Department: Science
Subject: Biology

Program of Study: Key stage 3 to Key stage 5

Intent

Curriculum

We teach the National Curriculum at key stage 3. The topics covered provide a secure introduction and insight into Science as a subject and into scientific thinking. Students are taught key concepts and 'Big Ideas' that enable them to access the Key Stage 4 curriculum, with a strong focus on developing practical skills.
At Key Stage 4, the students will study either separate or combined sciences. The department has high aspirations for all students, regardless of prior attainment at Key Stage 2, and as such offer access to the broader and more rigorous separate science curriculum alongside the traditional combined science route. The route of assessment is determined by staff, according to individual student circumstance.
Key Stage 5 students have the opportunity to study all three science subjects and as such are able to access higher education, work or take on apprenticeships in Science and STEM fields.

Teaching and Learning

We aim for all students to complete their science education having secure subject knowledge, the ability to analyse and critically evaluate data and to be confident and capable in practical work. Students should make links between theoretical science and the everyday world around them, including the wide-ranging opportunities of scientific careers. King's Academy Prospect science students should leave the school as skilful, productive members of society with the ability to enter further education or work in a science field.

Assessment

In Science, students are assessed through both formative and summative methods. Summative assessments across all year groups are in the form of class tests or PPEs. Assessment in years 7 and 8 takes the form of in-class end of topic tests that check recall and application of key ideas. Year 7 students also have an additional online assessment at the start of the year to assess KS2 knowledge and understanding against national outcomes. The assessments all enable mapping of potential GCSE outcomes. Students in years 9 to 11 have in-class end of topic tests that check recall of key ideas and learning outcomes. In addition, students have three assessment points per year where cumulative knowledge and application is assessed through exam-style questions. In conjunction with this, formative assessment occurs during each and every lesson.

Some examples of formative assessment in Science are:

- Extended response questions
- Practical skill assessments
- On-line recall questions (Seneca Learning or similar)
- Retrieval practice
- Oral questioning
- Written questions – e.g. practice exam questions

All students will receive either verbal or written feedback from these activities through a combination of self, peer or teacher assessment.

Key Concepts

Cell Biology	Organisation	Infection and Response	Bioenergetics	Homeostasis	Inheritance, Variation and Evolution	Ecology
Cells are the basic unit of all forms of life. Structural differences between types of cells enables them to perform specific functions within the organism and are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated before they have become too specialised, they can retain their ability to differentiate. This has led to the development of stem cell technology.	The human digestive system provides the body with nutrients and the respiratory system provides oxygen and removes carbon dioxide. They provide dissolved materials that need to be moved quickly around the by the circulatory system. Damage to any of these systems can be debilitating if not fatal. The plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with water and carbon dioxide for photosynthesis.	Pathogens are microorganisms that cause infectious diseases. They use their host to provide the conditions and nutrients to grow and reproduce. We can avoid diseases by reducing contact and the body has barriers against them. Once inside us, our immune system can usually destroy the pathogen. Our immunity can be enhanced by vaccination. Since the 1940s antibiotics have been developed against diseases caused by bacteria. Many groups of bacteria have become resistant to these antibiotics.	Plants use the Sun's energy in photosynthesis to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body switches to anaerobic respiration.	Cells in the body can only survive within narrow physical and chemical limits. The body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors and effectors. The nervous system can bring about fast responses. The hormonal system usually brings about much slower changes.	The number of chromosomes are halved during meiosis and then combined with new genes to produce unique offspring. Random gene mutations may occur and lead to a number of genetic disorders or death. Very rarely a new mutation can be beneficial and lead to increased fitness in the individual. Variation is the basis for natural selection and evolution. Scientists have intervened through selective breeding, cloning and genetic engineering.	The Sun is a source of energy for ecosystems. Materials including carbon and water are continually recycled, released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in complex ecosystems composed of communities of animals and plants dependent on each other and adapted to particular abiotic or biotic conditions. Humans are threatening biodiversity.

Key Themes

Biological molecules	Cells	Populations and Ecosystems	Interdependence	Photosynthesis	Respiration	Cycles	Genetics	Evolution
Life processes depend on molecules whose structure is related to their function	The fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living processes to be performed effectively	Living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways	Living organisms are interdependent and show adaptations to their environment	Life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen	Organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life	The chemicals in ecosystems are continually cycling through the natural world	The characteristics of a living organism are influenced by its genome and its interaction with the environment	Evolution occurs by a process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees.

