CURRICULUM INTENT: SCIENCE

The intention of the Science Department here at the North London Grammar School, NLGS, is to equip our students with skills for life from a scientific perspective. We aim to challenge our students by introducing them to a wide range of science topics, which form a sturdy foundation for their futures. Students successfully develop practical, mathematical, and scientific literacy skills through the exploration of integral topics in Biology, Chemistry and Physics. Our well-structured educational pathway in science trains our students, as part of their personal and academic development, to think logically and independently, to increase their problem-solving skills.

Initially, students follow a thorough two-year key stage three curriculum that covers key concepts in all sciences. All Year 7 students complete an introduction to secondary science module before their science teaching commences.

Confidence in these ideas is strengthened more using an in-depth approach at GCSE for three years from Year 9 to Year 11 in key stage four. At NLGS we teach the OCR Gateway science GCSE for both Combined Science and Separate sciences where each science discipline is given equal weighting. These courses provide a strong platform to progress into any Biology, Chemistry or Physics key stage five courses which subsequently lead on to all Higher educational qualifications and universities.

Within the areas of Biology, Chemistry and Physics, the science department also introduce numeracy and literacy within science along with building skills to work scientifically, especially within practical activities. The science department also aims to introduce students to careers in science to raise awareness of the many pathways that science qualifications can lead towards. In addition, Cultural capital will be embedded into each topic to ensure students are able to relate the science they learn about to a variety of contexts and to understand the importance of each scientific concept in day-to-day life.

The Science Department offer an exciting range of extracurricular experiences to give students a flavour of science beyond the classroom. Educational visits, STEM clubs, guest speakers and careers advice are available at each key stage to feed students' natural curiosity and allow access to novel ideas and experiences.

CURRICULUM IMPLEMENTATION: SCIENCE (PHYSICS)

	AUTUMN TERM		SPRING TERM		SUMMER TERM		Trips and Events
	Autumn 1	**Autumn 2**	**Spring 1**	**Autumn 1**	**Autumn 2**	**Spring 1**	
Year 7 Knowledge: What will students know?	**Introduction to Secondary Science** -Lab safety and equipment -How to use the Bunsen burner -Variables in science -How to draw a table -How to draw a graph -Drawing conclusions -Evaluating experiments **B1.1 Cells, the building blocks of life** **Please refer to Biology**	C1.3 Mixing, dissolving and separating Please refer to Chemistry Implementation document for details	**P1.5 Forces and effects** 1.5.2 Discovering forces 1.5.3 Measuring forces 1.5.4 Understanding weight on other planets 1.5.5 Exploring the effects of forces 1.5.6 Understanding stretch and compression 1.5.7 Investigating Hooke's Law	B1.2 Eating, drinking and breathing Please refer to Biology Implementation document for details	C1.4 Elements compounds and reactions Please refer to Chemistry Implementation document for details	**P1.6 Energy transfer and sound** 1.6.2 Exploring energy transfers 1.6.3 Understanding potential energy and kinetic energy 1.6.4 Doing work 1.6.5 Looking at dynamos 1.6.6 Understanding elastic potential energy 1.6.7 Knowing the difference between heat and temperature	Trip to RAF Museum Spring 1 British Science Week activities Spring 2

	Implementation document for details		1.5.9 Exploring the benefits of friction 1.5.10 Understanding air and water resistance 1.5.11 Discovering streamlining 1.5.13 Exploring forces and motion 1.5.14 Exploring how forces affect speed and direction 1.5.17 Discovering moments 1.5.18 Understanding the application of moments			1.6.8 Thinking about fuels 1.6.9 Investigating fuels 1.6.10 Applying key ideas 1.6.11 Exploring sound 1.6.12 Describing sound 1.6.13 Measuring the speed of sound 1.6.14 Understanding how sound travels through materials 1.6.16 Hearing sounds 1.6.18 Finding out sounds we cannot hear	
Year 7 Skills: What skills will students have developed?	**SMSC:** Science Cultural capital in all lessons. **Literacy:** •Language for learning – keywords shared every lesson. •Comprehension style/ cloze style activities in all lessons. •present reasoned explanations, including explaining data in relation to predictions and hypotheses •identify further questions arising from their results. **Numeracy:** •Graphing skills •understand and use SI units •undertake basic data analysis including simple statistical techniques. •evaluate data, showing awareness of potential sources of random and systematic error •apply mathematical concepts and calculate results • present observations and data using appropriate methods, including tables and graphs •interpret observations and data, including identifying patterns and using observations, measurements, and data to draw conclusions **GATSBY Benchmark 4:** Introduction to science linked careers at the start of each topic. **Practical Skills/ Working Scientifically:** • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience •make predictions using scientific knowledge and understanding •select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate •use appropriate techniques, apparatus, and materials during laboratory work, paying attention to health and safety					

