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 (BIOLOGY)

	AUTUMN TERM		SPRING TERM		SUMMER TERM		Trips
	Autumn 1	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**	
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** Practical 1.1.3 Comparing plant and animal cells 1.1.5 Describing Unicellular organisms	C1.3 Mixing, dissolving and separating Please refer to Chemistry Implementation document for details	P1.5 Forces and effects Please refer to Physics Implementation document for details	**B1.2 Eating, drinking and breathing** 1.2.2 Exploring a healthy diet 1.2.3 Testing foods 1.2.4 Comparing energy needs 1.2.5 Exploring obesity and starvation 1.2.6 Understanding deficiency diseases 1.2.7 Understanding the human digestive system *1.2.8 Investigation the start of digestion* 1.2.9 Understanding the role of the digestive organs	C1.4 Elements compounds and reactions Please refer to Chemistry Implementation document for details	P1.6 Energy transfer and sound Please refer to Physics Implementation document for details	Year 7 trip to RAF spring 1 British Science Week Activities Spring 2

	1.1.7 Understanding organisation of multicellular organisms 1.1.6a Plan practical Investigating diffusion Practical 1.1.6b Finding out how concentration affects diffusion 1.1.14 Understanding male reproductive system 1.1.15 Understanding female reproductive system 1.1.16 Learning about changes in puberty 1.1.17 Learning about how foetus develops			1.2.11 Introducing enzymes 1.2.12 Recognising the role of bacteria 1.2.13 Understanding how we breathe 1.2.14 Measuring breathing 1.2.15 Evaluating gas exchange in humans			
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 lessons. •present reasoned explanations, including explaining data in relation to predictions and hypotheses •identify further questions arising from their results. **Numeracy:** •Graphing skills •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 **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 fieldwork and 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 •apply sampling techniques. Please refer to Chemistry and Physics Curriculum Maps for Chemistry and Physics implementation.						

