

## **The Science Curriculum at Our Lady's Catholic High School**

The science department believes in the potential of every child and works to develop the mind-set and skills necessary to be a successful learner. In the science department every pupil matters and we continue to strive to help students achieve their very best through excellent learning and teaching and a positive environment. We strive to maintain a curiosity of the World around us through our engaging curriculum, and to promote skills of investigation, questioning, analysis, and experimental techniques.

The intent of the science curriculum at Our Lady's Catholic High School is to develop all pupils' understanding and love of science while supporting the whole school mission statement. Our curriculum aims to ignite and maintain pupils' curiosity about the world in which we live. The curriculum is designed to help all pupils learn across the whole school curriculum, including literacy and numeracy, and to open doors to rewarding and interesting careers to which pupils can aspire.

The science curriculum is planned to ensure the delivery of the KS3 National Curriculum KS3 and KS4 programmes of study in a conceptually progressive order to all pupils. Our curriculum spirals, building on prior knowledge and revisiting key concept areas from years 7-11. For example, pupils study cell structure in year 7 which is used to understand a cell process called respiration in year 8, which is needed for transport between cells in year 9, which is needed to understand types of respiration in year 10, which is connected to control of blood glucose control in year 11.

SEND pupils are known and taught the same ambitious curriculum as other pupils, differentiated where necessary. We have introduced the ELC for some of our weaker pupils which enables them to gain this qualification, whilst also being able to gain GCSE combined science at the same time. This means that all pupils have access to the GCSE science course and the opportunity to be entered for the examinations.

Disadvantaged pupils are known by class teachers who monitor their progress and provide timely intervention as necessary. This may take the form of providing resources, extra teaching, or enrichment activities.

All pupils are challenged by our curriculum, and we have high expectations of them within lessons. Our curriculum ensures that pupils are stretched, and each classroom has a set of 'challenge' activities for any pupil who wants to extend their work.

Teachers strive to get the best from each pupil, every lesson. We do this by planning engaging, relevant lessons that inspire pupils' imaginations. We build positive relationships with pupils and parents alike, ensuring that pupils are aware of our desire to see them succeed in science. By enriching the curriculum, we are enabling pupils to connect the science they learn in school with the outside world, and possible careers using science qualifications. Year 7 have the RSC Flash Bang show, year 8 visit Chester Zoo, year 9 visit the UCLAN observatory and experience a medical careers day, year 10 take part in a spectroscopy session with the RSC. STEM club runs for years 7-9, and our science week activities provide enrichment opportunities for all year groups. We are all passionate about science, and are developing ways in which we can encourage pupils to engage with science outside the classroom. One of the ways in which we are doing this is a half-termly email to all pupils with current and engaging STEM articles in the news. We also give pupils the opportunity to focus on a career in STEM at three points (two in year 11) during each year. This involves pupils having to read and research a career as directed by their teacher. In addition, pupils will be taught about a number of potential careers that they would be able to access should they wish to follow the STEM subjects further. This shows the relevance of science to them in their future lives.

Year 7	Year 8	Year 9	Year 10	Year 11
Forces	Forces	Cells	Organisation	Homeostasis
Electromagnets	Electromagnets	Bioenergetics	Infection and Response	Inheritance
Energy	Energy	Atomic Structure and the Periodic Table	Ecology	Rates
Matter	Waves (parts 1 and 2)	Atmosphere and Using Resources	Bonding	Organic Chemistry
Reactions	Matter	Particle Model of Matter	Quantitative Chemistry	Chemical Analysis
Earth (Space only)	Reactions	Maths skills	Chemical Change	Forces
Organisms	Earth	Space	Energy Changes	Waves
Ecosystems	Organisms		Energy	Magnetism
Genes	Ecosystems		Electricity	
	Genes		Atoms and Isotopes	

Pupils study materials in year 5, living things and electricity in year 6. Since pupils face a chemistry-heavy GCSE, our curriculum is designed to ensure they cover essential knowledge of chemistry in year 7 to bridge any gaps from primary school. By having a carefully designed curriculum that provides essential prior knowledge, and accurately assessing pupil progress, we can be confident that pupils are ready to begin the KS4 programme of study. We are currently looking at ways in which we can teach scientific vocabulary more explicitly within our curriculum and have introduced strategies such as the use of Frayer grids to help pupil progress. We use a number of other strategies such as cloze passages, word-matching, key word definitions, word searches, spelling tests and games, targeted questioning and sentence construction to scaffold pupils learning. We have available a number of scientific magazines and journals which are used to encourage wider reading around the subject. These feature new and relevant science enabling our pupils to have in-depth discussions amongst themselves and their teachers, thereby increasing their scientific literacy and oracy.

