Our Lady Queen of Peace
Catholic Engineering College

Curriculum Overview

YEAR 11 SCIENCE

	Knowledge & Understanding			Subject Specific Literacy Development		Cultural Capital / Enrichment Opportunities
	Composites (Bigger Picture)	**Components (Key Concepts)**	**Retrieval Practice Focus**	**Reading for meaning**	**Key Vocabulary**	
Autumn Term (Half term 1)	**<u>Paper 2 Biology:</u>** <u>Homeostasis</u> The human nervous system Hormonal control	Define the term homeostasis and describe 3 internal conditions in the human body regulated during homeostasis. Describe the role of the nervous system. Identify and describe the pathway of a reflex arc from stimulus to response. Describe in detail how to investigation into the effect of a factor on human reaction time (RP6). Describe the role of the endocrine system. Describe what a hormone is, where it is produced, how it travels around the body and where it produces an effect. Compare and contrast messages sent by the endocrine and nervous system. Describe and explain the hormones involved in the maintenance of blood glucose levels. **Explain the role of thyroxin and adrenaline in the body.** Describe and explain how these hormones interact with each other in the control of the menstrual cycle. Describe and evaluate different methods of contraception. **Describe the process of In Vitro Fertilisation (IVF).**	Recall cellular structures and functions, particularly the cell membrane and cellular transport. Recall all major organ systems and their basic functions and how they work together to maintain health. Recall enzymes and metabolism.	Conscious or unconscious? Creating life with science.	Homeostasis Hormone Negative feedback Thermoregulation Vasoconstriction Insulin Glucagon Receptor Effector Neuron Reflex Synapse	Reading for meaning. Opportunities to share related news stories. Debates and Discussions: on ethical dilemmas or current issues in health and homeostasis (e.g., genetic engineering, organ transplants) encourages critical thinking and application of knowledge. Possible community engagement through health fairs, wellness workshops, or partnerships with local healthcare providers can provide practical insights into how homeostasis applies to everyday health and wellness practices.

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			Recall the basic concepts of atoms, molecules and ions. Recall chemical formulas and equations. Recall knowledge of the properties and behaviours of the three states of matter. Recall knowledge on kinetic theory and the basic idea that particles are in constant motion and how temperature affects this motion. Recall knowledge on the laws of conservation of mass.			Cross-Curricular opportunities exploring the connections with history (impact of chemical discoveries on society), mathematics (graphing reaction rates),

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Autumn Term (Half term 1)	**<u>Paper 2 Chemistry:</u>** <u>Rates & Equilibrium</u>	Describe in detail how to measure the rate of a reaction. Draw and interpret graphs showing product formed or reactant used against time. **Calculate the gradient of a tangent to a curve to measure rate of reaction.** Describe collision theory in terms of particles and energy. Explain how each factor would affect the rate of reaction using collision theory (temperature, surface area, concentration, pressure and catalyst). Describe in detail how to Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour (RP11). Define reversible reactions. Describe equilibria in a reversible reaction. **State Le Chatelier's Principle.** **Predict the effect of changes on systems at equilibrium from information given.**	Recall the basic concepts of forces such as the definition of a force and the different types of forces. Recall the units of measurements. Recall the knowledge of balanced and unbalanced forces. Recall concepts of energy, work done, kinetic and potential energy.	Drawing conclusions from results	Rate of reaction Collision theory Activation energy Catalyst Concentration Equilibrium Reversible reaction Turbidity	
Autumn Term (Half term 1)	**<u>Paper 2 Physics:</u>** <u>Forces</u> Forces in balance Motion	Describe the interaction between pairs of objects which produce a force on each object. Describe the difference between scalers and vectors. Calculate the resultant of two forces that act in a straight line. **Use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object.**		Weight and mass what is the difference? Interpreting velocity time graphs. To break or not to break?	Resultant force Mass Weight Acceleration Terminal velocity Scalar Vector Momentum Inertia Elastic Limit	Reading for meaning. Opportunities to share related news stories.