Year 8 Knowledge: What will students know?	**B2.1 Getting the energy your body needs** 2.1.2 Exploring the human skeleton 2.1.3 Analysing the skeleton 2.1.4 Understanding the role of skeletal joints 2.1.5 Investigating muscle strength 2.1.6 Analysing muscle strength 2.1.7 Examining interacting muscles 2.1.8 Exploring problems with the skeletal systems 2.1.10 Understanding how the muscle gets energy 2.1.11 Investigating respiration 2.1.12 Analysing adaptations for respiration 2.1.13 Examining links between respiration and body systems 2.1.14 Exploring respiration in sports 2.1.15 Understanding anaerobic respiration 2.1.16 Investigating fermentation 2.1.17 Comparing aerobic and anaerobic respiration	C2.3 Explaining physical changes Please refer to Chemistry Implementation document for details	P2.5 Exploring contact and non-contact forces Please refer to Physics Implementation document for details	**B2.2 Looking at plants and ecosystems** 2.2.2 Understanding the importance of plants 2.2.3 Exploring how plants make their own food 2.2.4 Looking at leaves 2.2.5 Exploring the role of stomata 2.2.6 Investigating photosynthesis 2.2.7 Exploring the movement of water and minerals in plants 2.2.8 Investigating the importance of minerals to plants 2.2.9 Investigating chemosynthesis 2.2.11 Understanding food webs 2.2.12 Exploring the importance of insects 2.2.13 Looking at other examples of interdependence 2.2.14 Understanding the interactions in the environment 2.2.15 Learning about ecological balance 2.2.16 Understanding the effects of toxins in the environment 2.2.17 Understanding how organisms co-exist	C2.4 Explaining chemical changes Please refer to Chemistry Implementation document for details	P2.6 Magnetism and electricity Please refer to Physics Implementation document for details	YEAR 8 trip to science museum autumn 1 British Science Week Activities Spring 2
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 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 fieldwork and 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 •apply sampling techniques. **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?	1.1 The light microscope 1.2 Looking at cells 1.3 Practical: Using a light microscope to observe animal and plant cells 1.4 Primitive cells 1.6 Maths skills: Size and number 1.7 The structure of DNA 1.8 Proteins 1.9 Explaining enzymes 1.10 Practical: Investigate the effect of pH on the rate of reaction of amylase enzyme 1.11 Cells at work 1.12 Living without oxygen 1.13 Enzymes at work	1.14 Practical: Use qualitative reagents to test for a range of carbohydrates, lipids and proteins 1.15 Looking at photosynthesis 1.16 Explaining photosynthesis 1.17 Practical: Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism 1.18 Increasing photosynthesis 1.19 Maths skills: Extracting and interpreting information	2.1 Diffusion in living systems 2.2 Explaining water movement 2.3 Practical: Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue 2.4 Learning about active transport 2.5 Cell division 2.6 Cell differentiation 2.7 Stem cells	2.10 Learning about the circulatory system 2.11 Investigating gaseous exchange 2.12 Exploring the heart 2.13 Studying blood 2.14 Investigating leaves 2.15 Learning about plants and minerals 2.16 Looking at stomata 2.17 Moving water 2.18 Moving sugar 2.19 Investigating transpiration 2.20 Maths skills: Surface area to volume ratio	3.1 The nervous system 3.2 Reflex actions 3.3 Practical: Investigating reaction time 3.4 The eye 3.5 Seeing in focus 3.6 Eye defects 3.7 The brain 3.8 The endocrine system 3.9 Negative feedback 3.10 Key concept: Systems working together	3.11 Human reproduction 3.12 Contraception 3.14 IVF 3.16 Auxins 3.18 Practical: The effect of light and gravity on the growth of germinating seeds 3.20 Homeostasis 3.21 Controlling body temperature 3.22 Controlling blood glucose 3.23 Diabetes 3.24 Diabetes recommendations 3.25 Water Balance 3.26 Kidney	YEAR 9 Trip to science museum spring 1 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 chemical nomenclature unless inappropriate • 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 • recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative • 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?	4.1 Cycling materials 4.2 Cycling carbon 4.3 Investigating decay 4.4 Ecosystems 4.5 Changing abiotic factors 4.6 Investigating predator-prey relationships 4.7 Competing for resources 4.8 Looking at trophic levels 4.9 Transferring biomass 4.10 Maths skills: Using graphs to show relationships	5.1 Genetics 5.2 DNA and genes 5.3 Asexual and sexual reproduction 5.4 Meiosis 5.5 Genetic crosses 5.7 Maths skills: Fractions, ratio, proportion and probability 5.8 Gregor Mendel 5.9 Variation 5.10 The theory of evolution 5.11 The tree of life 5.12 Mutations 5.13 The origin of species by natural selection	5.14 A new species 5.15 Evidence of natural selection and evolution? 5.17 How much have organisms changed? 5.18 Antimicrobial resistance 5.19 Darwin and Wallace 5.20 Key concept: Evolution: fitting the pieces of the jigsaw 5.21 Extinction... or survival? 5.22 Maths skills: Using charts and graphs to display data	6.1 Practical: Sampling techniques 6.2 Practical: Measure the population size of a common species in a habitat 6.3 Changing the environment 6.4 Learning about land use 6.5 Changing the landscape 6.6 Thinking about global warming 6.7 Looking at waste management	6.8 Investigating pollution 6.9 Maintaining biodiversity 6..10 Learning about food security 6.11 Maintaining food security 6.12 Selective breeding 6.13 Producing new plant varieties 6.14 Genetic engineering 6.15 Genetically modified crops	6.16 Is genetic modification safe? 6.17 Ethically wrong, or essential? 6.18 Learning about health 6.19 Studying pathogens 6.20 Analysing and evaluating data 6.21 Learning about malaria	YEAR 10 trip to new scientists' live autumn 1 British Science Week Activities Spring 2

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 and IUPAC chemical nomenclature unless inappropriate • 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 • recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative • 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?	66.22 Learning about viral diseases 6.23 Studying bacterial diseases 6.24 Looking at fungal diseases 6.25 Looking at plant diseases 6.26 Learning about plant defences 6.27 Protecting the body 6.28 Exploring white blood cells 6.29 Investigating monoclonal antibodies 6.30 Building immunity 6.31 Using antibiotics and antivirals	6.32 Growing microorganisms 6.33 Practical: Investigating disinfectants 6.34 Making new drugs 6.35 Key concept: Looking at risk factors 6.36 Treating cardiovascular disease 6.37 Cancer 6.39 Stem cells in medicine 6.40 The Human Genome Project 6.41 Gene technology in medicine 6.42 Maths skills: Sampling and scientific data	B1 – B6 revision	B1 – B6 revision	B1 – B6 revision	B1 – B6 revision	YEAR 11 Trip to Kew Garden Autumn 1 British Science Week Activities Spring 2
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. **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 • recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative • 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 (BIOLOGY)

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 genetic engineering appropriately and whilst being respectful of others' ideas and opinions.