



# Science Curriculum

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*The most exciting phrase to hear in science, the one that heralds new discoveries, is not 'Eureka!' but 'That's funny...'*      **Isaac Asimov**

## Overview

The Science team at St Wilfrid's use an enquiry based approach to the subject that, in addition to fuelling a passion to understanding scientific phenomena, encourages students to think for themselves, to ask questions, to form their own conclusions and evaluate evidence presented to them.

## Key Stage 3

Our theme based Science course aims to provide the foundations for understanding the world through the disciplines of Biology, Chemistry and Physics. Students are taught the essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, students are encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They are encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. The themes are:

Year 7: Being a Scientist, Pyrotechnics, Science and Sport, By the Seaside.

Year 8: Space Traveller, Elementary my Dear, Feed the World, Out of this World, Staying Alive.

Year 9: Modern Living, The Reactivity League.

## Key Stage 4

GCSE Science, Core and Additional, are taught mainly in Years 10 and 11 respectively. We follow the AQA specification. This has three taught units per GCSE that cover different topics from Biology, Chemistry and Physics. Students also complete a controlled practical assessment called an ISA (In School Assessment).

- **Year 10 - Core Science GCSE**

Students achieve a GCSE in Core Science. The course is assessed by examinations (worth 75% of the GCSE) and an ISA (controlled assessment) worth 25% of each GCSE. Students will either sit Higher tier (A\*-D grades) or Foundation Tier (C to G grades) examinations.

- **Year 11 – Additional Science GCSE**

Most students will go on from Core Science to achieve a GCSE in Additional Science which is assessed by the same means as Core Science. Students that achieve Core and Additional will have 2 separate GCSE's.

- **Year 11 – Further Additional Science GCSE:** Students that attain an A or A\* grade in Core Science will have the option to pursue Further Additional Science by studying extra units in Biology, Chemistry and Physics. Students that achieve Core, Additional and Further Additional will have 3 separate GCSE's – triple Science.

- **Year 11 – Vocational Course:** At present we are exploring appropriate vocational courses for some students in Year 11.



## Key Stage 5

### Biology

#### AS

**BIOL 1:** This unit studies how digestive and gas exchange systems can be affected by communicable and non-communicable diseases. It also looks at how knowledge of basic biology allows us to understand the symptoms of disease and interpret data relating to risk factors.

The unit is examined by a 1 hour 15 minute written exam consisting of five - seven short answer questions plus two longer questions (a short comprehension and a short structure essay).

**BIOL 2:** This unit looks at the influence of genetic and environmental factors on intraspecific variation, as well as how the variety of life is reflected in similarities and differences in its biochemical basis and cellular organisation. It also studies how size and metabolic rate affect an organism's requirements and give rise to adaptations.

The unit is examined by a 1 hour 45 minute exam comprising of five - seven short answer questions plus two longer questions (one will emphasise data handling and include a section requiring continuous prose. The other will assess *How Science Works*).

**BIOL 3:** This unit is worth 20% of the total AS marks and involves an externally marked practical assignment (EMPA) consisting of two tasks and a written test.

#### A2

**BIOL 4:** This unit looks at how living organisms form ecosystems, as well as how human activity affects ecological balance. It also looks at how genetic variation and isolation may lead to the formation of new species.

The unit is examined by a 1 hour 30 minute exam consisting of six - nine short answer questions plus two longer questions (a short comprehension and a short structured essay).

**BIOL 5:** This unit looks at the importance of the nervous system in survival of organisms, as well as the role of homeostasis and the maintenance of a constant internal environment. It also looks at genes and genetic expression.

It is examined by a 2 hour 15 minute exam comprising of eight - ten short answer questions plus two longer questions (a data-handling question and a synoptic essay - choice of one out of two).

**BIOL 6:** This unit is worth 10% of the total A Level marks and involves an externally marked practical assignment (EMPA) consisting of two tasks and a written test.

**Subject Leader:** Miss S Boreham



## CHEMISTRY

The AQA AS and A-Level Chemistry specifications are followed at St. Wilfrid's Catholic School. These two qualifications exist separately as of September 2015. Both of these qualifications are now linear. Linear means that students will sit all the AS exams at the end of their AS course and all the A-level exams at the end of their A-level course. The AS course will be taught alongside the A-level course giving students an opportunity to decide whether they wish to pursue chemistry as a one year qualification, which is known as AS chemistry (7404), or the two year qualification, known as A-level chemistry(7405).

### AS

The AS (Advanced Subsidiary) Chemistry qualification represents a standalone qualification in chemistry starting in September 2015 and lasting one academic year. The qualification is assessed as follows:

- 2 Papers to be written in June 2016
- Each paper accounts for 50% of the final grade
- The papers last 1 hour 30 minutes
- Each paper is scored out of 80 marks (65 marks for short and long answer questions and 15 marks for multiple choice questions).

