



# Department: Science

## Subject: Chemistry

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

Atomic structure and the periodic table	Bonding, structure, and the properties of matter	Quantitative chemistry	Chemical changes	Energy changes	The rate and extent of chemical change	Organic chemistry	Chemical analysis	Chemistry of the atmosphere	Using resources
The periodic table provides a structured organisation of the known chemical elements. The arrangement can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.	Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties.	Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Analysts can then use quantitative methods to determine the purity of chemical samples and to monitor the yield from chemical reactions.	Understanding of chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms.	Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds.	Chemical reactions can occur at vastly different rates. There are many variables that can be manipulated in order to speed them up or slow them down. Understanding energy changes that accompany chemical reactions is important in industry to determine the effect of different variables on reaction rate and yield.	The main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are used in the petrochemical industry. Chemists take organic molecules and modify them in many ways to make new and useful materials.	Analysts have developed qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate.	The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change.	Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products.

## Key Themes

Atoms	Elements	Periodic table	Bonding	Structure	Rates of Reaction	Energy changes
Matter is composed of tiny particles called atoms and there are about 100 different naturally occurring types of atoms called elements	Elements show periodic relationships in their chemical and physical properties	Periodic properties can be explained in terms of the atomic structure of the elements	Atoms bond by either transferring electrons from one atom to another or by sharing electrons	The shapes of molecules (groups of atoms bonded together) and the way giant structures are arranged is of great importance in terms of the way they behave	There are barriers to reaction so reactions occur at different rates	Energy is conserved in chemical reactions so can therefore be neither created or destroyed.

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## Key Stage 3

### YEAR: 7

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6	
<b>Topics:</b> 1.FORCES Speed and gravity  2.MATTER Particle model and separating mixtures	<b>Topics:</b> 1.ELECTROMAGNETS (start) Circuits – voltage and current  2.ORGANISMS Movement and cells	<b>Topics:</b> 1.ELECTROMAGNETS (cont.) Circuits – voltage and current  <b>2.REACTIONS</b> Metal reactions and acids/alkalis	<b>Topics:</b> 1.ENERGY (start) Costs and transfers  2.ECOSYSTEMS Interdependence and plant reproduction	<b>Topics:</b> 1.ENERGY (cont.) Costs and transfers  <b>2.EARTH Structure</b> and Universe	<b>Topics:</b> 1.WAVES Sound and Light  2.GENES Variation and human reproduction	
Key Concepts		Key Concepts		Key Concepts		
		Chemical changes		Chemistry of the atmosphere		
Key Themes		Key Themes		Key Themes		
		Atoms	Elements	Periodic Table	Elements	Structure
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 7 GL assessment				

### YEAR: 8

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
<b>Topics:</b> 1.FORCES Contact forces and pressure  <b>2. MATTER</b> Periodic table and elements	<b>Topics:</b> 1.ELECTROMAGNETS Magnetism and electromagnetism  2.ORGANISMS Breathing and digestion	<b>Topics:</b> <b>1.REACTIONS (term 3+4)</b> Chemical energy and types of reactions  2.ECOSYSTEMS (term 3+4) Respiration + photosynthesis	<b>Topics:</b> 1.ENERGY (start) Work, and heating and cooling	<b>Topics:</b> 1.ENERGY (cont.) Work, and heating and cooling  <b>2.EARTH</b> Climate and Earth resources	<b>Topics:</b> 1.GENES Evolution and inheritance  2.WAVES Effects and properties
Key Concepts		Key Concepts		Key Concepts	
Atomic structure and the periodic table	Bonding, structure	Chemical changes	Energy changes	Bonding	Chemistry of the atmosphere
Key Themes		Key Themes		Key Themes	
Atoms	Elements	Periodic table	Atoms	Elements	Periodic table
		Atoms		Elements	
		Elements		Structure	
		Periodic table			

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
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## YEAR: 9

Term 1				Term 2			Term 3			Term 4			Term 5			Term 6		
Atoms and the Periodic Table and Chemical changes – pH scale and reaction of acids				Quantitative chemistry and Chemistry of the Atmosphere			Bonding structure and the properties of matter & Rate and extent of chemical change											
Key Concepts				Key Concepts			Key Concepts											
Atomic structure and the periodic table		Chemical changes		Chemical analysis		Quantitative chemistry		Chemistry of the atmosphere		Bonding structure and properties of matter		Energy changes		Rate and extent of chemical change				
Key Themes				Key Themes			Key Themes			Key Themes								
Atoms	Elements	Periodic table		Structure		Atoms	Elements		Structure		Bonding		Rates of reaction		Energy changes			
Assessment: Seneca + ERA/Prac End of Topic Test AP 1 (term 1+2 content)				Assessment: Seneca + ERA/Prac End of Topic Test AP 2 (term 1-4 content)			Assessment: Seneca + ERA/Prac End of Topic Test AP 1 (term 1-6 content)											