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		Use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces. Recall and apply the equation: [distance = speed x time]. Explain the vector–scalar distinction as it applies to displacement, distance, velocity and speed. **Explain that if an object is accelerating, its speed at any particular time can be determined by drawing a tangent and measuring the gradient of the distance–time graph at that time.** Draw and interpret distance–time graphs. Recall and apply the equation: [Acceleration = change in velocity / time]. Draw and interpret velocity–time graphs. Describe the energy transfer involved when work is done. Describe the difference between a linear and non-linear relationship between force and extension. Describe in detail how to investigate the relationship between force and extension for a spring (RP18). Describe and apply Newton's First Law to explain the motion of objects moving with a uniform velocity and objects where the speed and/or direction changes. Describe inertia. Explain the effect of how varying the force on the acceleration of an object with constant mass (RP19). Describe and apply Newton's Third Law to examples of equilibrium situations.				

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		Explain the factors which affect the distance required for road transport vehicles to come to rest in emergencies, and the implications for safety. Use the concept of momentum as a model to describe and explain examples of momentum in an event, such as a collision.				
Autumn Term (Half term 2)	**<u>Paper 2 Biology:</u>** <u>Inheritance, Variation and Evolution</u>	Describe the process of meiosis. Compare and contrast mitosis and meiosis. Compare and contrast sexual and asexual reproduction. Describe the structure of DNA. Describe the relationship between DNA, chromosomes and genes. Describe what the Human Genome Project (HGP) is and explain the importance. Define the terms: dominant, recessive, homozygous, heterozygous, genotype and phenotype. All in relation to inheritance. Predict the outcome of genetic crosses by using simple ratios and direct proportion. Explain why using Punnett squares to predict the outcome of genetic crosses is limited. Describe the genetic diseases Polydactyly and Cystic Fibrosis and describe how they are caused. Describe the benefits and drawbacks of genetic screening for the above conditions. Describe how variation arises through mutations. Describe the theory of natural selection.	Recall basic cell biology in terms of cell structures and functions. Recall knowledge on chromosomes that carry genes made of DNA. Recall knowledge on sexual and asexual reproduction. Recall factors affecting variation in terms of genetic and environment	The famous 6 toed teacher. Charles Darwin and natural selection	Genotype Heterozygous Homozygous Phenotype Allele Chromosome Genome Mutation Natural selection Selective breeding Genetic engineering Extinction	Historical development of key concepts and discoveries; Students should be familiar with influential scientists, experiments, and milestones in the history of cell biology, such as the discovery of the cell theory, the structure of DNA, and the development of cell culture techniques.

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		Describe the process of selective breeding in both animals and plants. Describe the process of genetic engineering. Describe what a fossil is and how they are formed. Explain how the fossil record provides evidence for evolution. Define the term extinction and describe factors which can contribute to the extinction of a species. Describe Carl Linnaeus' classification system: KPCOFGS. Explain why classification systems have developed over the years since Linnaeus. Interpret evolutionary trees to extract information about how organisms have changed over time.				
Autumn Term (Half term 2)	**<u>Paper 2 Chemistry:</u>** <u>Organic Chemistry</u>	Describe how crude oil was formed and that it is a mixture of hydrocarbons. Describe the process of fractional distillation including evaporation and condensation. Describe and link size of hydrocarbon molecule to the properties of boiling point, viscosity and flammability and its uses. Describe the combustion of fuels to produced energy and write word and balanced symbolic equations. Describe steam and catalytic cracking including the conditions. Explain the reason cracking is used and some uses of alkenes.	Recall the basic concepts of atoms, molecules and ions. Recall chemical formulas and equations. Recall knowledge of covalent, ionic and metallic bonding and properties. Recall the definition of a wave.	Hydrocarbons in the modern world	Hydrocarbon Monomer Saturated Polymer Viscosity Alkanes Alkenes Homologous Cracking Fermentation	Reading for meaning. Opportunities to share related news stories.