	•make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements **Please refer to Chemistry and Biology Curriculum Maps for Chemistry and Biology implementation.**						
Year 8 Knowledge: What will students know?	B2.1 Getting the energy your body needs Please refer to Biology Implementation document for details	C2.3 Explaining physical changes Please refer to Chemistry Implementation document for details	**P2.5 Exploring contact and non-contact forces** 2.5.6 Understanding electrostatic fields 2.5.7 Applying what we know about electrostatics 2.5.8 Exploring gravity on Earth 2.5.9 Applying our understanding of gravity to space travel 2.5.11 Exploring pressure on a solid surface 2.5.12 Calculating pressure 2.5.13 Exploring pressure in a liquid 2.5.14 Explaining floating and sinking 2.5.15 Exploring gas pressure 2.5.16 Working with pressure **P2.6 Magnetism and Electricity** 2.6.3 Exploring magnetic materials 2.6.4 Testing the strength of magnets 2.6.6 Investigating electromagnetism 2.6.7 Using electromagnets	B2.2 Looking at p lants and ecosystems Please refer to Biology Implementation document for details	C2.4 Explaining chemical changes Please refer to Chemistry Implementation document for details	**P2.6 Magnetism and Electricity** 2.6.11 Describing electric circuits 2.6.12 Understanding energy in circuits 2.6.13 Explaining resistance 2.6.14 Investigating factors affecting resistance 2.6.15 Explaining circuits using models 2.6.16 Describing series and parallel circuits 2.6.17 Comparing series and parallel circuits 2.6.18 Applying circuits 2.6.10 Investigating batteries	Year 8/9 Trip to Science Museum Spring 1 British Science Week activities Spring 2

			2.6.8 Exploring D.C. motors				
Year 8 Skills: What skills will students have developed?	**SMSC:** Science Cultural capital in all lessons. **Literacy:** •Language for learning – keywords shared every lesson. •Comprehension style/ cloze style activities in all lessons. •present reasoned explanations, including explaining data in relation to predictions and hypotheses •identify further questions arising from their results. **Numeracy:** •Graphing skills •understand and use SI units and derive simple equations and carry out appropriate calculations •undertake basic data analysis including simple statistical techniques. •evaluate data, showing awareness of potential sources of random and systematic error •apply mathematical concepts and calculate results • present observations and data using appropriate methods, including tables and graphs •interpret observations and data, including identifying patterns and using observations, measurements, and data to draw conclusions **GATSBY Benchmark 4:** Introduction to science linked careers at the start of each topic. **Practical Skills/ Working Scientifically:** • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience •make predictions using scientific knowledge and understanding •select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate •use appropriate techniques, apparatus, and materials during laboratory work, paying attention to health and safety •make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements **Please refer to Chemistry and Biology Curriculum Maps for Chemistry and Biology implementation.**						
GCSE Examination Board: OCR (GATEWAY 9-1)							
Year 9 Knowledge: What will students know?	**P1 Matter** 1.1 Developing ideas for the structure of the atom	**P1 Matter** 1.9 Specific Heat Capacity 1.11	**P2 Forces** 2.1 Scalars and vectors 2.2 Speed, distance time graph	**P2 Forces** 2.8 Forces and motion 2.9 Resultant forces	**P3 Electricity** 3.1 Static electricity	**P3 Electricity** 3.10 Calculating Power 3.11 Investigating Series and parallel circuits	Year 8/9 Trip to Science Museum Spring 1

