Holy Cross
CATHOLIC HIGH SCHOOL

Science Department

Enrichment and Personal Development		Links to Careers in Science	
Year 7	• Pupils will explore practical skills of working scientifically throughout all science disciplines. Pupils will take part in data handling, planning experiments and carrying out investigations within lessons. • Pupils will have opportunities to engage in Big Bang NW and understand how the force and effect of gravity changes in Space, Robotics Club and explore movements through electricity and current. • All pupils partake in a programme of alternative activities to celebrate British Science Week and have the opportunity to explore and engage in activities related to the yearly theme.	**Year 7**	• Pupils will explore how developments in science have created new and exciting employment opportunities e.g. microbiology and radiography • Pupils will start to build up foundational skills that are transferable to many careers such as organisation and presentation skills and look in depth at the skills which employers value. • Pupils are introduced to careers in science including: Biomedical and Forensic Scientists, Physiotherapists, Pilots, Electricians, Conservation Biologists, Midwives and Sound Engineers.
Year 8	• Pupils will explore interactions of forces, motion and energy and are provided with opportunities to problem solve and investigate how to increase efficiency through application of knowledge. • Pupils will take part in enquiry and research skills in local fieldwork investigations when studying feeding relationships within ecosystems in the school environment (school pond). • Pupils will explore key global problems e.g. climate change and limited food availability to understand how the world is changing and how environmental science can support a growing population. • Pupils will be able to participate in the CREST awards programme and take part in the Robotics Challenge. • All pupils partake in a programme of alternative activities to celebrate British Science Week and have the opportunity to explore and engage in activities related to the yearly theme.	**Year 8**	• Through exploring topical issues like climate change pupils will introduced to emerging employment opportunities. • Pupils will explore potential job opportunities and introduced to careers in science including: Psychologists, Archaeologists, Radiographers, Marine Biologists, Nuclear Physicists, Horticulturists and Pharmaceutical Chemists. • Some pupils will have the opportunity to attend Myerscough College to explore future career opportunities in outdoor education including botany and horticulture for those pupils who would like an alternative pathway in education. • Some pupils will partake in the Unilever Bright Futures programme to explore how materials are developed and recycled in industry. Winning teams will have the opportunity to visit Unilever Port Sunlight and see their material product brought to life.
Year 9	• Pupils will learn about the importance of protecting their physical health and mental well-being and learn about the negative impacts of unhealthy lifestyle choices. • Pupils will have opportunities to attend Engineer's club, STEM club, BAE Roadshow and Salter's Chemistry Festival throughout Y9. • All pupils partake in a programme of alternative activities to celebrate British Science Week and have the opportunity to explore and engage in activities related to the yearly theme. • Engagement with STEM ambassadors to deepen pupils' understanding of scientific skills and exploring opportunities in the real world.	**Year 9**	• Pupils will explore careers linked to all scientific disciplines including: Microbiologists, Metallurgists, Dieticians, Engineers and Polymer Scientists • Pupils will be equipped with a range of transferable skills e.g. the ability to collect, present and analyse data alongside the ability to explore scientific theories/models and develop hypotheses. • Careers where specific techniques and apparatus should be selected are also introduced throughout the curriculum including Materials and Polymer Scientists.
Year 10	• Pupils will explore the importance of physical health and fitness alongside how to support their physical and mental well-being. • Pupils will evaluate ethical issues which may arise and perceptions of risks for communicable and non-communicable diseases. • Pupils will be visited by Microbiologists working in local hospitals and a Marine Biologist who will explore themes of how waste is damaging ecosystems. • Pupils have the opportunity to attend the educational visit to Iceland to explore how waves interact and changes to the Earth's atmosphere. • Pupils will explore key themes e.g. reactions in chemistry, effects and uses of the emissions of radiation and applications of electricity through a series of topics. • All pupils partake in a programme of alternative activities to celebrate British Science Week and have the opportunity to explore and engage in activities related to the yearly theme.	**Year 10**	• Careers in research and outdoor education highlighted through the curriculum including: Biochemists, Personal Trainers, Pharmacists, Fuel Scientists, Chemical Engineers and Environmental Scientists. • Pupils studying separate science may explore a range of career opportunity e.g. seismologists/ climate researcher. • Pupils will look at the importance of Women in Science and Engineering who have supported advancements in science including Marie Curie and Joan Beauchamp Procter. • Discussions of the variety of routes into work both academic and vocational opportunities take place. • Visits from microbiologists working in hospitals linking to infections and lesson visits from past pupils now working in marine biology visit school to present their findings from research and work.
Year 11	• Pupils will accurately carry out experiments and suggest improvements to improve both accuracy and precision whilst also translating data in various forms e.g. tables, graphs and text information. • Pupils will learn about inheritance and genetics whilst discussing ethical implications for embryonic screening and testing. • Pupils will communicate scientific rationales and ideas when exploring climate change and how scientists are involved in ensuring the Earth's sustainability for the future • Pupils will investigate how forces and their interactions bring about movements whilst establishing the importance of reducing stopping distances. • Pupils studying separate sciences will explore stellar evolution and recognise the importance of peer reviewing data. • All pupils partake in a programme of alternative activities to celebrate British Science Week and have the opportunity to explore and engage in activities related to the yearly theme. • Opportunities to learn fundamental principles for A-Level Chemistry.	**Year 11**	• Explore key sectors of industry and future jobs linked to projects e.g. spectroscopy analysis in chemistry (Lancaster University) • Pupils will continue to explore careers linked to all scientific disciplines including: Genetics Councillors, Mechanical Engineers, Formulation Scientists, Hydrologists, Science Teachers and Astrophysicists. • Pupils will leave with a vast array of transferable skills to support the next stages in their careers as they are now scientifically literate pupils.