What is assessed in Paper 1?	What is assessed in Paper 2?
Relevant physical chemistry topics (sections 3.1.1 to 3.1.4, 3.1.6 and 3.1.7)	Relevant physical chemistry topics (sections 3.1.2 to 3.1.6)
Inorganic chemistry (section 3.2)	Organic chemistry (section 3.3)
Relevant practical skills	Relevant practical skills

### A Level

The A Level Chemistry qualification represents a standalone qualification in chemistry starting in September 2015 and lasting two academic years. The qualification is assessed as follows:

- 3 Papers to be written in June 2017
- Papers 1 and 2 count 35% towards the final grade and paper 3 is worth 30% of the final grade
- All 3 papers are 2 hours long
- Papers 1 and 2 are scored out of 105 marks (short and long answer questions) while paper 3 is scored out of 90 marks (40 marks of questions on practical techniques and data analysis, 20 marks of questions testing across the specification and 30 marks of multiple choice questions)

What is assessed in Paper 1?	What is assessed in Paper 2?	What is assessed in Paper 3?
Relevant physical chemistry topics (sections 3.1.1 to 3.1.4, 3.1.6 to 3.1.8 and 3.1.10 to 3.1.12)	Relevant physical chemistry topics (sections 3.1.2 to 3.1.6 and 3.1.9)	Any content
Inorganic chemistry (section 3.2)	Organic chemistry (section 3.3)	Any practical skills
Relevant practical skills	Relevant practical skills	



## Entry Requirements

Grade B or above in BOTH Core Science and Additional Science or GCSE Chemistry AND at least a B grade in GCSE Maths and GCSE English Language

## Subject Content

3.1 Physical Chemistry	3.2 Inorganic Chemistry	3.3 Organic Chemistry
3.1.1 Atomic structure 3.1.2 Amount of substance 3.1.3 Bonding 3.1.4 Energetics 3.1.5 Kinetics 3.1.6 Chemical equilibria and Le Chatelier's principle 3.1.7 Oxidation, reduction and redox equations 3.1.8 Thermodynamics (A-level only) 3.1.9 Rate equations (A-level only) 3.1.10 Equilibrium constant $K_c$ for homogeneous systems (A-level only) 3.1.11 Electrode potentials and electrochemical cells (A-level only) 3.1.12 Acids and bases (A-level only)	<ul style="list-style-type: none"><li>• 3.2.1 Periodicity</li><li>• 3.2.2 Group 2, the alkaline earth metals</li><li>• 3.2.3 Group 7(17), the halogens</li><li>• 3.2.4 Properties of Period 3 elements and their oxides (A-level only)</li><li>• 3.2.5 Transition metals (A-level only)</li><li>• 3.2.6 Reactions of ions in aqueous solution (A-level only)</li></ul>	3.3.1 Introduction to organic chemistry 3.3.2 Alkanes 3.3.3 Halogenoalkanes 3.3.4 Alkenes 3.3.5 Alcohols 3.3.6 Organic analysis 3.3.7 Optical isomerism (A-level only) 3.3.8 Aldehydes and ketones (A-level only) 3.3.9 Carboxylic acids and derivatives (A-level only) 3.3.10 Aromatic chemistry (A-level only) 3.3.11 Amines (A-level only) 3.3.12 Polymers (A-level only) 3.3.13 Amino acids, proteins and DNA (A-level only) 3.3.14 Organic synthesis (A-level only) 3.3.15 Nuclear magnetic resonance spectroscopy (A-level only) 3.3.16 Chromatography (A-level only)

## Aims

A course of study based on this syllabus should:

- Provide an appreciation and understanding of the nature and importance of chemical theories and principles;
- Develop a scientific approach to the solving of problems within the context of planning and conduct of investigations;
- Develop the skills to work safely with apparatus and chemicals in the laboratory;
- Provide an appreciation of the contributions which chemists make to society through their work;
- Encourage an understanding of the technological applications of chemistry and their social, economic and industrial implications

**Subject Leader:**

**Mr T Baglole**



## PHYSICS

### Overview

We follow the OCR Physics A specification, with the units covered offering students a chance to gain a solid scientific and mathematical background which they will find useful for future employment or further study in any of the natural sciences at a higher level. Students will study the full 2-year A level course, however will be entered for the AS level exam after the first year as an opportunity to measure their progress.

### AS

All students studying Physics at A level will be expected to sit the AS exams, which cover content from the first year of teaching. There are two exams:

**Breadth in Physics (Paper 1):** Two sections (multiple choice and structured questions) covering content from modules 1, 2, 3 and 4. It has a weighting of 50%

**Depth in Physics (Paper 2):** Structured questions covering content from modules 1, 2, 3 and 4. It has a weighting of 50%

### A Level

The A level consists of 6 modules of work which are assessed over 3 papers at the end of the 2 years of study. Practical knowledge is assessed within these 3 papers, and is also reported separately as a pass/fail accreditation (bearing no weight on the final A level grade).

<b>Module 1: Development of practical skills in physics</b> Developing planning, implementing, analysis and evaluating skills within an experimental context.	<b>Module 3: Forces and motion</b> How things move: what can we use to describe motion, force, energy and momentum?	<b>Module 5: Newtonian world and astrophysics (A Level only)</b> What do we know about gravity and space? Circular motion and oscillations. Thermal physics.
<b>Module 2: Foundations of physics</b> The "basics": physical quantities and units, measurements, scalars and vectors.	<b>Module 4: Electrons, waves and photons</b> Electrons in circuits, how is energy transferred? Waves. The weird world of quantum physics.	<b>Module 6: Particles and medical physics (A Level only)</b> Subatomic particles, electric and magnetic fields, capacitors and applications of medical physics.

**Modelling physics (Paper 1):** Two sections (multiple choice and structured questions) covering modules 1, 2, 3 and 5. It has a weighting of 37%

**Exploring Physics (Paper 2):** Two sections (multiple choice and structured questions) covering 1, 2, 4 and 6. It has a weighting of 37%

**Unified Physics (Paper 3):** A synoptic paper consisting of structured questions on all 6 modules of study. It has a weighting of 26%

**Subject Leader:** Mr D Donaldson

**Department Website:** <http://science.stwilfrids.com/>