Key Stage 3

YEAR: 7

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Topics: FORCES (speed and Gravity) MATTER (particle model and separating mixtures)	Topics: ORGANISMS (movement and cells) ELECTROMAGNETS (circuits – voltage and current)	Topics: REACTIONS (metals, non-metals, acids and alkalis) ECOSYSTEMS (interdependence and plant reproduction)	Topics: ENERGY (costs and transfers) EARTH (structure and Universe)	Topics: GENES (variation and human reproduction) WAVES (sound and light)	Topics: Review of needs from assessments and intervention topics.
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
	Cell Biology / Organisation	Inheritance / Ecology / Organisation		Inheritance	
Key Themes					
	Biological molecules / Cells	Cells / Populations and Ecosystems / Interdependence		Genetics / Cells	
Assessment Method: KS2 GL assessment Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests End of year 7 GL assessment

YEAR: 8

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Topics: FORCES (contact forces and pressure) MATTER (Periodic table and elements)	Topics: ORGANISMS (breathing and digestion) ELECTROMAGNETS (magnetism and electromagnetism)	Topics: REACTIONS (chemical energy and types of reactions) ECOSYSTEMS (respiration and photosynthesis)	Topics: ENERGY (work and heating + cooling) EARTH (climate and Earth resources)	Topics: GENES (Evolution and inheritance) WAVES (effects and properties)	Topics: Review of needs from assessments and intervention topics.
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
	Cell Biology / Organisation	Cell Biology / Organisation / Bioenergetics		Inheritance	
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
	Biological molecules / Cells	Photosynthesis / Respiration		Genetics / Evolution	
Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests	Assessment Method: Seneca + ERA/Prac End of topic tests End of year 8 GL assessment

YEAR: 9

Term 1	Term 2	Term 3
Cell biology, photosynthesis	Photosynthesis, plant transport, enzymes	Digestion, heart and lungs
Key concepts	Key concepts	Key concepts
Cell biology / Bioenergetics	Bioenergetics / Organisation	Organisation
Key themes	Key themes	Key themes
Cells / Photosynthesis / Respiration	Photosynthesis / Cells	Cells
Assessment: Seneca + ERA/Prac End of Topic Test AP 1 (term 1 content)	Assessment: Seneca + ERA/Prac End of Topic Test AP2 (term 1+2 content)	Assessment: Seneca + ERA/Prac End of Topic Test AP3 (term 1-3 content)

Key Stage 4

YEAR: 10

Term 1	Term 2	Term 3
Health and disease and homeostasis	Homeostasis and genetics	Genetics and evolution
Key concepts	Key concepts	Key concepts
Infection and response / Homeostasis	Homeostasis / Inheritance, variation and evolution	Inheritance, variation and evolution
Key themes	Key themes	Key themes
Cells / Cycles	Cycles / Cells / Genetics	Genetics / Evolution
Assessment: Seneca + ERA/Prac End of Topic Test AP 1 (term 1 content)	Assessment: Seneca + ERA/Prac End of Topic Test AP2 (term 1+2 content)	Assessment: Seneca + ERA/Prac End of Topic Test AP3 (term 1-3 content)

YEAR: 11

<table>
<tr><th colspan="4">Term 1</th><th colspan="3">Term 2</th><th>Term 3</th></tr>
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<tr><td colspan="4">Key concepts</td><td colspan="3">Key concepts</td><td>Key concepts</td></tr>
<tr><td colspan="2">Inheritance</td><td colspan="2">Ecology</td><td colspan="3">Ecology</td><td></td></tr>
<tr><td colspan="4">Key themes</td><td colspan="3">Key themes</td><td>Key themes</td></tr>
<tr><td>Genetics</td><td>Cycles</td><td>Populations and ecosystems</td><td>Interdependence</td><td>Cycles</td><td>Populations and ecosystems</td><td>Interdependence</td><td></td></tr>
<tr><td colspan="4">Assessment:
Seneca + ERA/Prac
End of Topic Test
AP 1 (term 1 content)</td><td colspan="3">Assessment:
Seneca + ERA/Prac
End of Topic Test
AP2 (term 1+2 content)</td><td>Assessment:
EXAMS</td></tr>
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Key Stage 5

YEAR: 12

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Biological molecules Cells and microscopy Enzymes Cell cycle and mitosis	Cell transport DNA/RNA Water and inorganic ions Digestion and absorption Immunity Protein synthesis	Gas exchange Genetic diversity and natural selection	Mass transport in animals Species and taxonomy Biodiversity	Mass transport in plants Populations and ecosystems PPEs.	Succession Sampling techniques Statistical tests FIELD TRIP Ecosystems and nutrient cycles Farming practices
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	Key Themes
Assessment Method: CPAC + End of topic test	Assessment Method: CPAC + End of topic test	Assessment Method: CPAC + End of topic test	Assessment: CPAC + End of topic test	Assessment Method: CPAC + End of topic test	Assessment Method: CPAC + End of topic test Exam (year 1 content)

YEAR: 13

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Photosynthesis Stimuli and response Nervous coordination Respiration	Respiration (continued) Muscle structure and contraction Homeostasis Inheritance and genetics	Control of gene expression Regulation of transcription and translation Populations – Hardy Weinberg PPEs	Regulation of transcription and translation (continued) DNA technology	DNA technology (continued) Revision and required practical catch ups.	[redacted]
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	
Assessment Method: CPAC + End of topic test	Assessment Method: CPAC + End of topic test PPE 1 (paper 1 content)	Assessment Method: CPAC + End of topic test	Assessment: CPAC + End of topic test PPE 2 (paper 2 and 3 content)	Assessment Method: External EXAMS	