Key areas of focus in this unit of work

Subject specific knowledge

Assessment (including both formative and summative)

Progression of learning

KS2 Transferable Skills

Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.
Understanding of the nature, processes and methods of science through enquiry .
Some experience of practical work and working scientifically to collect data

Science Department
Year 7 Curriculum Journey

Holy Cross
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Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Working Scientifically Particles 1	**Cells Periodic Table 1**	**Forces Organisation**	**Electricity Space and Gravity**	**Acids and Alkalis Reproduction**	**Waves (sound) Plants**
Introduction to fundamentals of science: focus on working scientifically within the laboratory, recording observations and results and evaluating data from experiments. Particle Model - explore characteristics of particles and matter including density of solids, liquids and gases and observing how changes of states occur. Investigate separation techniques.	Cells – explore an understanding of cellular structures in organisms and identify the key functions of organelles in cells. Comparing movement of materials through diffusion, osmosis and active transport. Periodic Table 1 – compare the physical and chemical properties of elements from the Periodic Table and observe chemical reactions.	Forces – explore forces and their interactions to bring about movement and investigate deformation, stretching, friction and squashing. Organisation 1 – apply understanding of cells to hierarchical organisation of multicellular organisms and be introduced to organ systems found in human organisms.	Electricity 1 – introduction to the fundamentals of electricity and components found in circuits. Apply knowledge to calculations involving current and potential difference. Space and Gravity – build upon foundational knowledge of the force gravity in Spring 1 and explore how we experience day and night and how seasons arise.	Acids and Alkalis – investigating household acids and alkalis and using the pH scale to measure acidity/alkalinity. Applying knowledge to neutralisation and indigestion tablets. Reproduction – understanding of structure and function of reproductive systems in both plants and animals with a greater emphasis on asexual and sexual reproduction later in the topic and exploration of ethical issues surrounding IVF.	Waves (sound) – exploring sounds in different mediums and linking understanding of waves to loudness and pitch. Research the use of sound waves in echoes and ultrasounds. Plants – building upon knowledge from cells and reproduction to establish how plants absorb reactants for photosynthesis and making carbohydrates.
• How to collect, present and discuss various data from investigations • Differences in properties, movement and arrangement of particles in solids, liquids and gases • Differences between physical and chemical reactions • Explain the key processes in separating techniques: evaporation, distillation, chromatography and filtration	• Structure and functions of organelles in living organisms • Differences between animal and plant cells • Key processes (diffusion, osmosis and active transport) • Developments of scientific theories for the atomic structure • Examples of atoms, elements and compounds • The principles underpinning Mendeleev's PT	• Name contact and non-contact forces • Measure balanced and unbalanced forces through experiments • Investigating Hooke's law and elastic deformation • Hierarchical organisation from cells to organisms • Knowledge of functions of the digestive, circulatory, respiratory and skeletal systems • Compare the adaptations of the villi and alveoli	• Difference between series and parallel circuits • How to measure current and voltage using circuit components • Calculations of force using gravitational field strengths • Organisation of our solar system the Milky Way • Identification of moon phases	• Difference between acids and alkalis • Characteristics of acidic and alkaline substances • Comparison of indicators used in chemistry • Using neutralisation in real-life applications • Structure and function of male and female reproductive systems • Knowledge of gametes and chromosomes • Effects of maternal lifestyle on the foetus through the placenta	• How sound is produced • Recognise the auditory range of humans and animals • Knowledge of echoes and uses of sound waves • Where photosynthesis takes place and how almost all life depends on the products of photosynthesis to survive • Adaptations of leaves to carry out photosynthesis • Key process of reproduction in plants (pollination, fertilisation and seed dispersal)
Formative: Interpret and analyse a chromatogram. Summative: A series of substantive knowledge and skills questions related to the current units working scientifically and particles.	Formative: Identification of cells and organelles. Comparison of specialised cells. Describe and comparison of models question. Summative: A series of disciplinary knowledge and skills questions related to the current units.	Formative: Identification and labelling question and constructing a method. Describe and calculation question. Summative: A series of knowledge, skills and application questions related to the current units.	Formative: Interpreting data and description of our sun as a star. Summative: A series of knowledge and skills questions related to the current units.	Formative: Constructing a method and application of knowledge. Comparison and explain questions linked to reproduction. Summative: A series of knowledge, calculation and skills questions related to the current units.	Formative: Comparison and explanation questions for sound. Designing and suggesting improvements to experiments. Summative: A series of disciplinary knowledge and skills questions related to the current units.
These topics aims to build on foundational science knowledge and skills learnt at KS2- this is essential if pupils are to master the range of topics explored including scientific attitudes, experimental skills and investigations, measurements and evaluation.	Cells – Pupils will learn substantive knowledge essential to understanding plants in Summer 2 Y8 Inheritance and Adaptations in Y8. Periodic Table 1 – Pupils will apply the skills and knowledge learnt in Particles Autumn 1 to chemical reactions and arrangement of atoms. Pupils will then study reactions of metals in Y8 to explore and predict patterns in reactions.	Forces – Throughout this term pupils will learn substantive knowledge essential for the interactions between two objects and the disciplinary knowledge of measuring forces. In Y8, pupils will use their understanding of forces to apply to description of motion of vehicles. Organisation 1 – Pupils will apply knowledge of organ systems including the digestion system to Health and Lifestyle in Autumn 1 Y8. Pupils will link knowledge of diet choices to consequences of imbalances in diets including obesity.	Electricity – Knowledge learnt from the components in circuits will be highlighted in Electricity and Magnetism Y8 when pupils will explore interactions of positive and negative charges in static electricity and explore attraction and repulsion of magnets. Space and Gravity – Pupils will build upon their understanding of space if studying the separate sciences in KS4 and continue to explore advancements in technology which have lead to discoveries in space.	Acids and Alkalis – Pupils will revisit acids and alkalis in Reactions Y8 and Chemical Changes Y10 when they further consider reactions of acids with metals, alkalis and bases to determine new products. Reproduction – Pupils will apply understanding of sexual reproduction of organisms to adaptations and variation of species in Y8. Exploring reproduction is also a stepping stone to future topics in KS4 e.g. Infections and hormones in the menstrual cycle.	Waves (sound) – Following an understanding of how sound is produced, pupils will consider waves and Energy in Y8. Longitudinal waves will be revisited in Waves Y10 and comparisons made between sound and light waves. Plants – Pupils revisit plant reproduction in Environmental Science and Ecology Y8 to explore future crop production and sampling techniques for the distribution of plant species in our school field.