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Spring Term (Halt term 3)	**<u>Paper 2 Physics:</u>** <u>Waves</u>	Describe the difference between longitudinal and transverse waves. Describe wave motion in terms of their amplitude, wavelength, frequency and period. Describe a method to measure the speed of sound waves in air. Describe in detail how to use a ripple tank to investigate and calculate wavelength, wave speed and frequency (RP20). Describe the electromagnetic spectrum as a continuous spectrum of transverse wave radiation that travel through a vacuum at the same speed. **Explain why different substances may absorb, transmit, refract or reflect electromagnetic waves in ways that vary with wavelength.** Describe and construct ray diagrams to illustrate reflection and refraction of a wave at the boundary between two different media. Describe in detail why the amount of IR radiation absorbed or radiated by a surface, depends on the nature of the surface (RP21). Draw conclusions from given data about the risks and consequences of exposure to radiation.	Recall types and basic properties of waves. Recall wave terminology such as wavelength, frequency, amplitude and wave speed. Recall basics on wave behaviour such as reflection, refraction and diffraction.	Uses of EM waves data interpretation Black body radiation graph interpretation	Longitudinal Transverse Wavelength Amplitude Frequency Period Reflection Refraction Electromagnetic spectrum Infrared Ultrasound	Reading for meaning. Opportunities to share related news stories.
Spring Term (Halt term 3)	**<u>Paper 2 Biology:</u>** <u>Ecology</u>	Define the terms: organism, habitat, population, community and ecosystem and suggest how they relate to each other. Define the term interdependence and why it is important in a community of organisms. Describe what an abiotic and biotic factor is and give examples.	Recall knowledge of plant cellular structures and functions. Recall adaptations and transportation of water and dissolved sugars in plants.	Biodiversity data interpretation Predator prey relationships	Ecosystem Habitat Population Community Biodiversity Producer Decomposer Competition Adaptation	Students should have an understanding the impact of human activities on the organisation of animals and plants, including habitat destruction, pollution, climate

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		Identify and explain adaptations organisms have for the habitat they live in. Define the term producer, primary, secondary and tertiary consumer and identify them in food chains. Describe how to use a quadrat and transect to determine the distribution and abundance of species in an area. Measure population size using sampling techniques and plan an investigation into the effect of a factor on species distribution (RP7). Describe the main stages of the carbon and water cycle. Describe and explain why having high biodiversity in an ecosystem is important in keeping it stable. Describe the impact on resources that a rapidly growing human population will have and why levels of pollution will increase. Describe and explain how pollution occurs in water, on land and in the air. Describe what a peat bog is. Describe what deforestation and explain is and why it happens.	Recall knowledge on ecosystems and habitats. Recall knowledge of feeding relationships and the interdependence with communities. Recall knowledge on the human impact on ecosystems and the importance of maintaining biodiversity. Recall the composition of the earth's current atmosphere and how it changed over time,		Interdependence Abiotic Biotic	change, and conservation efforts. Students should recognise the importance of preserving biodiversity and ecosystems.

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Spring Term (Halt term 4)	**Paper 2 Chemistry:** Chemistry of the Earth's Atmosphere	State the composition of the atmosphere and describe how the atmosphere changed over time. Describe the greenhouse effect in terms of how greenhouse molecules interact with short and long wave radiation. Describe four possible effects of climate change and the environmental implications. Describe and explain how carbon monoxide, carbon particles (also called soot and particulates), sulfur dioxide and oxides of nitrogen are produced by burning fuels and the problems caused.	Recall knowledge on environment impact caused by humans and pollution and its effects. Recall knowledge on elements and the periodic table. Recall knowledge on the properties of acids and bases. Recall knowledge on the use of measuring instruments and how to analyse results.	The future of the atmosphere	Atmosphere Greenhouse gases Climate change Global warming Fossil fuels Combustion Carbon footprint Particulates	Reading for meaning. Opportunities to share related news stories.
Spring Term (Halt term 4)	**Paper 2 Chemistry:** Chemical analysis	State what is meant by pure and impure substance. State what a formulation and identify formations from information given. Describe and explain in detail how paper chromatography can be used to separate and tell the difference between coloured substances and calculate Rf values (RP12). Describe the test and results for hydrogen, oxygen, carbon dioxide, and chlorine.		Formulations you didn't know you used.	Formulation Impure Precipitate Qualitative Quantitative	
Spring Term (Halt term 4)	**Paper 2 Physics:** Magnetism	Describe the difference between permanent and induced magnets. Describe how to plot the magnetic field pattern of a magnet using a compass. Describe how the magnetic effect of a current can be demonstrated. Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field). **Describe Fleming's left-hand rule.**	Recall basic properties of magnets and knowledge of magnetic field lines. Recall knowledge on how electric currents create magnetic fields of a conducting wire.	Reading and improving methods Uses of electromagnets	Magnetic field Solenoid Motor effect Electromagnet Induced Permanent magnet Transformer Core	Reading for meaning. Opportunities to share related news stories.

