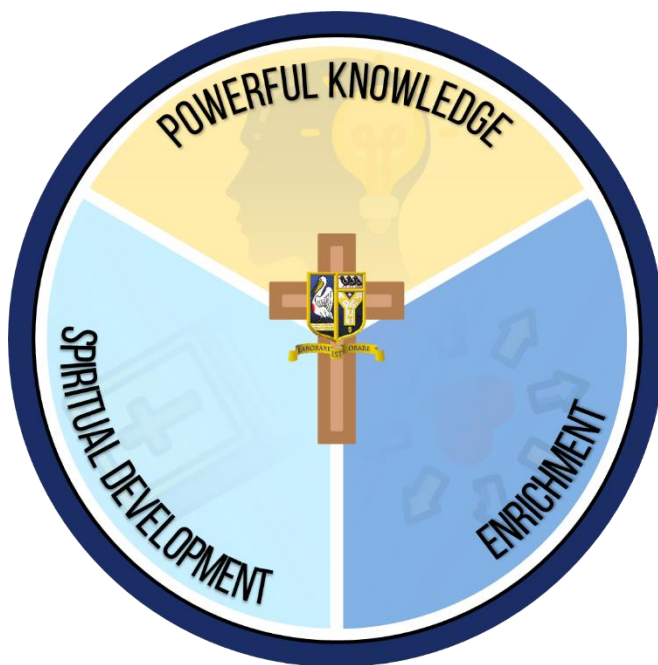


THE BECKET SCHOOL



SCIENCE

CURRICULUM INTENT



*"I HAVE COME IN ORDER THAT YOU MIGHT HAVE
LIFE
—LIFE IN ALL ITS FULLNESS."*

~JOHN 10:10

OUR INTENTION IS FOR STUDENTS TO WORK HARD BECOMING THE VERY BEST SCIENTIFIC THINKERS AND PROBLEM SOLVERS. TO BE KIND AND LOVING, CONSIDERING OTHERS AND THE WORLD IN WHICH WE LIVE SO THAT THEY CAN DO THE RIGHT THING FOLLOWING IN THE FOOTSTEPS OF JESUS CHRIST.

THE AIM OF SCIENCE IS TO ENABLE OUR STUDENTS TO GAIN FUNDAMENTAL SCIENTIFIC KNOWLEDGE THAT WILL HELP PREPARE THEM FOR FURTHER STUDIES AND ALLOW THEM TO NAVIGATE THE WORLD BEYOND THE CLASSROOM. THEY WILL BECOME COMPETENT PRACTICALLY BY DEVELOPING SKILLS TO ALLOW THEM TO FOLLOW SCIENTIFIC METHODS SAFELY USING CORRECTLY IDENTIFIED EQUIPMENT AND THEN EVALUATE DATA. THROUGHOUT THEIR STUDIES, STUDENTS AT THE BECKET SCHOOL WILL GAIN SCIENTIFIC LITERACY, HAVING AN UNDERSTANDING OF THE TERMINOLOGY USED WITHIN SCIENCE AND DEVELOP THEIR NUMERACY SKILLS TO MANIPULATE DATA AND CARRY OUT CALCULATIONS. OUR HOPE IS THAT STUDENTS WILL CULTIVATE A LOVE OF SCIENCE THAT WILL CONTINUE WITH THEM INTO ADULTHOOD.

INTENDED OUTCOMES

The Science curriculum is designed in a way to support students in learning and retrieving core scientific knowledge so that they can build and make connections. We also have a large focus on developing skills. By adopting a hierarchical and spiral approach to teaching and learning, it enables students to have repeated practice so that scientific skills are refined and embedded alongside core knowledge.

In year 7 and 8, there is a focus on core knowledge as well as scientific skills, which are embedded throughout each topic. These skills are interleaved and built upon throughout both years allowing students to be prepared for year 9 science and beyond. At the end of year, 7 students take part in a practical project. This is an excellent opportunity for students to practice these skills by completing a scientific project in biology, chemistry and/or physics. In this, they will decide on a question to investigate, design a method, risk assess the method and design results tables to collect data. Once the data is collected, students then draw a graph to represent the results and draw conclusions and evaluations linked to their investigation.

