Science Curriculum at Brownhills Ormiston Academy

The department's vision

This is our vision shared with students:

As scientists we are *ready* to thrive in our world, *respect* our environment and all living things within it and to make *safe*, informed choices throughout.

- We aim incorporate the values of the academy into our subject to show students their importance and relevance to their future.
- We aim to develop the ability to question science in the news and make informed and ethical decisions about the scientific questions facing society.
- We aim to expose the pupils to a range of career pathways, for example in all key stage 3 lessons a career linked to the learning is shared with students. This will provide a greater understanding of careers available and get students ready to make decisions about their next steps.
- New vocabulary is explicitly taught to students so that they can articulate and communicate in a scientific way supporting the development of reading, writing and oracy.

OAT curriculum – Key stage 3 at present

The OAT curriculum was implemented at Brownhills Ormiston Academy in November 2023 and as a department we are continually reviewing and adapting appropriately for our learners.

The intent of the OAT curriculum is to establish a clear pathway to meet one or more of the 6 overarching aims. These aims underpin both the strategic and operational components of this curriculum.

1) The curriculum will be accessible by all students

2) The curriculum will excite students and promote curiosity which is sustained beyond the formal education

3) The curriculum will explicitly promote scientific literacy

4) The curriculum will make relevant the study of science, and encourage the uptake of science related careers

5) The curriculum will be systematically assessed to ensure that students are making the expected progress

6) The curriculum will promote the improved teaching of science.

Sequencing of lessons

Through careful sequencing, agreed by a team of subject specialists, students will build their understanding of both the substantive and disciplinary knowledge needed to become expert learners. This will be measured through students' ability to be able to recall knowledge then apply this knowledge in a range of different contexts in both familiar and unfamiliar. Over time, as designed through the curriculum, students will deepen their understanding of the learned science and make increasingly more complex links between knowledge of the same domain, and then across domains, we call this the interplay of science. These opportunities are signposted within the curriculum for teaching to introduce where and when appropriate.

To support students this curriculum focuses all learning around 9 Key substantive big ideas, and 6 key disciplinary big ideas. These big ideas run through the curriculum from EYFS to Year 11.

Substantive Knowledge

Biology Big ideas	***Chemistry Big ideas***	***Physics Big ideas***
1 The Building Blocks of Life (BBL) 2 The Interaction of Life (IOL) 3 The Human Body (THB)	1 Chemical Reactions (CR) 2 Our Earth (OE) 3 The Behavior of Matter (BOM)	1 The Behavior of Energy (BOE) 2 Objects Effects on other Objects (OEOO) 3 Beyond our Earth (BE)

Disciplinary Knowledge

Thinking Scientifically	Understanding the application and uses of science	Communicating and collaborating in science	Using investigative approaches	Working critically with evidence	Mathematical skills

At Brownhills Ormiston Academy we intend to roll out the key stage 4 programme with our current year 9 students, as these students will have completed the key stage 3 learning of this curriculum plan.

The tables below show how each big idea is broken down into a series of individual units. These units are appropriately dispersed and sequenced to ensure students have the best chance of learning the curriculum.

(Courtesy of the *The Ormiston Academies Trust; Science Curriculum The Rosetta Principle*)

Biology

Big Idea		
The Building Blocks of Life (BBL)	The Interaction of Life (IOL)	The Human Body (THB)
BBL1 Animal Cells	*IOL1 The Natural World*	*THB1 The Natural World*
BBL2 Human Reproduction	*IOL2 The Outside World*	*THB2 The Five Senses*
BBL3 Cellular Respiration	*IOL3 Growing Plants*	*THB3 Nutrition and Digestion*
BBL4 Plant Cells	*IOL4 The Animal Kingdom*	*THB4 Circulation*
BBL5 Inheritance and Evolution	*IOL5 Living things and their habitats*	*THB5 Our Changing Body*
BBL6 Microscopy	*IOL6 Plant Structure*	*THB6 Evolution and Inheritance*
BBL7 Transport 1 (Animals)	*IOL7 Animal Survival*	*THB7 The Breathing System*
BBL8 Transport 2 (Plants)	*IOL8 Classification Organisms*	*THB8 Health and Disease*
BBL9 Reproduction	*IOL9 Life Cycles of Animals*	*THB9 Nutrition and Digestion*
BBL10 Genetics	*IOL10 Feeding Relationships*	*THB10 Homeostasis 1 (Common)*
	IOL11 Classifying Organisms	*THB11 Homeostasis 2*
	IOL12 Photosynthesis	
	IOL13 Interdependence	
	IOL14 Communicable Diseases	
	IOL15 Classification	
	IOL16 Biodiversity	
	IOL17 Plants and Disease	
	IOL18 Energy in Ecosystems	