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		Apply the equation: [Force = Magnetic flux density x current x length of wire]. **Explain how the force on a conductor in a magnetic field causes the rotation of the coil in an electric motor.**	Recall definitions and types of natural resources eg renewable and non-renewable. Recall extraction processes from the earth. Recall environmental impact associated with resources extraction and waste.			
Spring Term (Halt term 4)	**<u>Paper 2 Chemistry:</u>** <u>Using Resources</u>	Describe the difference between finite and renewable resources. State examples of natural products that have been replaced by synthetic products. Describe the differences between potable water, pure water, salty water and ground water. Describe the steps taken to sterilise and produce potable water in the UK. Describe in detail how to analysis and purification of water samples from different sources, including pH, dissolved solids and distillation (RP13). **Describe the processes of extracting copper by bioleaching and phytomining.** **Explain how scrap iron can extract copper from solutions and electrolysis.** Describe the stages in a life cycle assessment. Describe and explain the process of recycling and reusing and why is important.		Recycling rates of different materials.	Potable water Desalination Bioleaching Corrosion Alloy Phytomining Ore Life cycle assessments	Reading for meaning. Opportunities to share related news stories.

Key Assessments – Year 11 Science

When	What will be assessed?	Why is this being assessed?

Half Term 1	• B3 (INFECTION AND RESPONSE), C4 (CHEMICAL CHANGES), C4 (ENERGY CHANGES), P2 (ELECTRICITY) are taught from and are continually assessed through Essential Knowledge Checks and Formative assessments, including end of unit assessments.	• Essential Knowledge Checks are our opportunity to look at the work in books and assess the learning taking place so we can address gaps in knowledge early.
Half Term 2	• In HT2 we will be teaching B4 (BIOENERGETICS), C3, P2 (ATOMIC STRUCTURE AND RADIOACTIVITY), these are continually assessed through Essential Knowledge Checks and Formative assessments, including end of unit assessments.	• To track progress and give teachers and students a clear picture of strengths and weaknesses, which can then be addressed through feedback and students' responses to feedback. •
Half Term 3	• The Mid-Year Exam will assess content covered in the year so far and year 10 through a full AQA Paper 1 in a mock exam style. • We also teach and assess B5 (HOMEOSTASIS) C6 (RATES & EQUILIBRIUM), C7 (ORGANIC CHEMISTRY), C8 (CHEMICAL ANALYSIS) and P6 (WAVES) this term, which again are assessed through Essential Knowledge checks	• The mid-year supports conversations at parents evening, and setting decisions where applicable, as well as giving students and teachers a quantitative test score so we can trach progress over time • To track progress and give teachers and students a clear picture of strengths and weaknesses, which can then be addressed through feedback and students' responses to feedback.
Half Term 4	• B5 (INHERITANCE, VARIATION & EVOLUTION), P6 (WAVES), P7 (Magnetism), and C9 (CHEMISTRY OF THE EARTH'S ATMOSPHERE) are taught this term, these units are also assessed through Essential Knowledge checks at various intervals and at the end of each topic.	• To track progress and give teachers and students a clear picture of strengths and weaknesses, which can then be addressed through feedback and students' responses to feedback.
Half Term 5	• B5 (INHERITANCE, VARIATION & EVOLUTION) , B7 (ECOLOGY) P6 (WAVES), P8 (SPACE) are taught this term, which are assessed through Essential Knowledge checks at various intervals and at the end of each topic. • External GCSE's also take place	• To track progress and give teachers and students a clear picture of strengths and weaknesses, which can then be addressed through feedback and students' responses to feedback. • AQA GCSE's act as summative assessment and entry requirements for colleges, careers etc