From year 9 onwards, we take a hierarchical and spiral approach to delivering content with interweaved practice and knowledge retrieval throughout. We aim to develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. We want students to continue to become confident learners as well as gain understanding of the nature, processes and methods of science through different types of scientific enquiry that help them to answer questions about the world around them. By the end of year 11, students will be equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future allowing them to progress on to their next stage.

Overall across all years students will:

- Experience a broad and balanced curriculum, which is inclusive, covering all of the National curriculum or examination specification
- Experience a range of well-chosen, well-staffed and well-resourced subjects
- Have opportunities to develop good character and resilience by engaging with challenging content and skills whilst developing their faith through the 5 gospel values.
- Be supported in their development of a love of learning and the desire to extend their learning beyond the classroom.
- Be supported and challenged to stretch themselves to reach their individual full potential.

CURRICULUM INTENT

POWERFUL KNOWLEDGE	<p>Students will:</p> <ul style="list-style-type: none"> • Gain an understanding of the world in which we live through variety of topics • Gain an understanding about themselves and their bodies through a variety of topics • Have opportunities to develop their faith through the 5 core gospel values we have linked to topics we teach • Develop their independence, long-term memory/retrieval and retention skills through careful structuring within and between key stages as we interweave topics throughout
SPIRITUAL DEVELOPMENT	<p>Students will:</p> <ul style="list-style-type: none"> • Have opportunities to develop and reflect on their own faith, and teachings of the Catholic Church, whilst exploring the topics that we teach through five core gospel values and virtues. These are: <ul style="list-style-type: none"> - Stewardship - Human dignity - Integrity - Respect - Awe and wonder • As an example, awe and wonder is the response of a person who gains some deeper understanding into nature and reality. Students explore this studying topics such as atomic structure, the electromagnetic spectrum, biological molecules, cells and space.
ENRICHMENT	<p>Students will:</p> <ul style="list-style-type: none"> • Develop their cultural capital through teaching of essential knowledge. • Foster a love of learning through well-planned, engaging lessons. • Enhance key skills vital to experimental development. E.g. writing a hypothesis, method or evaluation. • Clear cross-curricular links to other subjects mapped out. • Visit Warwick university in year 9/10 to take part in Science in Action • Have access to STEM club in year 7 and 8. • Take part in British science week each year. • Have the opportunity to take part in our STEM speed-networking event. • At KS5 students will take part in the Olympiad. • At KS5 students will have access to The Becket Super Curriculum.

CURRICULUM IN THE CLASSROOM

B	EHAVIOUR IS EXCELLENT	
E	XPERT TEACHERS	
C	OGNITIVELY ACTIVE	
K	NOWLEDGE-RICH	
E	MBEDDED PRACTICE	
T	ESTING-FOR-LEARNING	

HOW WILL I LEARN SCIENCE?

- Students will be taught by a science specialist who is passionate about sharing their knowledge.
- Students will have access to expert resources and knowledge books.
- There is an emphasis on teaching our knowledge rich curriculum in a hierarchical and spiral way enabling students to revisit skills and core knowledge throughout all years.
- Students will have many opportunities to become practically competent by taking part in experiments.
- When students are taught something new teachers will stimulate their thinking through modelling, narrating and scaffolding sometimes using a visualiser.
- Teachers will check what students have learnt through regular retrieval quizzes and activities within lessons.
- Each term students will complete a longer assessment in order to measure what they have learnt.

LEARNING SEQUENCE

YEAR 7 – SCIENTIFIC SKILLS

TOPIC	Health and Safety Rules	Bunsen Burner	ID Equipment
EXPLANATION	<p>Students will be coming from primary school without any previous experience of laboratory classrooms and so are taught how to conduct themselves safely within the laboratory at all times. They will learn how to use a Bunsen burner safely and familiarise themselves with the location and use of specialised science equipment within the laboratory.</p> <p>Having done these lessons, students will receive a ‘science license’ that proves they have the skills to do experiments in science.</p>		