## Key Stage 4

### YEAR: 10

Term 1			Term 2			Term 3			Term 4			Term 5			Term 6			
Bonding and Chemical changes – Electrolysis			Properties of materials and Chemical analysis			Acids and Alkalis and Energy changes			Quantitative chemistry			The rate and extent of chemical change			Organic Chemistry and Chemistry of the atmosphere			
Key Concepts			Key Concepts			Key Concepts			Key Concepts			Key Concepts			Key Concepts			
Chemical changes	Bonding structure	Atomic structure	Chemical changes	Bonding structure	Chemical analysis	Energy changes			Quantitative Chemistry			Rate and extent of chemical reaction			Organic Chemistry	Chemistry of the atmosphere		
Key Themes			Key Themes			Key Themes			Key Themes			Key Themes			Key Themes			
Bonding	Elements		Elements	Bonding	Structure		Elements	Energy		Bonding	Elements	Atoms	Rates of reaction	Atoms		Atoms	Structure	Elements
Assessment: Seneca + ERA/Prac End of Topic Test			Assessment: Seneca + ERA/Prac End of Topic Test AP 1 (term 1+2 content)			Assessment: Seneca + ERA/Prac End of Topic Test			Assessment: Seneca + ERA/Prac End of Topic Test AP2 (term 1-4 content)			Assessment: Seneca + ERA/Prac End of Topic Test			Assessment: Seneca + ERA/Prac End of Topic Test AP3 (term 1-6 content)			

**YEAR: 11**

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
Rate and extent of chemical change	Organic Chemistry and Chemistry of the atmosphere	Using resources and Chemical analysis – identification of ions	REVISION	REVISION	
Key Concepts	Key Concepts	Key Concepts	Key Concepts	Key Concepts	
Rate of reaction	Organic Chemistry	Chemistry of the atmosphere	Chemical analysis	Using resources	
Key Themes	Key Themes	Key Themes	Key Themes	Key Themes	
Rates of reaction	Bonding	Structure	Bonding	Structure	Atoms
Assessment: Seneca + ERA/Prac End of Topic Test	Assessment: Seneca + ERA/Prac End of Topic Test PPE 1 (paper 1 content)	Assessment: Seneca + ERA/Prac End of Topic Test	Assessment: Seneca + ERA/Prac + Exams PPE 2 (paper 2 content) External EXAMS Assessment Method:		

# Key Stage 5

## YEAR: 12

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6												
Bonding, Atomic Structure and Amount of Substance	Amount of substance, Kinetics and Organic Chemistry (Alkanes)	Chemical Equilibria and Organic Chemistry (Halogenoalkanes)	Energetics and Organic Chemistry (Alcohols)	Periodicity and Organic Analysis	Oxidation, reduction (redox) equations and Organic Chemistry (carboxylic acids and derivatives)												
<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>												
Atomic structure and the periodic table	Bonding structure and properties of matter	Quantitative Chemistry	Quantitative Chemistry	Organic Chemistry	Rate and extent of chemical reaction	Quantitative Chemistry	Organic Chemistry	Rate and extent of chemical reaction	Quantitative Chemistry	Energy changes	Organic Chemistry	Atomic structure and the periodic table	Chemical changes	Chemical analysis	Atomic structure and the periodic table	Chemical changes	Organic Chemistry
<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>												
Assessment Method: Exam End of topic Test+ Exam Questions (Exampro) + Prac+ Exam+ EOTT	Assessment Method: End of topic Test+ Exam Questions (Exampro) + RP1+RP3+EOTT	Assessment Method: End of topic Test+ Exam Questions (Exampro) +Prac+ EOTT	Assessment Method: End of topic Test+ Exam Questions (Exampro) + RP2+RP5+EOTT	Assessment Method: End of topic Test+ Exam Questions (Exampro) + RP4+RP6+ Exam	Assessment Method: End of topic Test+ Exam Questions (Exampro) + RP8+EOTT												

## YEAR: 13

Term 1	Term 2	Term 3	Term 4	Term 5	Term 6								
Rate Equation and Optical Isomerism and Organic Chemistry (Aldehydes and Ketones; Carboxylic acids and derivatives)	Thermodynamics and Organic Chemistry (Amines and Polymers) and Aromatic Chemistry	Transition Metals and Amino Acids, Proteins and DNA	Acids and Bases and Organic Synthesis (Chromatography) and NMR Spectroscopy	<b>Revision</b>									
<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>	<b>Key Concepts</b>									
Bonding structure and properties of matter	Quantitative Chemistry	Rate and extent of chemical reaction	Quantitative Chemistry	Energy changes	Organic Chemistry	Atomic structure and the periodic table	Chemical analysis	Using resources	Bonding structure and properties of matter	Chemical analysis			
<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>	<b>Key Themes</b>								
Assessment Method: End of topic Test+ Exam Questions (Exampro) + RP7+RP10+EOTT	Assessment Method: End of topic Test+ Exam Questions (Exampro) Prac (making nylon)+ EOTT	Assessment Method:	Assessment Method: End of topic Test+ Exam Questions (Exampro) + RP9 +RP12+EOTT	Assessment Method:									

		End of topic Test+ Exam Questions (Exampro) + RP11+ Mock Exam			
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