Chemistry

Big Idea		
Chemical Reactions (CR)	Our Earth (OE)	The Behavior Of Matter (BOM)
CR2 Reactions	*OE2 Rocks*	*BOM2 The Natural World*
CR3 Types of Reactions	*OE3 The Rock Cycle*	*BOM3 Materials*
CR4 The pH Scale	*OE4 Our Atmosphere*	*BOM4 Changes of State*
*CR5 The reactivity series *KS3*	*OE5 Carbon*	*BOM5 The Particle Model*
CR6 Chromatography	*OE6 Resources*	*BOM6 The Atom*
*CR7 The reactivity series *KS4*	*OE7 Human Activity*	*BOM7 Changes of State*
CR8 Rates of Reaction		*BOM8 Purity*
CR9 Electrolysis		*BOM9 The Periodic Table*
CR10 Chemical Changes and Fuel Cells		*BOM10 Atoms and the Periodic Table*
CR11 Identification of Ions by Chemical and Spectroscopic Means		*BOM11 Energy and the Particle Model*
CR12 Using Materials		*BOM12 Bonding, Structure and Materials (Split into 12a/b)*
CR13 Synthetic and Naturally Occurring Polymers		*BOM13 Quantitative Chemistry*
		BOM14 Atoms and Nuclear Radiation
		BOM15 Bulk and Surface Properties
		BOM16 Quantitative – Gases and Liquids
		BOM17 - Pressure

Physics

Big Idea		
The Behavior Of Energy (BOE)	Objects Effect on other Objects (OEO)	Beyond Our Earth (BE)
BOE2 Light	*OEO2 Friction*	*BE2 The Solar System*
BOE3 The Eye	*OEO3 Magnetism*	*BE3 Astrophysics*
BOE4 Sound	*OEO4 Changing Shape*	*BE4 The Space Race*
BOE 5 Gravity (BE overlap)	*OEO5 Forming circuits*	*BE5 Looking outwards*
BOE 6 The Seasons	*OEO6 Force and motion*	*BE6 More radiation*
		BE7 Space
BOE7 Energy in use	*OEO7 Changing forces*	
BOE8 Flowing energy	*OEO8 Magnetism*	
BOE9 Mechanics	*OEO9 Pressure*	
BOE10 Principles of Energy	*OEO10 Static Electrcity*	
BOE11Heating and cooling	*OEO11 I V R Relationships*	
BOE12 Energy in our home	*OEO12 Defining force*	
BOE13 Waves	*OEO13 Speed*	
BOE14 Light	*OEO14 Generating electrcity*	
BOE15 Electromagnetic Waves	*OEO15 Newtons Laws*	
BOE16 Energy Transfers	*OEO16 Duality of waves*	
	OEO17 Moments	
	OE018 Fields and induction	

Year 10 Sequence for 2024- 25

Biology AQA Combined GCSE Organisation, Non-communicable diseases, bioenergetics, Enzymes and digestion, homeostasis and response, and Ecology (delivered during general science lesson)

Chemistry AQA Combined GCSE chemical changes, chemical analysis, bonding, structure and properties, redox reactions, quantitative chemistry, energy changes, rates of reaction and organic chemistry.

Physics AQA Combined GCSE Atomic structure, Waves, force basics and elasticity, energy, and forces in action.

Year 11 Sequence for 2024-25

Combined Science Biology AQA GCSE:

Inheritance, variation and evolution topic. Then PPE preparation covering nerves and reaction time, hormones and diabetes, genetic crosses, contraception, sampling required practical, cycling materials, fossils.

Combined Science Chemistry AQA GCSE:

Using resources, Chromatography, Testing for common gases, hydrocarbons, fractional distillation and cracking, rates of reaction, evolution of atmosphere, atmospheric pollutants, water treatment, life cycle analysis, atomic structure, history of atomic model, periodic table and trends, ionic bonding and properties, covalent bonding and properties, metallic bonding, acids, bases and pH, making salts required practical, the reactivity series, extraction of metals and reduction, electrolysis, extraction of aluminium, energy changes and bond enthalpy, temperature change required practical, and concentration of solutions.

Combined Science Physics AQA GCSE:

Types of magnetism, magnetic fields, particle model of matter, electromagnetism, wave features, wave speed calculations, waves required practical, electromagnetic waves, forces basics, weight, mas and gravity, reaction time and breaking distances, and work done and energy transferred.

Our 11L1 group are studying for triple science award and will cover the additional topics below.

Separate Biology AQA GCSE:

Inheritance, variation and evolution topic plus triple content learning such as the brain, the eye, plant hormones and decay.

Separate Chemistry AQA GCSE:

Testing for positive and negative ions, hydrocarbons, alkenes, alcohols, carboxylic acids, addition and condensation polymerisation, rusting, Haber process, equilibrium, rates of reaction, titrations, atom economy and yield, cells and batteries, fuel cells, nanoparticles, atomic structure, history of the atomic model, chromatography, periodic table and trends, ionic bonding and properties, covalent bonding and properties, metallic bonding, acids, bases and pH, making salts required practical, the reactivity series, extraction of metals and reduction, electrolysis, extraction of aluminium, energy changes and bond enthalpy, and temperature change required practical.

Separate Physics:

Types of magnetism, magnetic fields, electromagnetism, particle model of matter, space, wave features, wave speed calculations, waves required practical, electromagnetic waves, forces basics, weight, mass and gravity, reaction time and breaking distances, and work done, and energy transferred.

Assessment

Assessment takes place in all lessons with pupils' self and peer assessing their work against model answers.

Pupils are given opportunity to recall information from previous lessons in low stake quizzes in every lesson.

Formative assessments consist of multiple choice, structured, closed short answer, and open response question types allowing pupils to demonstrate the ability to recall and apply knowledge and understanding, and analyse information.

Formal KS3 assessments take place during each unit. A re-teach lesson follows which is individual the groups needs based on the assessment date.

Formal KS4 assessments are more extensive and take place at the end of each unit. PPE's also play an active role in both year groups. Year 11 have two PPE opportunities which then guidse the subsequent planning and teaching.