Year 8

Science Department
Year 8 Curriculum Journey

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Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Particles 2 Motion and Pressure	**Health and Lifestyle Energy**	**Inheritance and Adaptations Waves (light)**	**Periodic Table 2 Ecology**	**Electricity and Electromagnetism Reactions**	**Environmental Science Earth**
Particles 2 - Understanding how particles are representedin Biology, Chemistry and Physics; including their limitations. Motion and Pressure – explore pressure in gases and fluids, increasing with depth; upthrust effects and floating and sinking and identify forces needed to cause objects to stop or start moving	Health and Lifestyle – understanding of the different types of pathogens, the importance of bacteria in the human digestive system, how the body fights infections and explore the effects of unhealthy diets, recreational drugs and substance misuse on the body. Energy – introduction to energy changes and transfers which take place in everyday processes, links to efficiency of appliances and energy transfers from hotter to colder objects.	Inheritance and Adaptations – explore the development and models of DNA to determine characteristics of organisms and identify variation between species and organisms, understanding the importance of maintaining biodiversity. Waves (light) – recognise how light waves travel and the speed at which they do in a vacuum, investigate the reflection and refraction of light from source to absorber.	Periodic Table 2 – explore the Periodic Table including periods and groups, metals and non-metals to predict and describe trends and develop an understanding of the need for ceramics, polymers and composite materials. Ecology – understanding of interactions between species linked to loss of biomass through food chains/webs and how organisms are affected by the accumulation of toxic materials.	Electricity and Electromagnetism – investigate static electricity and the transfer of electrons and also attraction and repulsion between magnets and magnetic poles. Application of knowledge from Electricity 1 Y7 on how resistance is determined using current and potential difference. Reactions – introduction to the chemical reactions between metals with acids, water and oxygen, linking to the reactivity series and extraction of metals which can be used as catalysts in reactions.	Environmental Science – using our school greenhouse to identify how plants take part in photosynthesis, can be used to support the decay, water and carbon cycles and feed the world, exploration of the interdependence of organisms in an ecosystem. Earth – understanding of the structure of the Earth and composition of its atmosphere, recall of the rock cycle from KS2 and discussion of how human activity is impacting climate change.
• How to collect, present and discuss various data from Investigations • Calculations involving speed, distance and time • How to interpret D-T and V-T graphs • Compare atmospheric pressure and pressure in liquids and solids • Calculations of pressure given force and area	• Recall body defences including the first and second line of defences • Describe how vaccines work and their importance (linked to COVID-19) • Effects of poor lifestyle choices on health and well-being • Calculation of energy transfers and efficiency • Compare heat and temperature • Key processes of energy transfers (conduction, convection and radiation)	• Discuss experiments which lead to the structure of DNA • Explore how gametes and sexual reproduction can result in variation amongst species • Mitosis and the Cell Cycle • Adaptations of organisms • Description of Darwin's theory of natural selection • How light transmits through different materials • Investigations of light including reflection, refraction and colour	• Reactions of alkali metals, alkali earth metals and halogens • Observations of halogen displacement reactions • Comparisons of bonding between metals and non-metals • How to interpret food chains and food webs • Effects of bioaccumulation within a food chain • Recognise what animals and plants compete for within an ecosystem • How to carry out sampling techniques	• What is 'static electricity' and how does it happen? • How conductors and insulators transfer energy • Comparison of current and potential difference in series and parallel circuits • Investigations of attraction and repulsion between magnets • Uses of electromagnets	• Key process of reproduction in plants (pollination, fertilisation and seed dispersal) • How plants uptake ions • Identify the limiting factors of photosynthesis • Identify importance of plant reproduction in human food security • Suggest reasons for changes in the Earth's atmosphere • Discuss the importance of recycling • Suggest how to tackle climate change
Formative: Calculations involving speed, interpret data from D-T graph and explain observations. Summative: A series of substantive and disciplinary knowledge and skills questions related to the current units.	Formative: Describe and explain question. Recall equations to calculate and compare values. Summative: A series of substantive and disciplinary knowledge and skills questions related to the current units.	Formative: Determine and compare questions linked to inheritance and DNA. Compare waves and plan an investigation. Summative: A series of knowledge, skills and application questions related to the current units.	Formative: Draw, comparison and explain questions linked to the Periodic Table. Create and explain relationships in food webs. Summative: A series of knowledge and skills questions related to the current units.	Formative: Constructing a method and application of knowledge. Constructing equations and deducing information from data for reactions. Summative: A series of knowledge, calculation and skills questions related to the current units.	Formative: Presentation of 'my greenhouse' design. Identify and explanation questions for Earth. Summative: A series of disciplinary knowledge and skills questions related to the current units.
These topics aims to build on foundational science knowledge and skills learnt at KS2- this is essential if pupils are to master the range of topics explored including scientific attitudes, experimental skills and investigations, measurements and evaluation.	Health and Lifestyle – Pupils will revisit health in Digestion and Food Y9 when they consider the tissues and organs of the digestive system, including adaptations of how the digestive system to improve efficiency and how food is digested using enzymes (biological catalysts). Energy – Knowledge learnt from Y8 will be highlighted when pupils learn equations for KE, EPE and GPE in Energy Y9. Pupils will also learn how conduction if involved in SHC of materials and learn about energy resources.	Inheritance and Adaptations – when studying Building Blocks of Life in Y9, pupils will further explore cellular structures using microscopes and deepen their understanding of the cell cycle and how chromosomes are involved in growth and repair. Waves (light) – understanding of light waves is revisited when pupils study Waves in Y10 including visible light and the electromagnetic spectrum and how all transverse waves travel at the speed of light.	Periodic Table 2 – Further built upon in Autumn Y9 when pupils learn about the history of the Periodic Table and explain the reactivity of elements in groups 1, 2 and 7 linked to their electronic structures. Uses of polymers are considered in Bonding (Summer Y9). Ecology – Movement of materials in plants highlighted in Transport in Plant Summer Y9 where pupils will consider transpiration and translocation in plants and factors affecting plant growth and therefore ecosystems.	Electricity and Magnetism – investigating energy revisiting when pupils learn about Energy in Spring Y9. Pupils will calculate the power in a heating element when investigating SHC of metal blocks. Magnetism is further explored in Electromagnetism Y11 when pupils build solenoids and electromagnets. Reactions – in Summer Y9, pupils reflect on the bonding between elements involved in reactions and how these types of bonding arise. Properties of covalent, metallic and ionic bonding are explored in depth.	Environmental Science – Knowledge learnt from Y7 and Y8 about plant adaptations is developed in Spring Y9 when pupils study the tissues in the cross section of leaves and consider transport in plants. Earth – Links to both chemistry and physics are explored in KS4 by considering our own carbon footprints and how to reduce the effects of climate change and understanding how the Big Bang caused the formation of our solar system including Earth.