YEAR 7

TOPIC	Block 1: Safety licence Cells Particles Forces	Block 2: Structure and Function of Body Systems Elements, Atoms and Compounds Sound	Block 3: Light Space Reactions	Block 4: Reproduction Acids and Alkalis Practical project
EXPLANATION	<p>The safety licence lessons are to teach students how to remain safe in a lab by looking at safety rules and how to use science equipment including the Bunsen burner. We start with cells, particles and forces as they introduce some of the fundamental ideas for biology chemistry and physics.</p> <p>In cells, we look at the building blocks of life to include microscopes, animal, plant cells and unicellular organisms.</p> <p>In particles, we look at states of matter and changes of state, diffusion and gas pressure.</p> <p>In Forces, we look at types of forces and how they affect objects, including gravity.</p>	<p>In the second block we build on the fundamental ideas introduced in the previous block.</p> <p>In the structure and function of body systems we look at organisation of an organism, the lungs, the skeleton and muscles.</p> <p>In Elements, atoms and compounds we define atoms, elements and compounds and introduce chemical formulae.</p> <p>In sound, waves are introduced and we look at the ear, loudness and pitch.</p>	<p>In the light topic, we build on concepts of waves from sound and explore reflection, refraction the eye and colour.</p> <p>In space, we use knowledge from the light topic to talk about light years and objects in the night sky as well as the seasons and the solar system.</p> <p>In reactions, we build on knowledge from the previous two chemistry topics and start to see how atoms react when burning, in thermal decomposition and exo- and endo- thermic reactions.</p>	<p>Reproduction is taught here to align with RE and we teach about the structure of the reproductive system, fertilisation and implantation of a foetus, growth of the foetus and the menstrual cycle, before moving to plants where we look at their structure, pollination and seed dispersal.</p> <p>In acids and alkalis, we find out about acids and alkalis, what indicators are, neutralisation reactions and making salts.</p> <p>The practical project brings together all of the practical skills students have learnt through year 7 to research and produce a sports drink or to make medals.</p>

YEAR 8

TOPIC	Block 1: Health and Lifestyle The Periodic Table Energy	Block 2: Ecosystem processes Separation techniques Electricity and magnetism	Block 3: Adaptation and Inheritance Metals and Acids Motion and Pressure	Block 4: The Earth Fertility
EXPLANATION	<p>In health and lifestyle, we look at how the body uses nutrients in food, the digestive system and the effects of drugs on the body, including cigarette smoking and drinking alcohol.</p> <p>In the periodic table, students learn about the structure of the periodic table, the groups and periods and then focus on group 1, 7 and 0.</p> <p>In the energy topic, students learn about energy in food, energy transfers, temperature, radiation, convection and conduction and energy resources, including power and work done.</p>	<p>In ecosystem processes, we look at the structure of an ecosystem including food chains and interdependence. We also look at respiration and photosynthesis reactions.</p> <p>In separation techniques, the students learn how to separate mixtures to include filtration, evaporation and distillation. They also look at solutions and solubility.</p> <p>In electricity and magnetism, students build circuits and learn about components, learn about static electricity and then magnets and electromagnets.</p>	<p>In adaptation and inheritance, we look at adaptations of various organisms and predator-prey cycles and then move on to looking at DNA and chromosomes.</p> <p>In metals and acids, students learn about how metals react with various substances, how metals can be extracted and then move on to studying other materials, e.g. polymers.</p> <p>In motion and pressure, students learn about speed, motion graphs and pressure in gases, liquids and solids.</p>	<p>In the Earth topic, we look at Earth's atmosphere, the rock cycle, the carbon cycle, climate change and recycling. In the fertility topic, we look at fertility, asexual and sexual reproduction, contraceptives and factors affecting the growth of a foetus.</p>

