Science

Curriculum Philosophy

Our philosophy is to **ignite the curiosity** of the upcoming generation of scientists, **empowering** them to **shape the world** through **profound scientific exploration.** We are dedicated to **nurturing students' innate inquisitiveness** about their surroundings by providing a **comprehensive** and **meticulous curriculum**. This curriculum **extends beyond exam specifications**, delving into a **diverse range** of **concepts** and **transcending exam-focused preparation.**

Our **tailored** and **thorough** curriculum not only covers **essential exam material** but also encompasses **pivotal** and **groundbreaking scientific revelations, processes,** and **modes of thinking.** This approach equips students to **fortify** their **expanding scientific knowledge** and **cultivates** their **critical thinking skills** by exposing them to **current scientific issues** impacting our planet.

As students progress, they will gain **confidence** and **resilience**, rooted in a solid understanding of **core scientific concepts** seamlessly integrated throughout the curriculum. Within our Science department, each lesson is a **platform for high-quality teaching and learning**, presenting **challenging scientific concepts** under the belief that **every student** has the potential to **succeed**.

To ensure **equal access** to the curriculum and foster scientific understanding, we **dismantle complex processes, scaffold** and **model** to ensure all pupils have an equal access to the curriculum and to **progress** their **scientific understanding.** Our curriculum emphasises a **systematic exploration** of the world through **observation** and **experimentation**, encouraging students to **inquire and question**. Through this journey, students will not only develop scientific skills but also **acquire essential life skills** such as **mathematics**, **independent inquiry**, and **problem solving**, crucial for success both in **scientific discovery** and **society**.

In order to achieve a true understanding of science, topics have been intelligently sequenced based on the following rationale:

- Scientific knowledge is **broadly hierarchical** in nature – students must have a secure understanding of each key block of knowledge before progressing onto the next stage. Therefore, in order to support this, **topics** have been **meticulously planned** and **sequenced** to ensure that students are always **building on** and **deepening** their **previous learning.**

- Core concepts and essential scientific skills are **interleaved** throughout the curriculum to ensure pupils are able to **apply** their **understanding** to **unfamiliar concepts** and to **synoptically link** through the different sciences and units within a discipline.

- Regular **interleaving** and **retrieval practice** through DO NOW tasks allow teachers to **address misconceptions immediately** and **adapt** their **teaching** accordingly. We conduct **ongoing regular assessment**; with end of unit tests that allow teachers to further identify misconceptions. In the lesson following, teachers and pupils are able to **reflect** on **potential gaps in knowledge** and **work responsively** to **develop** and **deepen understanding** of **scientific content.**

- **Regular** and **systematic exam decoding** and **practice** is evident in every lesson. Pupils are **explicitly** and **methodically** taught how to answer each type of exam question which **strengthens literacy skills** and builds pupil's **confidence**. This is complemented by **consistent live marking** of pupil work to ensure **misconceptions** are **identified and addressed immediately.**

The science curriculum will address social disadvantage by addressing gaps in students' knowledge and skills:

- The nature of the science curriculum is designed with the **most vulnerable studen**t in mind, assuming a basic scientific understanding from previous learning. We use allocated **'Closing the Gap'** time to ensure **fluency** by closing any **knowledge gaps** evidenced in assessment, whilst also providing suitable **extension**.
- **Disadvantaged students** are supported to **succeed** in **science** through **prioritised intervention**.
- Pupils with **special educational needs or disabilities** have **additional support**. **Over-timetabling** and **double staffing** are used to target this cohort and to help close any gaps.
- **All students** access the **same curriculum**, we have the **highest expectations** of all.

We fully believe science can contribute to the personal development of students at St George's:

- The **social development** of our students is **nurtured** through the **explicit teaching** and practice of **effective teamwork** and **communication skills** when working in groups for scientific investigations. Groups are selected by the teacher to ensure that students learn to **effectively collaborate** with others from different backgrounds or from outside of their friendship circle.
- Science naturally provides many opportunities for **balanced discussions of moral** and **ethical issues**. For example, we explore the **moral complexities** of **organ transplants**, the **controversial use** of **genetic engineering** and the disputed use of **stem cells** for disease treatment. Students are given time to discuss these issues both in pairs and as a class to allow students to develop **spiritually**. When teaching topics such as the **theory of evolution** and the **Big Bang theory**, this provides a chance to develop students' **cultural awareness** as we can **discuss viewpoints** of these theories from different religions and cultures. We also discuss **historical sexism** in scientific developments – for example, the famous case of **Rosalind Franklin's discovery** of the **structure of DNA**.
- Science lessons also provide a wealth of opportunities to **explore personal development** relating to **physical** and **mental health**. For example, students study the effects of smoking, drugs and alcohol from both a **scientific** and **social perspective**. When teaching about the digestive system, students are taught about the importance of a balanced diet and how to interpret nutritional information.
- We want students to become **respectful and responsible** citizens who **contribute positively** to **society**. For example, students are taught in detail about global warming, pollution and energy resources, so that they understand the importance of recycling, reducing waste and cutting down their carbon footprint.
- Our science curriculum also contributes towards the **whole academy anti-racism agenda**. We ensure that we teach about **prominent scientific figures** that are **representative** of all **cultures** and **ethnicities**.

At KS3 and KS4, our belief is that homework should be an interleaved revision of powerful knowledge that has been modelled and taught in lessons. This knowledge is recalled and applied through a range of low-stakes quizzing and practice.

Opportunities are built in to make links to the world of work to enhance the careers, advice and guidance that students are exposed to:

- Throughout the curriculum, pupils will encounter a **wide range** of both **scientific** and **current vocations**.

- Each topic taught has a **'careers spotlight'**, where pupils will explore a **profession** linked to that particular unit of work.

A true love of science involves learning about various cultural domains. We teach beyond the specification requirements, but do ensure students are well prepared to be successful in GCSE examinations: opportunities to explore the history and philosophy of science are embedded into the curriculum. For example:

- Pupils **investigate** the work of key scientists mainly taking the form of reading **rich texts** about an array of topics, such as: the history of space exploration, Semmelweis' work on Germ Theory and how new chemical elements get their names. Whilst not examined, they are included for **engagemen**t and to build **cultural capital**.

- Although pupils' **practical skills** are no longer examined through coursework, we believe it is **absolutely essential** that all pupils can **plan** and **carry out** practical experiments using **laboratory equipment safely** and **accurately** so that they are **fully prepared** for **future study** and **employmen**t.

Curriculum Sequencing

All children are entitled to a curriculum and to the **powerful knowledge** that will open doors and **maximise their life chances**. Below is a high-level overview of the critical knowledge children will learn in this particular subject, at each key stage from Year 7 through to Year 11, in order to equip students with the **cultural capital** they need to succeed in life. The curriculum is planned vertically and horizontally giving thought to the **optimum knowledge sequence for building secure schema**.

		Sequencing
Year 7	**Term 1**	***Working Scientifically Skills*** **Chemistry –**Atoms & The Periodic Table **Biology –** Cells & Microscopes **Physics –** Energy Stores
	Term 2	**Physics –** Light & Sound **Biology –** Interdependence/Tissues & Organs
	Term 3	**Physics –** Forces **Biology –** Reproduction **Chemistry –** The Rock Cycle **/** Separating Techniques
Year 8	**Term 1**	**Biology –** Photosynthesis & Respiration / Health & Disease **Chemistry –** Chemical Reactions / Climate Change **Physics –** Electricity / Space
	Term 2	**Chemistry –** Acids & Alkalis **Physics –** Speed & Pressure / Magnetism **Biology –** Variation & Inheritance
	Term 3	***Working Scientifically Skills*** **Chemistry –** Reaction of Metals **Biology –** Cycling Materials **Physics –** Elastic Objects & Turning Forces
Year 9	**Term 1**	**Biology -** Cells. **Chemistry -** Atomic Structure & The Periodic Table. **Physics -** Energy & Transfers.
	Term 2	**Biology –** Organization. **Chemistry –** Bonding. **Physics –** Electricity.
	Term 3	**Biology –** Infection & Response. **Chemistry –** Quantitative / Energy Changes. **Physics –** Particle Model / Atomic Structure.
Year 10	**Term 1**	**Chemistry –** Chemical Change **Physics –** Forces **Biology –** Bioenergetics / Inheritance
	Term 2	**Biology –** Ecology **Chemistry –** Energy Changes / Rates of Reaction / Organic / Analysis **C6-** Rates of Reaction
	Term 3	**Chemistry –** Atmosphere / Resources **Physics –** Magnetism **Biology –** Homeostasis
Year 11	**Term 1**	Delivery of triple content / Reteach & exam preparation.
	Term 2	Delivery of triple content / Reteach & exam preparation.
	Term 3	Delivery of triple content / Reteach & exam preparation.