Year 9

Science Department
Year 9 Curriculum Journey

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Autumn	Spring	Summer
Building Blocks of Life **Atomic Structure and the Periodic Table** **Particle Model of Matter**	**Digestion and Food** **Energy**	**Transport in Plants and Organisms** **Bonding**
Building Blocks of Life – understanding of cells as the basic structural unit of all organisms and taught the adaptations of cells related to their functions and the sub-cellular structure of eukaryotic and prokaryotic cells. Explore how cells can be viewed using both light and electron microscopes and the importance of stem cells in animals and meristems in plants. Atomic Structure and The Periodic Table – appreciation of the achievements in chemistry in showing complex and diverse phenomena linking to the development of the atomic structure from experimental data, how the modern Periodic Table is arranged and explore trends in reactivity for elements in the same group. Predictions of reactivity of elements in relation to their position in the Periodic Table. Particle Model of Matter – focus on relating models of arrangements and motions of particles in solids, liquids and gases to their densities, consideration of the state changes between states of matter and explore energy changes involved in heating using specific heat capacity and specific latent heat.	Digestion and Food – recall the hierarchical organisation in organisms and the importance of the digestive system. Understanding how enzymes act as biological catalysts and factors affecting the rate of enzyme activity, knowledge of carbohydrates, proteins and lipids and biological molecules. Knowledge of the digestive system related to tissues and organs involved and enzymes which are secreted from these organs. Energy - explore energy changes in systems involving heating, doing work using forces, doing work using current, calculating stored energies and understanding that energy which is wasted is known as dissipated energy and transferred to the surroundings. Apply understanding of energy transfers in closed systems to calculating efficiency and how power is defined as the rate of energy transfer per second. Understanding of how to calculate KE, GPE and EPE using known data.	Transport in Plant and Organisms – introduction to the need for transport systems in multicellular organisms including plants and explore how both the root hair cell and the stomata are involved in obtaining the reactants for photosynthesis. Explore how osmosis can occur in plants including potato and peppers to compare hypotonic, hypertonic and isotonic solutions. Consideration how transpiration and translocation transport water (and minerals) and sugars respectively. Bonding – understanding of the three types of bonding: covalent, metallic and ionic and the bulk properties of materials related to bonding and intermolecular forces. Investigate the structures, bonding and properties of giant covalent structures including diamond, graphite, graphene and fullerenes. Recall of the states of matter in terms of particle kinetics and relative strength of the intermolecular forces and chemical bonds. Awareness that there are limitations with the particle models.
• Compare structures and functions of eukaryotic and prokaryotic cells • Suggest adaptations of specialised cells in plants and animals • Investigate cellular structures through microscopy • Calculate magnification using image size and actual size • Describe the development of the atom • Compare separation techniques (filtration, distillation, chromatography) • The importance of Mendeleev in the development of the Periodic Table • Trends in reactivity of Group 1, Group 2 and Group 7 elements • Calculations of density for regular and irregular objects • Compare SHC and SLH for materials	• Recall the hierarchy of organisation (cells – tissue – organ – organ system – organism) • Describe how different organs are involved in the digestion of food • Adaptations of the stomach and villi which support digestion and make it efficient • How enzymes act as biological catalysts • Factors which affect enzyme activity including temperature and pH • Explain the importance of enzymes in digesting food • Energy transfers taking place in a variety of objects • Calculating KE, GPE, EPE, power and work done • Advantages and disadvantages of renewable and non-renewable energy sources	• Describe the movement of substances by diffusion, osmosis or active transport • How movement of water can increase of decrease the mass of plants (potatoes) • Compare transpiration and translocation in plants • Factors affecting transpiration • Compare covalent, metallic and ionic bonding • Relate the properties of each type of bonding to the intermolecular forces • Compare diamond and graphite (structure and properties) • The importance of graphene in electrical installations and nanoparticles in the development of scientific materials e.g. suncream
Formative: Compare question linked to eukaryotic and prokaryotic cells, explain question linked to reactivity trends and calculate question linked to SHC and SLH. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.	Formative: Determine and explain questions linked to enzymes and their products and calculation and evaluate questions linked to energy and resources. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.	Formative: Label and compare question linked to transport in plants and explain and compare question linked to the different types of bonding in molecules and compounds. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.
Building Blocks of Life – Pupils will build upon their understanding of cells and the organisation in the body to learn about two further organ systems in Body and Lifestyle Y10: the respiratory and circulatory (exploring the Heart and risk factors which can contribute to CHD and impact negatively on health. Pupils continue to learn about plant cells and tissues in Bioenergetics Y10 exploring the big idea of "how plants are essential to life". Atomic Structure and The Periodic Table – Further investigations of metals and their reactions builds upon knowledge of Group 1 and Group 2 reactivities when pupils study Chemical Changes in Y10. Investigations are carried out to extract metals using reduction and electrolysis and making salts using metal oxides. In Spring Y10, pupils record data on temperature changes from reactants to determine is a reaction is exothermic or endothermic. Particle Model of Matter – Pupils link to radiation when exploring how absorption or emission of radiation can lead to ionisation. Pupils will learn about interactions of energy on the electromagnetic spectrum in Summer Y10 when they continue to discover how "forces allow all objects to interact" Those studying separate sciences will link energy transfers to nuclear fission and fusion and our Sun's energy.	Digestion and Food – Building upon knowledge from the Autumn term and Building Blocks of Life, pupils will continue to develop an understanding of the human body through the Body and Lifestyle topics in Autumn Y10, learning how imbalances in diet and unhealthy choices can increase risks of non-communicable diseases. A deeper understanding of how some bacteria can be beneficial and communicable diseases involving food e.g. salmonella can cause unpleasant symptoms. Within the Infection and Response unit in Y10, pupils will also learn how the body defends itself against pathogens and how antibiotics and analgesics can help us if we are unwell. Energy – A consideration of how energy within chemical reactions can be calculated when pupils learn about exothermic and endothermic reactions in Energy Changes Spring Y10 including bond energy calculations when bonds are broken and made. In physics, pupils continue to investigate how energy including visible light, X rays and gamma waves is transmitted and how radio waves are used for communication purposes.	Transport in Plant and Organisms – In Y10, pupils continue to learn about photosynthesis and respiration when they consider the importance of plants in ecosystems to identify the uses of the glucose which is produced. Pupils will also build upon their knowledge of mitochondria and sub-cellular structures to discuss the importance of respiration. In Spring Y10, Infection and Response also considers bacterial, viral and fungal infections which plants may suffer from and how these can be identified on plants in the garden. Bonding – Developing pupils' understanding of the bonding in molecules and compounds, in Y10 pupils will consider how intermolecular forces in covalent molecules can be overcome to determine boiling points and will revisit the types of bonding when metals react with acids to form ionic substances. The understanding of ionic substances will lead pupils to recognise that solid ionic substances need to be molten or dissolved in an aqueous solution for electrolysis to take place in the Chemical Changes topic learnt in Summer Y10.

