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| **Our Lady Queen of Peace**  Catholic Engineering College | Curriculum Overview |
| **YEAR 10 SCIENCE** | |

|  | **Knowledge & Understanding**  Links to the National Curriculum and AQA Specification Statements | | | | **Key Vocabulary** | **Cultural Capital / Enrichment Opportunities** |
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|  | **Composites**  **(Bigger Picture)** | **Components**  **(Key Concepts)** | | **Recall & Retrieval Practice Focus** |
| **Autumn Term**  **(HT1)** | **Paper 1 Biology:**  Cell Biology  Cell structure and transport  Cell Division | **Core Substantial Knowledge** | **Core Disciplinary Knowledge** | Fundamentals of cell biology, including the characteristics of living organisms, the levels of biological organisation, and the basic principles of cell theory. | Active Transport  Diffusion  DNA  Eukaryotic  Genetic material  Organelle  Organism  Osmosis  Magnification  Mitochondria  Prokaryote | Reading for meaning.  Opportunities to share related news stories.  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. |
| Describe cells as basic structural units of all organisms; adaptations of cells related to the functions; the main sub-cellular structures of Eukaryotic and Prokaryotic cells.  Describe and explain the need for cellular transportation (diffusion, osmosis, and active transport).  Describe the three main stages of the cell cycle and the process of mitosis.  Describe differences between embryonic and adult stem cells. | Understand how microscopy techniques have developed over time  Use a microscope to make observations of biological specimens and produce labelled scientific drawings (RP1).  Recognise, draw and interpret images of cells and to interpret diagrams that model diffusion and osmosis (RP2).  Use models and analogies to develop explanations of how cells divide.  Evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments. |
| **Autumn Term**  **(HT 1)** | **Paper 1 Chemistry:**  Atomic Structure and the periodic table. | **Core Substantial Knowledge** | **Core Disciplinary Knowledge** | Fundamental concepts in atoms, elements, compounds., including the periodic table, chemical bonding, chemical reactions, and the properties of matter. | Atom  Electron  Element  Compound  Chromatography  Crystallisation  Filtration  Distillation  Neutron  Proton  Sub-atomic particles | Reading for meaning.  Opportunities to share related news stories.  Historical development of atomic theory, from early Greek philosophers to modern scientists like Dalton, Thomson, Rutherford, and Bohr.  Understand the historical context in which the periodic table was developed, including the contributions of scientists like Mendeleev and the significance of their work in organising the elements based on their properties. |
| Describe a simple model of an atom, consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes.  Describe how the elements are arranged in the modern periodic and how their position relates to their atomic structure and arrangements of outer electrons.  Describe trends in properties and reactivity of elements in the same group (1, 7 and 0).  Describe, explain and give examples of the processes of separation of filtration, crystallisation, simple distillation, fractional distillation and chromatography. | Using a variety of models show an understanding of why and describe how scientific methods and theories develop over time (atoms and periodic table).  Recognise, draw and interpret an atom and its electronic structure.  Explain how testing a prediction can support or reject a new scientific idea.  Safely use of a range of equipment to separate chemical mixtures. |
| **Autumn Term**  **(HT1 & HT2)** | **Paper 1 Physics:**  Energy  Conservation and dissipation of energy  Energy transfers by heating  Energy resources | **Core Substantial Knowledge** | **Core Disciplinary Knowledge** | Awareness of different mechanisms of heat transfer, including conduction, convection, and radiation, is beneficial. Students should understand how heat transfer occurs and its implications for energy transfer and thermal equilibrium. | Dissipated  Gravitational potential  Heat capacity  Kinetic energy  Specific Heat  Spring constant  Transfer | Reading for meaning.  Opportunities to share related news stories.  Potential opportunity for project/visit linked to renewable energy.  Students should have an awareness of technological innovations and advancements in energy production, storage, and distribution, such as smart grids, energy-efficient appliances, electric vehicles, and grid-scale energy storage systems. |
| Describe energy changes in a system involving heating, doing work using forces, and calculating the stored energies and energy changes involved.  Describe conservation of energy in a closed system, dissipation and calculate the efficiency for any energy transfers.  Describe how to determine the specific heat capacity of a material (RP14).  Distinguish between energy resources that are renewable and energy resources that are non-renewable and evaluate their impact on the environment. | Give examples of ways in which a model can be tested by observation or experiment.  Describe how to determine the specific heat capacity of a material (RP14). |