YEAR 9 - BIOLOGY

TOPIC	B1 Cells	B4 Bioenergetics
EXPLANATION	<p>This builds on the work students have done in the Year 7 cells topic and provides students with essential knowledge needed to access many other topics.</p> <p>Students start with the basic cell structure of plants and animals, before looking at cells under microscope.</p> <p>Students then look at specialised cells and unspecialised cells before moving on to ethics and the use of stem cells. This leads to how we can see details in cells and how much they are magnified when looking through microscopes. Then looking at prokaryote cells and comparing with cells already looked at. Next, we look at simple diffusion and factors affecting rate of diffusion then application; where does diffusion occur in living organisms. Lastly, we move on to active transport and where this occurs. Finally, student learn about osmosis as special form of diffusion and carry out a required practical.</p>	<p>This topic builds on the work students have done in year 7 and 8 on cells and photosynthesis respectively. Students begin looking at how substances move in plants through the xylem and phloem, as well as learning about transpiration and translocation photosynthesis. Then students study the factors affecting photosynthesis including limiting factors.</p> <p>Students also learn about respiration and metabolism. Starting with aerobic respiration then explaining anaerobic respiration and how they are different.</p>

YEAR 9 - CHEMISTRY

TOPIC	C1 Atomic structure and the periodic table	C2 Structure, bonding and properties	C9 Chemistry of the Atmosphere
EXPLANATION	<p>Students will build on their knowledge from year 7 and 8 to look at how the model of the atom has changed over time.</p> <p>Students will then learn how Mendeleev and Newlands have helped develop the periodic table and how it is organised today.</p> <p>The periodic table provides students with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties.</p> <p>Specifically, students will learn about the elements in group 1, 7 and 0.</p>	<p>In this, topic students gain an understanding of the types of bonding, their structure and how this relates to their properties.</p> <p>These 3 types are: ionic, covalent and metallic.</p> <p>This topic requires an understanding of C1, as they need to know the structure of the atom, be able to draw electron diagrams, know how ions form.</p> <p>C1 along with C2 provide a foundation for understanding all other topics taught in Chemistry.</p>	<p>The Earth's atmosphere is dynamic and forever changing. In this, topic students discover what the Earth's early atmosphere was like and how it is today.</p> <p>Students gain an understanding of the greenhouse effect and how human activity has led to an increase in greenhouse gases causing global warming.</p> <p>Students then consider carbon footprint and how it can be reduced. As well as looking at the effects of common atmospheric pollutants such as CO₂, CO, C, SO₂, NO_x</p>

YEAR 9 – PHYSICS

P1 - Energy	P3 - Particles	P4 – Atomic Structure
<p>This unit builds on ideas covered in Y8 about energy stores, transfers and power.</p> <p>The P1 topic specifically covers conduction, convection, and ways to reduce unwanted energy transfers. It also looks at the Earth's energy resources, firstly the finite resources that we use and are running out of and then the renewable sources of energy such as tidal, wind and solar.</p>	<p>This unit builds on work covered in the chemistry Y7 topic; Elements, atoms and compounds and also furthers ideas from P1 Energy.</p> <p>The P3 topic covers the density of materials and how density can be measured in different ways. Students also look at internal energy and changes of state before learning about specific latent heat.</p>	<p>This unit builds on the work done in the first Chemistry topic studied in year 9. This allows for an important recap of the structure of the atom and how the model of the atom has changed over time.</p> <p>Specifically, the P4 topic then covers isotopes and nuclear radiation. Within this students learn about the 3 types of radiation; alpha, beta and gamma. They learn what they are, their ionising ability and how far they can travel.</p> <p>Furthermore, students learn how to write nuclear equations and understand the term half-life before looking at the uses and risks of radiation.</p>

YEAR 10 – BIOLOGY

B2 - Organisation	B3 – Infection and Response	B4 - Homeostasis	B7 - Ecology
<p>This topic builds on students knowledge from the year 7 topic on Body systems.</p> <p>In B2, students will learn about the human digestive system and the respiratory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle.</p>	<p>Students learn about pathogens such as viruses and bacteria that cause infectious diseases in animals and plants. We will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens.</p> <p>Students will also look at how vaccinations and antibiotics can reduce the impact lethal diseases caused by bacteria. Unfortunately, many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics</p>	<p>Cells in the body can only survive within narrow physical and chemical limits. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors and effectors.</p> <p>Students will explore the structure and function of the nervous system and how it can bring about fast responses, which are so vital to our bodies. We will also explore the hormonal system, which usually brings about much slower changes.</p>	<p>This topic builds on students learning from year 8 when they study adaptation and inheritance.</p> <p>The topic focuses on ecology, which is all about how organisms and the environment that they live in and how the two interact. Students learn about competition for light, space, food, water as well as how changes in the environment can have an effect on animals and plants.</p> <p>Students learn how organisms are adapted to survive in different environmental conditions.</p> <p>During this topic students will also carry out a practicals using quadrats and transects to study the distribution of organisms.</p> <p>In addition, students learn about the water cycle and the carbon cycle understanding why both are important to sustaining life.</p>

