Christ the King Catholic High School — Science/Physics Curriculum 2023 - 2024

Upper Key Stage 2

Science teaching in upper KS2 should enable students to develop a deeper understanding of a wider range of scientific ideas compared to lower KS2 and KS1.

They should do this by exploring and talking about their ideas; asking their own questions about scientific phenomena and selecting the best methods to answer these questions. At this point of study the students should encounter more abstract ideas and begin to recognise how this helps them understand and make predictions about the world around them. Students should draw conclusions based on data and observations and use evidence and knowledge to explain their findings.

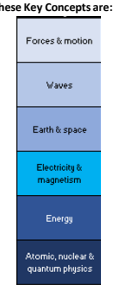
Students should read, spell and pronounce science vocabulary correctly.

Please see Mid/Long term plans for more detail.

Overall Rationale:

The curriculum in science has been designed around the best evidence of what works best to deliver the best learning experience for our students. The curriculum is sequenced such that it builds on knowledge and skills throughout KS3 and KS4 and has 5 key concepts that are the core of the learning of each discipline.

In Physics these Key Concepts are:



Working Scientifically (WS) Skills build up within this structure and in Year 7 include 2 WS units at the start and end of the year to help build and embed the procedural knowledge needed to access subsequent WS Skills.

For greater detail please see Science Curriculum Maps and Mid/Long Term Plans.

Year 7

Term 1

Forces

Key Concept: Forces & Motion

Core Concepts:
- Types of forces
- Effects of forces on shape and motion
- Effects of magnetic, gravitational, and electric fields

Rationale: *Forces are all around us and this topic enables understanding that without forces, nothing would be able to move or change shape. This unit builds upon pre-requisite knowledge gained at KS2. This unit allows access to the second unit of study; Motion and Pressure.*

Sound

Key Concept: Waves

Core Concepts:
- Types and features of waves
- How the ear works
- Uses of ultrasound

Rationale: *The ideas in this unit are key to understanding the next year 7 unit 'Light' along with the foundation of knowledge for the GCSE topic 'Waves'. Students will gain visual understanding of how waves move along with what happens to waves at a boundary.*

Term 2

Light

Key Concept: Waves

Core Concepts:
- Properties and behaviour of light
- How the eye and the camera work
- Combining colours, coloured filters and coloured objects

Rationale: *This unit continues to build on the knowledge learnt in the previous topic 'Sound' in order to gain the foundational knowledge for the GCSE topic 'Waves'.*

Term 3

Space

Key Concept: Earth & Space

Core Concepts:
- The Solar System and its formation
- Seasonal changes
- Phases of the Moon and eclipses

Rationale: *Space is a fascinating topic for many young scientists and this unit will allow students to gain an understanding of planets, seasons, moons and eclipses. This unit builds upon KS2 knowledge and directly links to the GCSE topic 'Earth and Space'.*

Year 8

Electricity & Magnetism

Key Concept: Electricity & Magnetism

Core Concepts:
- Static electricity
- Building circuits and taking measurements.
- Effects of magnetic fields and uses of electromagnets

Rationale: *This unit introduces many practical skills and safety hazards when building electrical circuits, which is vital as students' progress through KS3 and onto KS4. The knowledge gained in this unit links directly to the GCSE curriculum enabling students to access the Electricity unit in year 10 and the Electromagnetism unit in year 11.*

Energy

Key Concept: Energy

Core Concepts:
- Energy resources
- Energy stores and transfers.
- Work done, energy, and power.

Rationale: *Energy is not a tangible object or thing, which many students find difficult to understand. There is little coverage on this topic at KS2, therefore the ideas introduced in this unit are vital for foundational understanding which links directly to the KS4 unit 'Energy'.*

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Motion & Pressure

Key Concept: Forces & Motion

Core Concepts:
- Speed and distance–time graphs
- Pressure
- Turning forces

Rationale: *This unit builds upon some ideas learnt in the year 7 unit forces. Mathematical skills are used often in this unit which will build upon the working scientifically unit taught in year 7. These mathematical skills are linked to skills needed throughout the KS4 curriculum.*

Year 9

Forces

Key Concept: Forces & Motion

Core Concepts:
- Forces: types and interaction pairs
- Force diagrams
- Motion
- Stretching and Hooke's Law
- Forces at a distance
- Mass and weight
- Unbalanced forces

Rationale: *This topic applies concepts that students have covered In KS3 such as balanced and unbalanced forces and applies them to more challenging scenarios. This topic enables the foundational understanding for studying forces as part of the GCSE curriculum.*

Energy

Key Concept: Energy

Core Concepts:
- Energy conservation, transfer, and dissipation.