Year 10

Science Department
Year 10 Curriculum Journey

Holy Cross
CATHOLIC HIGH SCHOOL

Autumn	Spring	Summer
Body and Lifestyle **Bioenergetics** **Electricity**	**Infection and Response** **Atomic Structure and Radiation** **Energy Changes**	**Ecology** **Chemical Changes** **Waves** **Chemical Analysis**
Body and Lifestyle – explore the relationship between health and disease (especially non-communicable diseases linked to the heart) and to review data on the impact of lifestyle factors on the incidence of non-communicable diseases, Understanding the relationship between the structure and functions of the human circulatory system, Bioenergetics – identify photosynthesis as the key process for food production and biomass for life and recall some factors such as temperature and carbon dioxide concentration will affect the rate of photosynthesis. Understand the importance of cellular respiration including the processes of aerobic and anaerobic respiration and when these occur in the body. Electricity – explore current, potential difference and resistance in series and parallel circuits and for different circuit elements and understand how to measure the current and potential difference in circuits using correct equipment. Explore safety measures when wiring a plug.	Infection and Response – focus on communicable and non-communicable diseases, how the body defends against pathogens (bacteria, viruses and fungi) and the role of the immune system against disease. Apply understanding of pathogens to reducing and preventing the spread of infectious diseases in plants and animals. Explore the process of discovery and development of new medicines from natural resources. Atomic Structure and Radiation – build upon knowledge of ions and isotopes from Y9 to explore radioactive decay of substances with large nuclei in the classroom using a Geiger-Muller tube to test the emission of alpha, beta or gamma radiation. Apply understanding of radioactive substances to associated risks and uses of radiation in science and medicine (contamination and irradiation). Energy Changes – investigate chemical reactions and qualitatively measure the energy changes in these reactions through observations with hand warmers and ice packs. Compare reaction profiles to deduce if reactions are endothermic or exothermic.	Ecology – focus on the levels of organisation with ecosystems and how biotic and abiotic factors can affect communities. Explore the role of microorganisms in the cycling of materials through an ecosystem. Apply understanding of ecosystems, interdependence and adaptations to the importance of biodiversity. Analyse ways to estimate the distribution of species through appropriate sampling techniques. Chemical Changes – build upon knowledge of atoms to determine empirical formulae from ratio of atoms and balance chemical and ionic equations. Identification of common gases and apply understanding of metal reactions to acids, alkalis and carbonates. Explore the changes in pH which may occur in reactions and compare reduction and oxidation within chemical reactions. Waves – focus on subject specific terminology and identifying: amplitude, wavelength, frequency for both transverse and longitudinal waves. Compare the velocities between different mediums and recognise that there are many uses for the waves found on the electromagnetic spectrum including communication and medicine. Chemical Analysis - identifying pure and impure substances and suggesting tests and expected results, awareness of separating techniques for separating mixtures including chromatography. Explore tests and results for gases (and identification tests for positive and negative ions for separate scientists)
• How blood flows through the heart (naming chambers and blood vessels) • Suggest how to treat conditions associated with the heart • Recognise risk factors from poor lifestyle choices can contribute to non-communicable diseases • Word and symbol equations for photosynthesis and respiration • Interpret data linked to rate of photosynthesis and limiting factors • Compare aerobic and anaerobic respiration (oxygen debt) • Investigate current, potential difference and resistance in circuits • I-V characteristic graphs for diode, filament lamp and resistors • National Grid and energy transfers • How appliances in the home are designed to be used safely	• Compare bacteria and viruses and how they make us unwell • Interpret data on the exponential growth of bacteria and conditions which support its growth • How the body defends itself (naturally) and how the population are protected through vaccination programmes • Describe how drugs are developed before they are approved to be used by the public and what they are tested for • Compare the properties of alpha, beta and gamma radiation • Calculate half-life given graphical or numerical data • Compare contamination and irradiation • Deduce information from reaction profiles for exothermic and endothermic reactions • Investigate temperature changes and suggest improvements to apparatus • Calculations of bond energy from data provided	• Recognise abiotic and biotic factors which may affect ecosystems • How to carry