HOLLAND PARK SCHOOL
SCIENCE

SUBJECT LEADER MS EMILY MANOLOPOULOS
emily.manolopoulos @hollandparkschool.co.uk

CURRICULUM INTENT STATEMENT

At Holland Park School, we aim for students to be curious about the world around them and develop their scientific literacy in order to effectively explain phenomena that they experience in their everyday lives. Our approach to the curriculum focuses on students knowing more and being able to explain more with this knowledge over time. Lesson time is dedicated to testing knowledge, building understanding and application of knowledge. We prioritise rehearsal over recording. Analogies, real life examples and demonstrations are used to introduce new concepts, so that the development of understanding is concrete and not abstracted from reality.

KEY STAGE THREE OVERVIEW | At KS3 students develop their knowledge and understanding of core scientific principles. We are ambitious, using the national curriculum as a starting point and extending this in key areas such as atomic structure, introducing the nuclear model in year 7 to support further embedding of this central aspect of chemistry. Students develop their understanding of the scientific method, conducting practicals in order to know how to use scientific equipment correctly to obtain accurate data, as well as consider how to write scientific methods in order to test hypotheses. Students develop their understanding of how data can be analyse in both tabular and graphical form to draw conclusions.

Year 7

Chemistry

Students begin the year with the foundations of physical sciences through the development of their understanding of particles and states of matter. They encounter practical techniques such as use of a Bunsen burner and develop their ability to make accurate measurements and draw conclusions from data. Students will then discover the history of the development of the nuclear model of the atom including its subatomic particles and they meet the periodic table for the first time. Their understanding of the difference between elements and compounds is then developed, which is revisited when considering chemical reactions and acids and alkalis later in the year.

Physics

Students' understanding of the concept of a force is extended from their KS2 knowledge through considerations of gravity and how human understanding has changed over time with thanks to astronomical observations. Newton's laws are introduced to challenge common misconceptions of the effects of forces and students will consider this further through developing their understanding of motion. Later on in the year students revisit physics and develop their knowledge from KS2 in relation to sound and light, focussing on key questions such as 'how do we see the moon?' and 'why are there no sounds heard in space?'.

Biology

At the beginning of the Spring term, students discover the fundamentals of biology, developing their understanding of the building blocks of life: cells. They will revisit their learning from the topic of particles, considering how diffusion occurs within the body cells and developing their understanding of the process of respiration. Students will then link key processes together in the study of organ systems, including the skeletal, respiratory, circulatory and reproductive systems.

Year 8

Chemistry

In year 8, students revisit fundamental ideas within chemistry, initially by re-embedding core concepts such as the difference between elements, compounds and mixtures, extending their understanding by considering how mixtures can be separated through a range of practical techniques. Students' understanding of Mendeleev's genius in development of the periodic table is enhanced, and electronic structure is revisited, with a focus on the alkali metals and halogens including their reactions. Students further explore chemical reactions, developing their abilities to consider formations of new compounds and reactivity through the lens of metal reactions.

Physics

Students will develop their understanding of the concept of energy in year 8, starting with the fundamental idea that energy is conserved, and further extending this idea by considering energy transfers and stores. Students will meet complex calculations and practice solving problems using mathematical processes. They will then revisit the particle model from year 7 and use this to explain conduction and convection. Students will then consider the different types of energy resources and their advantages and disadvantages within the context of climate change. Later on in the year, students will develop their KS2 knowledge of electricity and magnetism by considering static electricity and the meaning of electric current, potential difference and resistance as applied to circuits. Electromagnetism is explored and examples of how we use electromagnetic devices in real life scenarios is highlighted.