	1.2 Atomic structure 1.3 Density 1.5 Investigate the densities of regular and irregular solid objects 1.4 Key concept Particle model and changes 1.6 Change of state 1.7 Internal energy 1.8 Specific latent heat	RP: Investigating specific heat capacity 1.10: Maths skills/ drawing and interpreting graphs 1.16 Handling data 1.12 Particle motion in gases 1.13 Increasing the pressure in a gas 1.14 Pressure in a fluid 1.15 Atmospheric Pressure	2.3 Acceleration 2.12 Required practical Investigating the acceleration of an object 2.4 Calculations of motion 2.5 Velocity–time graphs 2.6 Maths skills Making estimates of calculations 2.7 Forces explain how objects interact	2.10 Forces and acceleration 2.16 Key concept Forces and acceleration 2.11 Momentum 2.13 Newton's third law 2.14 Work done and energy transfer 2.15 Understanding power 2.17 Forces and energy in springs 2.18 RP: Investigate the relationship between force and the extension of a spring 2.19 Potential energy 2.20 Heavy or massive 2.21 Moments 2.22 Levers & Gears	3.2 Electric charge and current 3.3 Electric circuits and potential difference 3.5 Resistance 3.6 Practical: Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance 3.7 Investigating circuits 3.8 Control circuits 3.9 Power and energy Transfer	3.12 Differences between potential difference and current 3.13 and 3.14 Maths skills **P4 Magnetism** 4.1 Magnetism and magnetic force 4.2 Compasses and Magnetic field 4.3 Magnetic effect	British Science Week activities Spring 2

Year 9 Skills: What skills will students have developed?	**SMSC:** Science Cultural capital in all lessons. **Literacy:** Language for learning – keywords shared every lesson. Comprehension style/ cloze style activities in all lessons. **Numeracy:** •Graphing skills • using SI units and IUPAC • using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano) • interconverting units • using an appropriate number of significant figures in calculations. **GATSBY Benchmark 4:** Introduction to science linked careers at the start of each topic. **Practical Skills/ Working Scientifically:** •using scientific theories and explanations to develop hypotheses •planning experiments to make observations, test hypotheses or explore phenomena • applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments • carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations • making and recording observations and measurements using a range of apparatus and methods • evaluating methods and suggesting possible improvements and further investigations.						
Year 10 Knowledge: What will students know?	**P4 Magnetism** Recap Year 9 Magnetism 4.4 Calculating force on a conductor 4.5 The Generator Effect 4.6 Electric motors 4.7 Generators and transformers 4.8 Loudspeakers and microphones Recap Year 9 electricity 4.9 The link between electricity and magnetism 4.10 Maths skills	**P5 Waves in matter** 5.1 Describing Waves 5.2 Transverse and longitudinal waves 5.3 Reflection and refraction of waves 5.4 Sound waves 5.5 Exploring Ultrasound 5.6 Practical: Measuring the wavelength, frequency and speed of waves in a ripple tank and waves in a solid 5.7 Maths skills 5.8 Transferring energy or information by waves 5.9 The Electromagnetic spectrum	**Year 10 Mid-year Exams** **P5 Waves in matter** 5.13 Radio and microwave communication 5.14 Reflection, refraction and wavefronts 5.15 Practical: Investigate how the amount of IR radiation absorbed or radiated by a surface depends on the nature of that surface 5.16 Practical: Investigate the	**P5 Waves in matter** 5.17 Lenses 5.18 Images and magnification 5.19 Colour **P6 Radioactivity** 6.1 Atomic structure 6.2 Radioactive decay 6.3 Nuclear Equations 6.4 Radioactive half-life 6.5 Background Radiation 6.6 Maths Skills	**P6 Radioactivity** 6.7 Hazards and uses of radiation 6.8 Irradiation 6.9 Uses of Radiation in medicine 6.10 Using nuclear radiation 6.11 Nuclear Fission 6.12 Nuclear Fusion **P7 Energy** 7.1 Investigating work done	**P7 Energy** 7.5 Dissipation of energy 7.6 Energy Efficiency 7.7 Practical: Investigating ways of reducing the unwanted energy transfers in the system 7.8 Energy Transfer 7.9Maths Skills	Y10 Trip to New Scientist Live Autumn 1 British Science Week activities Spring 2