out sampling techniques including line transect and random sampling • What animals and plants may compete for • How materials are cycled through carbon, water and decay cycles • Maintaining biodiversity and preventing global warming • Recall the reactivity series and use this to predict if reactions will occur • Plan investigations to prepare salts from metal oxides and acids • Electrolysis is used to separate metals above carbon on the reactivity series • Ionic substances must be molten or aqueous to allow the ions to move in electrolysis • Compare transverse and longitudinal waves • Investigate reflection and refraction of light • Know how to observe light waves (ripple tank) and sound waves (standing rope) • Distinguish between pure and impure substances • Analyse chromatograms • Identify the tests and results for gases (oxygen, hydrogen, carbon dioxide and chlorine)
Formative: Evaluate question on treatments for coronary heart disease, compare aerobic and anaerobic respiration in humans and plants and interpret resistance of a wire results. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.	Formative: Explain question on how pathogens make us unwell and how vaccines work, comparing the properties of alpha, beta and gamma radiation and constructing reaction profiles for exothermic and endothermic reactions and calculating bond energies. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.	Formative: Suggest question linked to knowledge and understanding of food webs and interdependence, plan question on extracting different metals from compounds and labelling transverse and longitudinal waves including direction of oscillations. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.
Body and Lifestyle – Pupils will build upon prior knowledge in Y9 and Y10 to continue the big idea of "animals" and explore how body cells undergo mitosis and gametes meiosis which can lead to variation amongst species. Pupils will also see how inherited disorders may arise through parental alleles and determine probabilities. Evidence for evolution will provide some answers to pupils on how our bodies have evolved due to natural selection over time and will study Darwin's finches to support their understanding of this theory. Bioenergetics – Pupils will continue to develop their understanding of how plants are essential to life when they study Ecology and plant adaptations in Summer Y10 and reinforce how species of plants have evolved due to natural selection. Links will be made to genetic modification of crops e.g. resistance to herbicides, increased food value of crops and ethical concerns of these crops. Electricity – Knowledge of circuits including current will be revisited when pupils learn about the magnetic effects of currents and explore uses of electromagnets and other applications of electricity including loudspeakers.	Infection and Response – Following on from infections and body defences, pupils will continue to explore the big idea "how do our bodies support us physically and mentally?" when learning about Homeostasis and Response in Spring Y11. Pupils will link viral and bacterial infection to STI's and also learn about how our bodies control blood glucose levels and treatments for those who have been diagnosed with diabetes. Pupils will also revisit antibiotic resistant bacteria when they describe natural selection in evolution in the Inheritance, Variation and Evolution unit in Y11. Atomic Structure and Radiation – Knowledge learnt in radiation will be revisited in Waves in Summer Y10 and Space in Summer Y11 to discuss how radiation can be useful linking to gamma radiation as part of the electromagnet spectrum in Waves and the expanding universe linked to red shift and energy movements in the Space unit (separate sciences). Energy Changes - Pupils will apply understanding of energy changes and bond making/breaking to Organic Chemistry in Summer Y11 through properties of hydrocarbons (viscosity and boiling point linked to intermolecular forces) and Quantitative Chemistry in Spring Y11 when covering conservation of mass and chemical equations.	Ecology – Building upon knowledge of plants in Bioenergetics Y10, pupils gain further understanding of adaptations of plants and animals and their importance in the water and carbon cycles. Content Is built upon when pupils learn about classification of organisms including the three-domain system in the Inheritance, Variation and Evolution unit in Y11. Chemical Changes – After investigation reactions of metals with acids, bases and alkalis and using electrolysis to extract metals, pupils will consider the environmental impacts of materials in life cycle assessments and metal recycling when studying Using Resources in Summer Y11. Waves – In Y11, we link interactions of waves to motion and forces and space where pupils recognise that radiation from the Sun can be dangerous and describe the formation of the Sun in our solar system. Chemical Analysis - In Y13, further analysis of organic molecules, their structure and the way they react is explored and the analytical techniques used by chemists to identify compounds is e.g. IR spectroscopy, NMR and test-tube reactions.