| **Spring Term**  **(HT 2)** | **Paper 1 Biology:**  Organisation  Organisation and the digestive system  Organisation in Animals and Plants | **Core Substantive Knowledge** | **Core Disciplinary Knowledge** | Students should have a strong grasp of fundamental biological principles, including the characteristics of living organisms, levels of biological organisation, and basic cell biology concepts.  Students should be familiar with the concept of tissues and organs, including the types of tissues (e.g., epithelial, connective, muscular, nervous) and their functions in various organ systems. | Students should have a strong grasp of fundamental biological principles, including the characteristics of living organisms, levels of biological organisation, and basic cell biology concepts. | Students should have a strong grasp of fundamental biological principles, including the characteristics of living organisms, levels of biological organisation, and basic cell biology concepts. |
| State and arrange the different levels of organisation into order.  Describe the need for transport systems in multicellular organisms, including plants.  Describe and explain the relationship between the structure and function of the human digestive system.  Describe and explain the role of carbohydrates, proteins, nucleic acids and lipids as key biological molecules, linking the role of enzymes and factors affecting the rate of enzymatic reactions.  Describe and explain the relationship between the structure and function of the human circulatory system. | Use of models to explain enzyme action.  State the reagents used in food tests for starch, glucose, protein and fat and recall what a positive result looks like (RP3).  Describe and explain the effects of changing temperature and pH on enzyme action (RP4).  Evaluate the risks related to use of blood products.  Interpret data about risk factors for specified diseases.  Evaluate methods of treatment bearing in mind the benefits and risks associated with heart treatments.  Observation and drawing of a cross section of leaf.  Measure the rate of transpiration by the uptake of water.  Investigate the distribution of stomata and guard cells. |
| **Spring Term**  **(HT3)** | **Paper 1 Chemistry:**  Bonding, Structure & Properties  Ionic bonding  Covalent bonding  Metallic bonding | **Core Substantive Knowledge** | **Core Disciplinary Knowledge** | Students should understand the basic structure of the atom, including the arrangement of subatomic particles (protons, neutrons, and electrons) and their charges. They should also be familiar with the concept of atomic number and mass number.  Knowledge of the periodic table and its organisation is essential. Students should understand how elements are arranged based on atomic number, and they should be able to identify groups, periods, and trends such as atomic radius and electronic structure. | Alloy  Covalent  Electrostatic  Graphene  Intermolecular  Ionic lattice  Metallic  Limitation | Reading for meaning.  Opportunities to share related news stories.  Students should recognise the practical applications of structure and bonding concepts in everyday life, including in materials science, pharmaceuticals, agriculture, and environmental science. Cultural capital involves understanding how chemistry influences various aspects of modern society. |
| Describe and explain the three types of strong chemical bond: ionic, covalent and metallic.  Describe and explain the structures, bonding and properties of ionic compounds.  Describe and explain bulk properties of materials related to bonding and intermolecular forces.  Describe and explain bonding of carbon leading to the vast array of natural and synthetic organic compounds that occur due to the ability of carbon to form families of similar compounds, chains and rings.  Describe and explain the structures, bonding and properties of diamond, graphite, fullerenes and graphene. | Using models visualise and represent 2D and 3D forms including two dimensional representations of 3D objects linking limitations.  Recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding.  Recognise substances as giant ionic structures from diagrams showing their bonding.  Recognise substances as metallic giant structures from diagrams showing their bonding. |
| **Spring Term**  **(HT3)** | **Paper 1 Physics:**  Particle Model and Matter | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Knowledge of the three states of matter—solid, liquid, and gas—is necessary. Students should understand the characteristics of each state and the transitions between them, including melting, freezing, evaporation, condensation, and sublimation. | Internal  Density | Reading for meaning.  Opportunities to share related news stories.  Students should recognise the practical applications of the particle model and matter concepts in fields such as materials science, chemical engineering, and nanotechnology. |