Key scientific ideas have been identified in each year group that are essential for development of learning within science. This forms the basis of how the curriculum is structured. In order to progress to the next stage of learning, certain material must be covered in a particular order. For example, in order for pupils to understand respiration inside cells in year 8, they must cover cell structure in year 7. These key concepts are revisited using our interleaving maps below:

Key Scientific Ideas					
	Year 7	Year 8	Year 9	Year 10	Year 11
<b>Key Ideas in Biology</b>	Structure and function of plant and animal cells (8.1 Organisms). Diffusion, Osmosis, Active Transport (8.1 Organisms). Adaptations (8.1 Genes). Reproductive systems (8.1 Genes). Adolescence (8.1 Genes).	Photosynthesis (8.3 Organisms). Gas Exchange (8.3 Organisms). Absorbing nutrients (8.3 Organisms). Enzymes (8.3 Organisms). Respiration (9.4 Ecosystems ). Food chains and food webs (9.4 Ecosystems). Chromosomes (10.3 Genes). Biodiversity (10.3 Genes)	Structure and function of plant and animal cells. Diffusion, Osmosis, Active Transport.	Cells - structure/transport	Cells - specialised cells. DNA/Chromosomes. Adaptations.
<b>Key Ideas in Chemistry</b>	Particle model of matter (5.1 Matter). Changes of state (5.1 Matter). Acid strength (5.1 Matter).	Atoms in reactions (5.3 Matter). Elements, mixtures and compounds (5.3 Matter). Formulae (6.3 Reactions). Conservation of mass (6.3 Reactions).	Particle model of matter. Changes of state.	Atomic structure. Conservation of mass. Acids and alkalis. Endothermic and exothermic reactions.	Particle model. Elements and compounds. Solubility.
<b>Key Ideas in Physics</b>	The Solar System (7.1 Earth). Speed, distance and time (1.1 Forces). Current, voltage and resistance (2.1 Electromagnets). Energy stores (3.1 Energy).	Springs and extension (1.3 Forces). Magnetic Fields (2.3 Electromagnets). Energy transfers (3.3 Energy). Conduction, convection and radiation (3.3 Energy). Properties of sound and light waves (4.1/4.3 Waves).	Particle model of matter. Changes of state. Density.	Energy stores. Current/Voltage/Resistance. Atomic structure. Balanced and unbalanced forces. Wave properties. Radiation of heat.	Magnetic fields. Gravity.

Reinforcing Key Ideas					
Topic	Recap lesson(s)				
Forces	Balanced and unbalanced forces				
Electromagnets	Current, voltage and resistance				
Energy	Energy stores				
Waves					
Matter	Particle model				
Reactions	Particle model				
Earth	Gravity				
Organisms	Cells				
Ecosystems	Plant cells/Gametes				
Genes	Cells				
B1 Cells			Cells - structure/transport		
B2 Organisation				Cells - structure/transport	
B3 Infection				Cells - structure	
B4 Bioenergetics			Cells - structure/transport		
B5 Homeostasis					Cells - specialised cells
B6 Inheritance					DNA/Chromosomes
B7 Ecology					Adaptations
C1 Atomic Structure and PT			The periodic table		
C2 Structure and Bonding				Atomic structure	
C3 Quantitative Chemistry				Conservation of mass	
C4 Chemical Changes				Acids and alkalis	
C5 Energy Changes				Endothermic and exothermic reactions	
C6 Rates					Particle model
C7 Organic Chemistry					Elements and compounds
C8 Chemical Analysis					Solubility
C9 Atmosphere			Radiation of heat		
C10 Using resources					
P1 Energy				Energy stores	
P2 Electricity				Current/Voltage/Resistance	
P3 Particle Model of Matter			Particle model		
P4 Atomic Structure				Atomic structure	
P5 Forces				Balanced and unbalanced forces	
P6 Waves				Wave properties	
P7 Magnetism					Magnetic fields
P8 Space					Gravity
Maths skills					