Rationale: *In this unit, students continue to build on prior learning of energy stores and the transfer of energy. This unit builds key links to the GCSE curriculum; unit 1 Energy and unit 3 Particle Model, due to its links with specific heat capacity and specific latent heat.*

Waves, Sound & Light:

Key Concept: Waves

Core Concepts:
- Wave properties
- Seeing light

Rationale: *In this unit, students will already be familiar with some waves such as Sound and Light. This topic introduces the rest of the EM spectrum and allows students to identify the risks associated with some waves. The topic also allows practise of maths skills which are vital in the GCSE unit 'Waves', such as calculating time period and distance to an object.*

Electricity & Magnetism

Key Concept: Electricity & Magnetism

Core Concepts:
- Forces at a distance.
- Static electricity and charge.
- Circuits and current.

Rationale: *This unit revisits some core concepts learnt in year 8 with more detail. The unit has fundamental GCSE links such as inducing potential difference and the generator.*

P1 Energy

Key Concept: Energy

Core Concepts:
- What are the connections between energy transfer and power?
- What is the connection between energy changes and temperature change?
- How can we monitor and control the transfer of energy?
- What is the environmental impact of different energy resources?

Rationale: *This unit is the first unit of the GCSE Physics course and builds on the foundation unit Energy. Understanding energy transfers is first in GCSE Physics curriculum because it is a fundamental concept in the study of physics and is referred to throughout other topics, such as describing energy transfers in the particle model etc.*

Year 10

P2 Electricity

Key Concept: Electricity & Magnetism

Core Concepts:
- What is static electricity?
- What are the key concepts in electricity?
- What are the characteristics of some electrical components?
- How can electricity be used safely in the home?

Rationale: *In unit 1, students will have come across Electricity when discussing different Energy stores. This unit builds upon this knowledge, along with knowledge gained from the year 8 unit Electricity and delves deeper into the subject of electrical components and electricity in the home.*

P3 Particle Model of Matter

Key Concept: Atomic, Nuclear & Quantum Physics

Core Concepts:
- What uses are made of the high specific heat capacity of water?
- What are the specific latent heat of vaporisation and the specific latent heat of fusion?
- What happens to the pressure of a gas when it is heated, keeping the volume constant?

Rationale: *Students have visited the particle model of matter in chemistry lessons from year 7(particles and their behaviour). This unit embeds this knowledge as well as building on other concepts visited in KS3 physics such as specific heat capacity.*

P4 Atomic Structure

Key Concept: Atomic, Nuclear & Quantum Physics

Core Concepts:
- Are all the atoms in an element exactly the same?
- Is it possible for atoms to change from one element to another?
- Can equations be used to represent nuclear reactions?

Rationale: *In unit 4 students revisit knowledge from Chemistry GCSE unit 1, such as models of the atom and Isotopes. This knowledge along with knowledge of chemical equations enables students to further understand radioactivity and representing nuclear equations.*

P5 Forces

Key Concept: Forces & Motion

Core Concepts:
- How can we describe motion?
- How can understanding forces make driving safer?
- What causes pressure in a fluid?
- How does the motion of a falling object change as it falls?

Rationale: *Unit 5 continues to build upon the knowledge learnt in the year 7 and 9 units of forces and applies these to real-life scenarios such as driving.*

Year 11

P6 Waves

Key Concept: Waves

Core Concepts:
- In what ways do other electromagnetic waves behave like light?
- What characteristics of waves can be measured?
- Are there any waves beyond the visible spectrum?
- How do waves allow us to detect structures we cannot see?