Biology

In year 8, students begin the biology topic by revisiting plant cells and extending their understanding of photosynthesis. Students will develop their knowledge of plant and animal adaptations and ecosystems, considering the interrelated nature of organisms within a community through analysis of food chains and food webs. Students' appreciation of the processes that transfer elements (such as carbon) into and out of the atmosphere is developed in the study of the carbon cycle, the history of the atmosphere and the greenhouse effect, and the impact of pollution on the environment is highlighted. Students then learn about the history of the field of genetics and Darwin's theory of evolution via natural selection through the development of their understanding of DNA and heredity. Students develop their knowledge of the meaning of biodiversity and why it should be maintained. The year 8 biology topics end by revisiting the human body systems, cells and diffusion, introducing students to the most fundamental of biological molecules - the enzyme - and considering the structure and purpose of the digestive system as well as its adaptations.

KEY STAGE 4 OVERVIEW | At KS4 we follow the AQA specification. In year 9 and 10, we aim to extend students' knowledge and understanding of scientific principles, building on their KS3 knowledge to deepen their ability to explain more complicated phenomena. In year 11, we revisit content from previous years to create a change in students' long term memory and enable them to synthesise their understanding from different areas, supporting application of knowledge to unfamiliar contexts. A large number of students choose Triple Science as an option subject for year 11, where they will learn more content across all three sciences, exploring new topics such as Space Physics, the anatomy and functioning of eye and brain in Biology and the Haber process in Chemistry. We aim for students to finish their GCSEs with the ability to critically analyse data in order to make informed conclusions and to participate in scientific debates within society. We aim for students appreciate the role that science plays in society as well as the processes, such as peer review, that ensure its efficacy. We aim for students to have the choice available to them to study science beyond KS4 if they wish.

For double science award (AQA Trilogy) students will receive two GCSEs. They will sit six papers, each of 1 hr 15 minutes, with two papers for each of Biology, Chemistry and Physics. The double grade will be based on their overall mark across the three subjects. The grade combinations would be the same eg. 7-7 or with one adjacent number eg. 8-7.

Specification: https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF

For the Triple science award (AQA Biology, AQA Chemistry, AQA Physics) students will receive three GCSEs - one for each of the sciences. Students will sit six papers, each of 1 hr 45 minutes, with two papers for each of Biology, Chemistry and Physics.

Specifications:

Biology - https://filestore.aqa.org.uk/resources/biology/specifications/AQA-8461-SP-2016.PDF
Chemistry -https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF
Physics - https://filestore.aqa.org.uk/resources/physics/specifications/AQA-8463-SP-2016.PDF

KEY STAGE 5 OVERVIEW | Key Stage 5

In all three sciences we follow the Edexcel specification (in Biology we follow the Biology B specification). In addition to the examinations, students will be assessed against the 'Common Practical Assessment Criteria' in order to receive the Practical Endorsement. This is separate to the exams and is based on students' competency in completing practical work throughout the course.

Physics

Physics A level builds on the topics studied at GCSE and looks at some of the big questions like "How did the universe begin?", "What are the basic building blocks of matter?" and "How does the Sun keep on shining?" Physics also enables students to express their mathematical understanding of concepts such as forces, cosmology and quantum theory. Physics students develop skills in areas such as: problem solving, reasoning, numeracy, ICT and communication.

The Year 1 topics continue many aspects of the subject that were introduced at GCSE, but develop the ideas further. These topics consider essential ideas such as: the motion of objects using Newton's Laws; how forces act; current, voltage and resistance in electrical circuits; and how materials respond to forces. The final topic starts to consider how physical models – in this case, for the nature of light – have developed due to new evidence.

In Year 2, students extend their knowledge of the subject further by developing greater understanding of physical concepts and scenarios. Students will extend their understanding of the motion of objects by learning about motion in a circle and also periodic motions, such as those of springs or pendulums. Ideas about electric circuits are extended to included capacitors and induction of an e.m.f. The structure of the atom – especially the nucleus – is studied, with reference to fundamental particles and to the energy available from nuclear reactions. This leads, through nuclear fusion, to consider how stars form and evolve as well as a wider study of the Universe. This study considers aspects of thermodynamics, as well gravitational attractions between bodies.

