible reactions, choosing reaction conditions

Module 6 Global changes

- Improving processes and products Extraction of metals, Corrosion, Recycling
- Organic chemistry- (Alkanes, Alkenes Alcohols, Carboxylic acids, polymerisation (Triple only)), Alkanes from crude oil
- Interpreting and interacting with Earth Systems – Atmosphere, climate change. Water for drinking

Physics

P3 Electricity

- Static and charge
- Simple circuits

P4 Magnetism and Magnetic fields

- Magnets and magnetic fields
- Uses of magnetism

P5 Waves in Matter

- Wave behaviour
- The electromagnetic spectrum
- Wave interaction

P6 Radioactivity

- Radioactive emissions
- Uses and hazards

P7 Energy

- Work done
- Power and efficiency

P8 Global Challenges

- Physics on the move
- Powering Earth
- Beyond Earth

What is studied at KS5

Biology follow the A level Biology for OCR A specification

Y12

Module 1 Development of practical skills

Module 2 Foundations in Biology

- Basic components of living systems (cells and microscopes)
- Biological molecules (water, proteins, carbohydrates, lipids and DNA)
- Enzymes
- Plasma membranes (structure of and movement through)
- Cell division (mitosis, meiosis, stem cells and specialisation)

Module 3 Exchange and transport

- Exchange surfaces and breathing (mammalian, fish and insect gas exchange systems)

- Transport in animals (heart, blood and transport of oxygen and carbon dioxide)
- Transport in plants (water transport, transpiration and translocation)

Module 4 Biodiversity, evolution and disease

- Classification and evolution (kingdoms, variation and natural selection)
- Biodiversity (sampling, genetic/habitat biodiversity and maintaining biodiversity)
- Communicable diseases (animal and plant diseases, defences and the specific immune system)

Y13

Module 1 Development of practical skills

Module 5 Communication, homeostasis and energy

- Neuronal communication (nervous transmission, structure and function of brain and muscles)
- Hormonal communication (blood glucose and controlling heart rate)
- Homeostasis (thermoregulation, liver and kidney)
- Plant responses (plant hormones, response to stress and commercial uses)
- Photosynthesis
- Respiration

Module 6 Genetics, evolution and ecosystems

- Genetics of living systems (mutations and control of gene expression)
- Patterns of inheritance and variation (monohybrid and dihybrid inheritance and evolution)
- Manipulating genomes (DNA profiling and sequencing and genetic engineering)
- Cloning and biotechnology (cloning and micro-organism use)
- Ecosystems (efficiency transfer and recycling within systems)
- Populations and sustainability (population size, relationships and case studies)

Chemistry follow the A level Chemistry for OCR A specification

Y12

Module 1 Development of practical skills

- (PAGs 1 to 6 and 12 – mole calculations, acid base titrations, enthalpy determination, qualitative analysis of ions, synthesis of an organic liquid and synthesis of an organic solid, Research skills)

Module 2 – Foundations in chemistry

- Atoms, ions and compounds
- Amount of substance
- Acids and redox
- Electrons and bonding

- Shapes of molecules and intermolecular forces

Module 3- Periodic Table and energy

- Periodicity
- Reactivity trends
- Enthalpy
- Reaction rates and Equilibrium

Module 4 Core Organic chemistry

- Basic concepts
- Alkanes
- Alkenes
- Alcohols
- Haloalkanes
- Organic synthesis
- Spectroscopy

Y13

Module 1

Development of practical skills (PAGs 7-11 Qualitative analysis of organic functional groups, Electrochemical cells, Rates of reaction(continuous and initial methods, pH measurements)

Module 5 Physical chemistry and transition metals

- Rates of reactions
- Equilibrium
- Acids, bases and p H
- Buffers and neutralisation
- Enthalpy and Entropy
- Redox and electrode potentials
- Transition metals

Module 6 Organic chemistry and analysis

- Aromatic chemistry
- Carbonyls and carboxylic acids
- Amines, amino acids and proteins
- Organic synthesis
- Chromatography and spectroscopy

Physics follow the A level Physics for OCR A specification

Y12

Module 1 Development of practical skills

Module 2 Foundations in physics

- Quantities
- Units
- Vectors

Module 3 Forces and Motion

- Motion
- Forces in action
- Work , energy and power
- Material
- Laws of motion and momentum

Module 4 Electrons, Waves and Photons

- Charge and current
- Energy, power and resistance
- Electrical circuits
- Waves 1 and 2
- Quantum physics

Y13

Module 5 Newtonian World and Quantum Physics

- Thermal physics
- Ideal Gases
- Circular motion
- Oscillations
- Gravitational fields
- Stars
- Cosmology (The Big Bang)

Module 6 Practicals and Medical physics

- Capacitance
- Electric Fields
- Magnetic Fields
- Particle physics
- Radioactivity
- Nuclear physics
- Medical imaging