Department: Science
Subject: Physics
Programme 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

Energy	Electricity	Particle model of matter	Atomic structure	Forces	Waves	Magnetism and electromagnetism	Space physics
The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century.	Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors, semiconductors and insulators makes it possible to design components and build electric circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind.	The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft.	Ionising radiation is hazardous but can be very useful. Radioactivity was discovered over a century ago, but it took several decades to understand the structure of atoms, nuclear forces and stability. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.	Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.	Wave behaviour appears in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music halls requires an understanding of mechanical waves. Modern technologies such qas imaging and communication systems show how we can make the most of electromagnetic waves.	Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this	In the past century, astronomers and astrophysicists have made remarkable progress in understanding the scale and structure of the universe, its evolution and ours. New questions have emerged recently. 'Dark matter', which bends light and holds galaxies together but does not emit electromagnetic radiation, is everywhere – what is it? And what is causing the universe to expand ever faster?

Key Themes

Models	Cause and Effect	Non-contact forces	Difference	Proportionality	Mathematical models (equations)
The use of models, as in the particle model of matter or the wave models of light and of sound	The concept of cause and effect in explaining such links as those between force and acceleration, or between changes in atomic nuclei and radioactive emissions	The phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic and gravitational effects	That differences, for example between pressures or temperatures or electrical potentials, are the drivers of change	That proportionality, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science	That physical laws and models are expressed in mathematical form.

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
Forces; Space physics	Electricity		Energy	Waves	
Key Themes	Key themes	Key Themes	Key Themes		
Cause and effect; Maths models	Difference; Maths models		Cause + effect; Proprtionality; Maths models	Models; Maths models	
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 year test

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
Forces	Magnetism + electromagnetism		Energy	Waves	
Key Themes	Key Themes	Key Themes	Key Themes	Key themes	Key Themes
Cause and effect; Maths models	Models; Maths models; Non-contact forces		Cause + effect; Proprtionality; Maths models	Models; Maths models	
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 year test (GL)

YEAR: 9

Term 1+2	Term 3+4	Term 5+6
Energy Big Question: How do we use energy to power the world we live in?	Electricity Big Question: How does electricity flow in a circuit with varying levels of resistance?	Particle Model of Matter Big Question: How does the particle model explain everyday phenomena and behaviour in the states of matter?
Key Concepts	Key Concepts	Key Concepts
Energy	Energy / Electricity	Particle Model / Energy
Key Themes	Key Themes	Key Themes
Cause & Effect / Maths Models / Proportionality	Difference / Maths models	Maths Models / Models
Assessment: Seneca + ERA/Prac + End of Topic Test	Assessment: Seneca + ERA/Prac + End of Topic Test	Assessment: Seneca + ERA/Prac + End of Topic Test

Key Stage 4

YEAR: 10

Term 1+2	Term 3+4	Term 5+6
Energy & Particle Model of Matter Big Question: How does energy and the particle model of matter relate? How do we use energy to power the world we live in? & How does electricity flow in a circuit with varying levels of resistance?	Atomic Structure Big Question: How has the model of the atom structure evolved over time to provide us with a clear and accurate picture today**?**	Forces & Motion How are forces applied in everyday life and how do we investigate the relationship between forces using mathematical concepts?
Key Concepts	Key Concepts	Key Concepts
Particle model / Energy / Electricity	Atomic Structure	Forces
Key Themes	Key Themes	Key Themes
models / Maths models / Difference	models / Cause and effect	Cause & effect / Maths models / proportionality
Assessment: Seneca + ERA/Prac + End of Topic Test	Assessment: Seneca + ERA/Prac + End of Topic Test	Assessment: Seneca + ERA/Prac + End of Topic Test