Pupil progress is assessed 'live' during lessons, via specific assessment activities throughout topics, and by formative assessments during the year. Acquisition of knowledge, and pupil progress is gauged as a result of this assessment and can be seen using peer assessment, self-assessment and teacher assessment. Pupils who are falling behind in the lesson sequence are dealt with by the class teacher, who arranges appropriate intervention such as catch-up sessions. Our rigorous and challenging assessments assess the required

knowledge and skills for each year group, and have been moderated internally and externally. Conversations are held with pupils who are not making expected progress to encourage and engage them to reflect on their current achievement, and to set targets for the future. The science department staff regularly call or text parents, send postcards and issue green writing within class to reward positive engagement within science lessons. Homework set in the science department is purposeful and consolidates learning within the classroom. An example of homework set could be to explain treatments for kidney failure.

<b>Assessments</b>					
<b>Knowledge</b>	7	8	9	10	11
<i>Describe</i>	9.1 Ecosystems (Key Idea Food chains and food webs).	1.3 Forces (Key Idea Springs).			
<i>Explain</i>	5.1 Matter (Key Idea Particle Model of Matter/Changes of state).	2.3 Electromagnets (Key Idea Magnetic Fields) 3.3 Energy (Key Idea Conduction, Convection and Radiation). 5.3 Matter			
<i>Compare</i>	3.1 Energy (Key Idea Energy Stores).	8.3 Organisms (Key Idea Respiration) 4.1/3 Waves (Key Idea Properties of Waves).			
<i>Model</i>	Cells 7.1 The Solar System	Digestive system Enzymes			
<i>Apply</i>	8.1 Organisms (Key Idea Plant and animal cells).	6.3 Reactions (Key Idea Conservation of Mass)			
<i>Vocabulary</i>	5.1 Matter (Key Idea Particle Model of Matter/Changes of state).	8.3 Organisms (Key Idea Photosynthesis)			
<b>Skills</b>					

<i>Planning</i>	6.1 Reactions	5.1 Matter	B4 Photosynthesis C10 Water purification P3 Density	B2 Food tests C4 Making salts P2 Resistance	B5 Reaction times
<i>Observing</i>	Microscopes	Magnetic Fields (as part of assessment) Waves (as part of assessment)	B1 Microscopy	B3 Microbiology (sep)	P6 Light (sep) P6 Radiation and absorption C8 Identifying Ions (sep)
<i>Graphs</i>	1.1 Forces (Speed distance and time). 10.1 Genes	9.3 Ecosystems	B1 Osmosis	P1 Specific Heat Capacity P2 I-V Characteristics C6 Rates of Reaction	P5 Force and extension
<i>Concluding</i>	2.1 Electromagnets (Key Idea V, I and R). 10.1 Genes	Working Scientifically Y7/8		B4 Photosynthesis C4 Electrolysis	B5 Germination (Sep) P6 Radiation and Absorption
<i>Evaluating</i>	Working Scientifically Y7/8	10.3 Genes		B2 Enzymes B7 Decay (sep) C5 Temperature Changes	P5 Acceleration P1 Thermal Insulation (sep)
<i>Numeracy</i>	1.1 Forces 2.1 Electromagnets 10.1 Genes	8.3 Organisms	P3 Density	B7 Field investigations C3 Neutralisation (sep)	P6 Wave Behaviour C8 Chromatography

The department led CPD is planned based on the requirements of staff, and largely influenced by the EEF. There is a deliberate focus on STEM training, utilising the STEM network for sessions as and when they are required such as Maths in Science and chemistry required practicals. Teaching and Learning features on every development time agenda, where staff take turns to share good practice and new practices are introduced. CPD is planned by the Principal Teacher of Science who ensures that staff are briefed on local and national teaching and learning developments within education. Our CPD is recorded in a departmental diary.