YEAR 10 – CHEMISTRY

TOPIC	C3- Quantitative Chemistry	C4- Chemical Changes	C5- Energy Changes	C6- The rate and extent of chemical change
EXPLANATION	<p>This topic is a mathematical based chemistry topic. Within this, topic students first learn about the term conservation of mass. They learn how sometimes it seems as if the mass is not conserved but this is due to a reactant or product being a gas.</p> <p>Students then go on to use their knowledge from C1 and the periodic table to understand the terms relative atomic mass and relative formula mass.</p> <p>Next students look at what the mole is (Avogadro's number). Students learn why scientist use the mole instead of the everyday units we are used to.</p> <p>Students then go on to learn about chemical calculations including the percentage yield, atom economy, gas volume and concentration calculations.</p>	<p>This topic builds on students knowledge from year 8 when they look at metals and acids.</p> <p>In this topic students learn about the key reactions of metals and acids and are introduced to redox reactions.</p> <p>Students also learn about methods of extracting metals including by electrolysis and using carbon.</p> <p>In addition, students learn how to make a pure dry salt using copper oxide and sulphuric acid.</p> <p>Separate scientists also learn how to carry out titrations and use their knowledge from the C3 topic.</p>	<p>This topic builds on students knowledge and understanding from the year 7 topic on reactions.</p> <p>In C5 students, study endothermic and exothermic reactions as well as learning about real world applications of both. In addition, students learn how to draw reactions profile diagrams and calculate bond energy calculations.</p> <p>Separate scientists also learn about chemical cells and fuel cells, which could play an important role in the future.</p>	<p>In this topic students learn about the factors, which effect the speed of reactions. Students get to experience many of these factors through carrying out experimental investigations. For example looking at how the concentration of hydrochloric acid affects the volume of gas given off.</p> <p>In the latter part of the topic students, learn about reversible reactions and the conditions, which affect them.</p>

YEAR 10 PHYSICS

TOPIC	P2 - Electricity	P5a – Forces & motion	P5b – Forces & their interactions	P6a - Waves	P8 – Space (separate science only)
EXPLANATION	<p>This topic builds on basic circuits work covered in Y8 by recapping circuit symbols as well as students knowledge of current, potential difference, resistance and series/parallel circuits.</p> <p>The topic then moves on to look at static electricity as well as domestic electricity, which looks at electrical safety, energy use and power. Students also study how electricity is distributed across the whole of Britain by looking at the national grid.</p>	<p>The forces topic builds on students understanding from the work they did in year 7 and 8 on forces and motion respectively.</p> <p>Forces is by far the biggest unit so it is split into 3 sections. The first section titled Forces and motion. It covers speed, distance, time, acceleration as well as motion graphs.</p> <p>Students will look at how to draw and interpret distance-time graphs as well as velocity-time graphs. Students will also cover terminal velocity and look at how forces change as this is reached.</p>	<p>This is the second part of the forces unit. It builds on ideas students have learnt earlier in the course.</p> <p>Specifically in this unit, students will learn about a number of ideas to do with the effects of forces such as interaction pairs, elasticity, moments and work.</p>	<p>The waves unit is split into 2 parts. In this first part, we learn about the different types of wave as well as properties such as wavelength, frequency, period and amplitude. We also cover the wave equation and students have the opportunity to carry out calculations using this expression.</p> <p>This work all builds on what students have covered in year 7 when they learn about sound and light.</p>	<p>Students first cover this topic in year 7 when they look at night and day, the solar system and the moon. This gives students a brief introduction to space before covering in the separate science aspect of the GCSE.</p> <p>P8 is a short unit where we cover ideas about the Solar System, historical models and why they changed. Students also look at the lifecycles of stars including ours, the sun. Students then student the phenomenon called redshift and use this to explain why the universe is still expanding.</p>