YEAR: 11

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Forces & Motion Big Question: How do we investigate the relationship between forces, using mathematical concepts?	Waves Big Question: How are waves applied to a variety of scenarios to enable us to carry out everyday tasks?	Magnetism & Space Big Question: How do we investigate magnetism using mathematical concepts? Big Question: How did the world come to look like it does today?	Revision	Revision & EXAMS	
Key Concepts	Key Concepts	Key Concepts	Key Concepts		
Forces	Waves	Magnetism / Space			
Key Themes	Key Themes	Key Themes	Key Themes		
Cause & effect / Maths models / Maths models	Cause and effect / Non contact forces	Maths Models / Models / Non-contact Forces			
Assessment: Seneca + ERA/Prac + End of Topic Test	Assessment: Seneca + ERA/Prac + End of Topic Test PPE 1	Assessment: Seneca + ERA/Prac + End of Topic Test	Assessment: Seneca + ERA/Prac + Exams PPE 2		

Key Stage 5

YEAR: 12

Teacher 1

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Measurements & Errors (Including GCSE to A-Level Transition) Big Question: How does Science Work?	Mechanics Big Question: How can we use mathematical concepts to explain motion and forces?	Mechanics & Materials Big Question: How can we use mathematical concepts to explain motion and forces? How can we use mathematical concepts to explain the behaviour of materials?	Waves Big Question: How does the behaviour of waves help create the world which we experience?	Waves & REVISION Big Questions: How does the behaviour of waves help create the world which we experience?	Further Mechanics Big Question: How do various mechanical concepts enable advancements in our world?
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: End of topic test	Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment: End of topic test	Assessment Method: EXAM	Assessment Method: End of topic test

Teacher 2

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Measurements & Errors (Including GCSE to A-Level Transition) Big Question: How does Science Work?	Electricity How is current flow affected by resistivity, potential difference dividers and the electromotive force?	Electricity How is current flow affected by resistivity, potential difference dividers and the electromotive force?	Particles & Radiation (Including GCSE to A-Level Transition) Big Question: What are the fundamental particles, and the forces that form atoms and lead to observable phenomena?	Particles & Radiation & Revision Big Question: What are the fundamental particles, and the forces that form atoms and lead to observable phenomena?	Revision Big Question: Revision Particles & Radiation Big Question: What are the fundamental particles, and the forces that form atoms and lead to observable phenomena?
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: End of topic test	Assessment Method: End of topic test	Assessment Method: End of topic test	Assessment: End of topic test	Assessment Method: EXAM	Assessment Method: End of topic test

YEAR: 13

Teacher 1

Term 1	Term 2	Term 2	Term 3	Term 4	Term 5	Term 6
Further mechanics Big Question: How do various mechanical concepts enable advancements in our world?	Gravitational and Electric Fields Big Question: How do fields impact modern society?	Gravitational and Electric Fields Big Question: How do fields impact modern society?	Capacitors and Magnetic fields Big Question: How do magnetic fields and devices impact life?	Nuclear Physics Big Question: What is the physics that underpins nuclear energy production and what is the potential impact on society?	Revision	
Key Concepts		Key Concepts		Key Concepts		
Key Themes		Key Themes		Key Themes		
Assessment Method: End of topic test		Assessment Method: PPE EXAMs		Assessment: End of topic test	Assessment Method: EXAMs	

Teacher 2

Term 1	Term 2	Term 2	Term 3	Term 4	Term 5	Term 6
Thermal Physics Big Question: How do the properties of materials affect their uses? What are the gas laws?	Engineering (optional module) How does engineering impact our everyday lives?	Engineering (optional module) How does engineering impact our everyday lives?	Engineering (optional module) How does engineering impact our everyday lives?	Nuclear Physics Big Question: What is the physics that underpins nuclear energy production and what is the potential impact on society?	Revision	
Key Concepts		Key Concepts		Key Concepts	Key Concepts	
Key Themes		Key Themes		Key Themes	Key Themes	
Assessment Method: End of topic test		Assessment Method: PPE EXAMs		Assessment: End of topic test	Assessment Method: EXAMs	