Specification:
https://qualifications.pearson.com/content/dam/pdf/A%20Level/Physics/2015/Specification%20and%20sample%20assessments/PearsonEdexcel-Alevel-Physics-Spec.pdf

Students will sit three papers at the end of Year 13.

Paper 1 (30% of the qualification, 1 hr 45 minutes)

- Working as a Physicist
- Mechanics
- Electric Circuits
- Further Mechanics
- Electric and Magnetic Fields

- Nuclear and Particle Physics

Paper 2 (30% of the qualification, 1 hr 45 minutes)
- Working as a Physicist
- Materials
- Waves and Particle Nature of Light
- Thermodynamics
- Space
- Nuclear Radiation
- Gravitational Fields
- Oscillations

Paper 3 (40% of the qualification, 2 hr 30 minutes)

- Questions in this paper may draw on any of the topics in this specification.
- The paper will include synoptic questions that may draw on two or more different topics.
- The paper will include questions that assess conceptual and theoretical understanding of experimental methods (indirect practical skills) that will draw on students' experiences of the core practicals.

Chemistry

Specification:
https://qualifications.pearson.com/content/dam/pdf/A%20Level/Chemistry/2015/Specification%20and%20sample%20assessments/A_level_Chemistry_2015_Specification.pdf

Students will sit three papers at the end of year 13:

Paper 1 (30% of the qualification, 1 hr 45 minutes)
- Topic 1: Atomic Structure and the Periodic Table
- Topic 2: Bonding and Structure
- Topic 3: Redox I
- Topic 4: Inorganic Chemistry and the Periodic Table
- Topic 5: Formulae, Equations and Amounts of Substance
- Topic 8: Energetics I
- Topic 10: Equilibrium I
- Topic 11: Equilibrium II
- Topic 12: Acid-base Equilibria
- Topic 13: Energetics II
- Topic 14: Redox II
- Topic 15: Transition Metals

Paper 2 (30% of the qualification, 1 hr 45 minutes)
- Topic 2: Bonding and Structure
- Topic 3: Redox I
- Topic 5: Formulae, Equations and Amounts of Substance
- Topic 6: Organic Chemistry I
- Topic 7: Modern Analytical Techniques I
- Topic 9: Kinetics I
- Topic 16: Kinetics II
- Topic 17: Organic Chemistry II
- Topic 18: Organic Chemistry III
- Topic 19: Modern Analytical Techniques II

Paper 3 (40% of the qualification, 2 hr 30 minutes)
Questions in this paper may draw on any of the topics in this specification.

- The paper will include synoptic questions that may draw on two or more different topics listed.
- The paper will include questions that assess conceptual and theoretical understanding of experimental methods (indirect practical skills) that will draw on students' experiences of the core practicals.

Biology

Specification:
https://qualifications.pearson.com/content/dam/pdf/A%20Level/biology-b/2015/specification-and-sample-assessment-materials/9781446930892_GCE2015_A_BioB_spec.pdf

Students will sit three papers at the end of year 13.

Paper 1 (30% of the qualification, 1 hr 45 minutes)
- Topic 1: Biological Molecules
- Topic 2: Cells, Viruses and Reproduction of Living Things
- Topic 3: Classification and Biodiversity
- Topic 4: Exchange and Transport
- Topic 5: Energy for Biological Processes
- Topic 6: Microbiology and Pathogens
- Topic 7: Modern Genetics.

Paper 2 (30% of the qualification, 1 hr 45 minutes)
- Topic 1: Biological Molecules
- Topic 2: Cells, Viruses and Reproduction of Living Things
- Topic 3: Classification and Biodiversity
- Topic 4: Exchange and Transport
- Topic 8: Origins of Genetic Variation
- Topic 9: Control Systems
- Topic 10: Ecosystems.

Paper 3 (40% of the qualification, 2 hr 30 minutes)
- This paper will include questions from Topics 1–10.