Year 11

Science Department
Year 11 Curriculum Journey

Holy Cross
CATHOLIC HIGH SCHOOL

Autumn	Spring	Summer
Inheritance, Variation and Evolution **Organic Chemistry** **Forces**	**Homeostasis and Response** **Electromagnetism** **Quantitative Chemistry**	**Atmosphere and Using Earth's Resources** **Rates of Reaction** **Space (separate science)**
Inheritance, Variation and Evolution – focus on the genome of an organism and how the genome influences the development of the phenotypes of organisms, there is a strong emphasis on scientific vocabulary including alleles, recessive, dominant and genotype. Determination of the probabilities of inherited disorders and sex determination in humans is carried out using punnet squares. Evidence of evolution through study of fossils allows us to suggest why some species may have become extinct. Organic Chemistry – understanding of how the formation of crude oil has led to the process of fractional distillation to separate into useful fractions e.g. petrol, diesel and bitumen. Conditions for cracking of alkanes to form shorter chained alkenes are discussed which then allows study of how alkenes can become polymers through synthesis. Forces – deduce types of contact and non-contact forces including electrostatic, magnetic and gravity. Identify force as a vector quantity and calculate work done and how elastic and inelastic stretching is work being done on an object. Interpretations of graphs involving distance, time and speed when investigating motion. Describe decelerations and breaking distances involved on roads linked to cars (Newton's 1st/2nd/3rd laws)	Homeostasis and Response – exploration of coordination and control and the principles of nervous coordination and control in humans, relationships between both the structures and function of the human nervous system and reflex arcs are compared to hormonal coordination and control in humans. Understanding of the hormones involved in the human reproduction and evaluating methods of contraception. Electromagnetism – exploring magnetic fields of permanent and induced magnets, and the Earth's magnetic field using a compass, investigate magnetic effects of currents and how solenoids enhance the effects and knowledge of electric motors using Fleming's left-hand rule. Quantitative Chemistry – focus on conservation of mass in equations and balancing equations, calculations of relative formula mass, limiting factors in reactions and calculating moles using mass and relative formula mass. Explore how organic compounds are synthesised and the importance of formulation scientists in the development of substances.	Atmosphere and Using Earth's Resources – understanding of the evidence for composition and evolution of the Earth's atmosphere over time and evidence for additional causes of climate change. Explore the effects of increased levels of greenhouses gases on the Earth's climate and how the Earth's water resource can allow us to obtain potable water and treat waste water. Rates of Reaction – knowledge of factors that affect the rates of reactions including: varying temperature, concentration, changing the surface area, increasing the pressure or adding a catalyst. Investigations into factors affecting reversible reactions may also take place. Experiments carried out to investigate rates of reactions through observations and collection of quantitative data. Apply understanding of factors affecting rate of reactions to dynamic equilibrium. Space (separate science) – identification of the main features of the solar system, its formation and consider the future of the universe. Understanding of how observations within space can take place through space exploration and introduction of satellites and advances in technology e.g. telescopes.
• Compare sexual and asexual reproduction • Highlight importance of mitosis and meiosis (gamete formation) • Determine probabilities using genetic cross diagrams • Classification of species using the five kingdoms and three domain system • Drawing and identification of alkanes and alkenes • Description of fractional distillation to separate crude oil • Conditions for cracking: steam and catalytic • Identify scalar and vector quantities • Investigate elastic and inelastic deformation in springs • Interpret D-T and V-T graphs • Calculations and experiments involving acceleration • Stopping distance = thinking distance + breaking distance	• Compare nervous system and endocrine systems in humans • Explain how insulin and glucagon control blood glucose levels • Interpret data for type 1 and 2 diabetes • Consider ways to