		5.10 Gamma rays & X-rays 5.11 UV and IR Radiation 5.12 Microwaves	reflection of light by different substances		7.2 Work done and energy transfer 7.3 Specific heat capacity 7.4 Energy and Power		
Year 10 Skills: What skills will students have developed?	**SMSC:** Science Cultural capital in all lessons. **Literacy:** Language for learning – keywords shared every lesson. Comprehension style/ cloze style activities in all lessons. **Numeracy:** •Graphing skills • using SI units • using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano) • interconverting units • using an appropriate number of significant figures in calculations. **GATSBY Benchmark 4:** Introduction to science linked careers at the start of each topic. **Practical Skills/ Working Scientifically:** •using scientific theories and explanations to develop hypotheses •planning experiments to make observations, test hypotheses or explore phenomena • applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments • carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations • making and recording observations and measurements using a range of apparatus and methods • evaluating methods and suggesting possible improvements and further investigations.					
Year 11 Knowledge: What will students know?	**P8 Global Challenges** 8.1 Keeping safe on the road 8.2 Transmitting Electricity 8.3 Using energy resources 8.4 Global energy supplies 8.5 Electricity in the home	**Year 11 Mock Exams** **P8 Global Challenges** 8.6 Red-Shift 8.7 The Sun and other stars 8.8 Emission and absorption of IR radiation 8.9 The solar system	**Year 11 GCSE Revision**	**Year 11 GCSE Exams**			Year 11 Trip to Kew Gardens Autumn 1 British Science Week activities Spring 2

		8.10 Orbits of planets, moons and artificial satellites 8.11 Gravity: the force that binds the universe 8.12 Temperature of the Earth 8.13 Measuring Wave Speeds 8.14 Sesimic Waves 8.15 Maths Skills			
Year 11 Skills: What skills will students have developed?	**SMSC:** Science Cultural capital in all lessons. **Literacy:** Language for learning – keywords shared every lesson. Comprehension style/ cloze style activities in all lessons. **Numeracy:** •Graphing skills • using SI units • using prefixes and powers of ten for orders of magnitude (e.g. tera, giga, mega, kilo, centi, milli, micro and nano) • interconverting units • using an appropriate number of significant figures in calculations. **GATSBY Benchmark 4:** Introduction to science linked careers at the start of each topic. **Practical Skills/ Working Scientifically:** •using scientific theories and explanations to develop hypotheses •planning experiments to make observations, test hypotheses or explore phenomena • applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments • carrying out experiments appropriately, having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations • making and recording observations and measurements using a range of apparatus and methods • evaluating methods and suggesting possible improvements and further investigations.			

CURRICULUM IMPACT: SCIENCE (PHYSICS)

All students will:

Demonstrate a love of science work and an interest in further study and work in this field
Retain knowledge that is pertinent to Science with a real life context through Cultural Capital and exploring science through cross curricular links.
Be able to question ideas and reflect on knowledge.

Be able to articulate their understanding of scientific concepts and be able to reason scientifically using rich language linked to science.
Demonstrate a good application of mathematical skills through their work, organising, recording and interpreting results.
Work collaboratively and practically to investigate and experiment.
By evaluating key theories and studies, students will develop the confidence to develop critical thinking skills · Students will be able plan and design research investigations so that they are both ethical and feasible
Students will be able to use mathematical skills to analyse and interpret data
By an emphasis on carrying out and analysing the results of practical investigations, students will develop curiosity and key scientific skills.
By encouraging students to aim high and evaluate their own investigations, students will develop confidence and resilience.
Demonstrating an increase in their effective use of key scientific terminology, particularly in extended writing pieces.
Extending the length and quality of their scientific explanations, particularly regarding Key stage 4 students' ability to respond to the six-mark questions on their GCSE papers.
Consistently using evidence obtained from scientific diagrams in their explanations.
Discussing ideas and issues such as the ethics associated with Radioactivity, Nuclear reactions and Nuclear Power Stations appropriately and whilst being respectful of others' ideas and opinions.