YEAR 11 – BIOLOGY



TOPIC	B6 – Inheritance, Variation and Evolution
EXPLANATION	This topic builds on students learning from year 8 when students study adaptations and inheritance. Students will discover how the number of chromosomes are halved during meiosis and then combined with new genes to produce unique offspring. Students learn about gene mutations and how they occur continuously but on rare occasions can affect the functioning of the animal or plant. Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. Students learn about selective breeding and the role this plays in producing livestock with favoured characteristics.

YEAR 11 – CHEMISTRY

TOPIC	C7 – Organic Chemistry	C8 – Chemical Analysis	C10 – Using Resources
EXPLANATION	<p>In this topic, students will learn about various homologous series. For combined science, students will specifically learn about alkanes and their properties. Separate scientists will look at a variety of functional groups including; alkanes, alkenes, carboxylic acids, alcohols and esters. They will learn about their reactions and properties.</p> <p>Students study how crude oil is separated into useful fractions and how they can be used as fuels.</p> <p>Finally, separate scientists will learn about condensation polymers, naturally occurring polymers, and the uses they have. This links back to the work they did in year 8 on polymers.</p>	<p>Students have some prior knowledge of this topic from when they learnt about the test for hydrogen gas as well as what chromatography is and how it works at key stage 3.</p> <p>This topic goes into more detail about chromatography and how it can be used to separate mixtures.</p> <p>Additionally, students learn how to test for oxygen, carbon dioxide, chlorine and hydrogen gas.</p> <p>Separate scientists will carry out an experiment to determine unknown compounds using their knowledge of cation and anion tests, which they will have learnt during this topic.</p>	<p>This is the final topic that students study in GCSE chemistry. This topic builds on students knowledge from the year 8 topic metals and acids and revisits the work they did on ceramics and composites for those studying separate science.</p> <p>The topic begins with students learning about finite and renewable resources. Students learn how we can reuse and recycle to conserve the resources we have on our planet.</p> <p>Students also learn about water and how it is treated so that it is safe to drink. Additionally, students study the treatment of wastewater.</p> <p>In this topic, separate science students specifically study the Haber process, which links back to the C6 topic studied in year 10 chemistry.</p>

YEAR 11 – PHYSICS

TOPIC	P6b – The Electromagnetic Spectrum	P5c – Newton’s Laws of Motion	P7 – Magnetism & Electromagnetism
EXPLANATION	<p>This is the second part of the Waves unit with students having studied part 1 at the end of year 10.</p> <p>This topic contains a large chunk of separate only content so is left until near the end of the course. It includes the different parts of the electromagnetic spectrum and their uses and dangers.</p> <p>The topic then goes into more detail on reflection, refraction, lenses, colour, and infrared radiation. Students will also study black body radiation and ultrasound.</p> <p>Finally, students study how waves can be used to detect and explore. For example, we can use the seismic waves produced by earthquakes to study the inner structure of the Earth.</p>	<p>This is the final part of the Forces unit and is covered here to break up the large unit. It also allows for natural interleaving of content as well as teaching the most challenging concepts last.</p> <p>In this topic students will learn about Newton’s 3 laws of motion. Specifically students will carry out an experiment to investigate how mass and force affect acceleration.</p> <p>Finally, students learn about momentum, changes in momentum and its conservation.</p>	<p>This unit contains the most challenging concepts in the course and is largely separate only content which is why it is covered at the end of the course.</p> <p>In this topic students discover the difference between permanent and induced magnets as well as learning about electromagnetism. Furthermore, students learn how a moving charge creates a magnetic field and how the direction of this can be found using the Right-hand rule.</p> <p>In addition, students learn about motors and generators. Students also learn Fleming’s Left Hand Rule so that they can find the size of a force and the direction in which it is acting.</p> <p>Lastly, students learn about generators and transformers.</p>