Rationale: *Previously, students have covered waves topics such as sound and light in the KS3 curriculum. This unit introduces the full electromagnetic spectrum as well as revisiting those topics previously covered. The unit also incorporates maths skills such as calculating speed of waves.*

P7 Magnetism & Electromagnetism

Key Concept: Electricity & Magnetism

Core Concepts:
- What is a motor and how does it work?
- How can a magnetic field be used to produce an electrical current?
- What is a transformer?
- Why is electricity transmitted at high potential differences?

Rationale: *In this unit, students revisit knowledge from the Electricity & Magnetism topic completed in year 8 and develop these ideas practically. Students will also use knowledge from the year 10 topic of electricity to help understand how electromagnets work.*

P8 Space

Key Concept: Earth & Space

Core Concepts:
- What can we learn about stars?
- What movements can we detect in space physics?
- What do our measurements tell us about the universe?
- What is the role of gravity in space physics?

Rationale: *In unit 8. students visit space for the first time since the year 7 unit. Students use this foundational knowledge to develop further understanding of stars and how the universe was created.*

Christ the King Catholic High School | Science Department

Enrichment, Personal Development & Extracurricular	The curriculum is designed along side the best evidence to ensure the best learning experience for our students and is based on 6 key pillars; • Coherence • High Expectations • Metacognitive learning • Learner Identity • Responsive Teaching & Learning • Awe and Wonder The department run numerous trips and visits to local universities and colleges and promote science in science week via the sharing of peer science projects or via community events such as primary science clubs. The school also has a weekly STEM club.	**Careers Education & Cultural Capital**	Relevance of Science to learners is integrated throughout the curriculum components and resources, including student-facing content on accessible Science and diverse scientists in society. Support for teachers promoting learner identity and identification with Science is provided through CPD and resources available on the kerboodle platform. These explore the impact and relevance to learners' lives and society, and pathways in Science, for each of the six key concepts for each discipline. (see MT/LT plans)
Numeracy	Mathematical skills are fundamental to success within scientific disciplines and, as such, learners' development of these crucial skills is emphasised within all curriculum materials. In particular, application of skills and knowledge learnt within the Maths curriculum to scientific contexts can be a sticking point for learners, and the curriculum is designed to support learners with this throughout KS3 and KS4 and within all resources. Maths skills are incorporated into all relevant lessons and further supported by targeted resources. See MT/LT Plans for more information.	Metacognition	Understanding of how an individual learns and self-regulation of that learning are key to develop effective Science learners. The EEF notes that incorporating metacognition and self-regulation approaches in teaching and learning leads to great positive impact on learner progress. This ownership of learning is developed in a number of ways including for example; • Incorporation of the plan-monitor-evaluate cycle within relevant activities and resources, so that learners become familiar with planning the steps they will take within an activity or to solve a problem, monitoring their progress, and evaluating what they have learned. • Direct teaching and practice of a range of metacognitive strategies throughout the lesson content and student resources, as appropriate for the scientific topic at hand, followed by use of metacognitive strategies outside of class to review and reflect. • Consistent teacher-led modelling of thinking and problem-solving skills, to demonstrate how an expert employs strategies like the plan-monitor-evaluate cycle. • Fostering metacognitive talk in the classroom at appropriate opportunities. • Dedicated support within teaching materials and targeted PD resources for teachers.
Literacy	Effective use of vocabulary, reading and writing skills, and scientific communication are all integral to long-term success in Science. Practice of literacy skills is therefore embedded throughout the Science curriculum, following a progression designed around the EEF's Improving Secondary Science recommendations. Literacy skills are developed through the use of literacy trackers to highlight key vocabulary and definitions, lesson activities, targeted guidance and activities. Literacy is also emphasised throughout the new activate KS3 scheme specifically to target recommendations within the Oxford University Press Bridging the Word Gap report, which highlighted literacy as a major target area for improvement in the transition to Secondary school.	**Catholic Ethos**	Science is delivered with the CtK virtues at it's core. The core pillars of the curriculum include 'awe and wonder' not only to instil a fascination with the world in which we live but equally importantly to deepen our students faith and spiritual journey by relating the wonders of our world to our Catholic faith. The curriculum also links closely to the Ctk way and the department actively promote the awarding of merits for particular aspects of learning and the curriculum.