control fertility and prevent STIs • Investigate permanent and induced magnetism • Describe the motor effect and how electric motors work • Calculate relative formula mass for compounds • Moles = mass ÷relative formula mass • Identify limiting factors in reactions using moles	• Composition of the Earth's early and current atmosphere • Identification of greenhouses gases (methane, water vapour and carbon dioxide) • Obtain potable water using distillation • Evaluate LCA's for paper and plastic materials • Describe ways to measure rate of reactions • Plan experiments to investigate how temperature and concentration affect rate of reactions • Evaluate conditions for dynamic equilibrium • How the position of equilibrium can change (Le Chatelier's) depending on temperature, concentration and pressure • Describe and explain the formation of the Universe • The life cycle of a star
Formative: Determine question for probabilities of offspring inherited disorders, draw and describe questions on alkanes/alkenes and fractional distillation and label and plan question on the acceleration required practical. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.	Formative: Plot question on data related to blood glucose levels and explaining effects of hormones on controlling levels, suggest question on uses of electromagnets, calculate question using moles, mass and mr and identify question on testing gases. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.	Formative: Justify question linked to the evolution of the Earth's atmosphere, plan question linked to rates of reaction and suggesting improvements to working scientifically and describe question on the life cycle of stars. Summative: A series of questions related to the current units testing pupils' knowledge and understanding of scientific ideas and techniques, application of knowledge linked to scientific enquiry and procedures and analysis of experimental procedures.
Inheritance, Variation and Evolution – At KS5, pupils discuss how DNA and RNA hold and transfer genetic information and how these are both polymers of nucleotides (nucleotides are introduced at KS4 to pupils studying separate sciences). Organic Chemistry – Pupils use knowledge of the basic alkanes and alkenes to apply IUPAC rules for nomenclature to name organic compounds at KS5 and use mechanisms to explain the reactions of organic compounds using curly arrows. Forces – development of the student's knowledge and understanding of forces, energy and momentum from KS4 is explored and then the introduction of mechanics and the study of materials in terms of their bulk properties and tensile strength at KS5. From Y10, quantitative and qualitative application of energy conservation from KE and GPE is covered.	Homeostasis and Response – Further understanding of how cell antigens allow the immune system to identify pathogens and toxins at KS5. In A level biology, pupils would revisit neurones from KS4 to consider the passage of an action along non- and myelinated axons resulting in nerve impulses. KS4 knowledge of hormones involved in controlling blood glucose is built upon when the actions of insulin, glucagon and adrenaline activating enzymes is explored at KS5. Electromagnetism – Ideas from electricity and magnetism in KS4 are further developed when pupils investigate practical applications of magnetic field theory and electrostatics. Quantitative Chemistry – At KS5, pupils should now define relative atomic and relative formula mass whilst carrying out calculations using Avogadro's constant, mass of substance and use the ideal gas law equation pV = nRT	Atmosphere and Using Resources – Further develop understanding of UV radiation is absorbed by ozone in the Earth's upper atmosphere and how use of CFC's (chlorofluorocarbons) catalyse the decomposition of ozone (which then allows harmful UV radiation through out atmosphere) Rates of Reaction – Pupils will revisit Le Chatelier's principle and dynamic equilibrium in Y12 when they study chemical equilibria to predict qualitive changes and in Y13, the mathematical relationship between rate and concentration is discussed to use given rate data to deduce a rate equation and calculate the rate constant, k. Space (separate science) – Building upon the KS4 Big Idea of Radiation which is introduced through particles and interactions, pupils at KS5 will apply fundamental physical principles to the study and interpretation of the Universe. Pupils will gain deeper insights into the behaviours of objects at large distances from Earth and consider devices used to gather information from afar.