| Describe and explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules.  Describe how, when substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved.  Distinguish and explain difference between specific heat capacity and specific latent heat. | Using models to describe the arrangements and motions of molecules in solids, liquids and gas phases to their densities.  Describe in detail how to determine the density of regularly and irregularly shaped objects (RP17).  Interpret heating and cooling graphs that include changes of state. |
| **Spring Term**  **(HT3)** | **Paper 1 Biology:**  Infection and Response  Communicable disease  Preventing and treating disease  Non-Communicable disease | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Understanding of human health and disease, including risk factors, prevention strategies, and the impact of lifestyle choices on health, contributes to understanding the broader implications of infection and response. | Antigen  Antitoxin  Antibody  Efficacy,  Pathogen  Placebo  Vector | **Epidemiology:** The History of disease and epidemics |
| Describe and explain the relationship between health and disease.  Distinguish the difference between communicable and non-communicable diseases.  Describe what a pathogen is and examples found in animals and plants, linking the transmission and treatment of bacteria, virus, fungi and protist.  Describe and explain the body defence against pathogens and the role of the immune system.  Describe the process of discovery and development of new medicines. | Describe and explain specified examples of the technological applications of science.  Describe and evaluate, with the help of data, methods that can be used to develop medicines, linking that recommendations can only be published only after scrutiny by peer review.  Evaluate the global use of vaccination in the prevention of disease. |
| **Spring Term**  **(HT 4)** | **Paper 1 Chemistry:**  Chemical Changes  Reactivity series  Making Salts  Electrolysis | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Students should have a strong grasp of fundamental chemistry principles, including atomic structure, chemical bonding, the periodic table, and balancing equations. | Displacement  Neutralisation  Electrolysis  Oxidation  Reduction | Reading for meaning.  Opportunities to share related news stories. |
| Determine the empirical formulae form the ration of atoms of different kinds.  balance chemical equations, ionic equations and state symbols.  Identify and give a description of common gases.  Describe and explain the chemistry of acids; reactions with some metals and carbonates  Describe and explain pH as a measure of hydrogen ion concentration and its numerical scale  Describe and explain electrolysis of molten ionic liquids and aqueous ionic solutions  Describe and explain reduction and oxidation in terms of loss or gain of oxygen. | Using apparatus to investigate the mixing of reagents to explore chemical changes and/or products.  Using apparatus to investigate pH changes when a strong acid neutralises a strong alkali.  Measure the pH of different acids at different concentrations |
| **Spring Term**  **(HT 4)** | **Paper 1 Chemistry:**  Energy Changes | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Understanding of the basic concepts of chemical reactions, including reactants, products, chemical equations, and the conservation of mass, is essential. | Catalyst  Endothermic  Exothermic  Thermal decomposition | Reading for meaning.  Opportunities to share related news stories.  Students should recognise the relationship between energy changes, bond breaking, and bond forming during reactions, linking to real life uses. |
| Describe bond breaking, bond making linking activation energy.  Draw simple reaction profiles (energy level diagrams) for exothermic and endothermic reactions. | Describe in detail how to Investigate the variables that affect temperature changes in reacting solutions such as acid + metal, Acid + carbonate, neutralisation and displacement (RP10). |
| **Summer Term**  **(HT4)** | **Paper 1 Physics:**  Atomic Structure  Radioactivity | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Students should have a strong grasp of the basic structure of the atom, including the arrangement of subatomic particles (protons, neutrons, and electrons) and their charges. They should also understand the concept of atomic number and mass number. | Alpha  Beta  Count-rate  Decay  Gamma  Geiger-Miller tube  Half-life  Ionisation  Irradiation  Isotopes  Nuclear equation  Penetration  Radioactive contamination | Reading for meaning.  Opportunities to share related news stories.  Students should recognise the environmental impacts of radioactive contamination and the challenges associated with radioactive waste management and disposal. This should involve the understanding the risks and regulations associated with nuclear facilities and activities. |
| Describe and explain the differences in numbers of protons, and neutrons related to masses and identities of nuclei, isotope characteristics and equations to represent changes.  Describe and explain ionisation, absorption or emission of radiation related to changes in electron orbits.  Describe and explain radioactive nuclei, emission of alpha, beta and gamma-rays, related to changes in the nuclear mass and/or change  Describe and explain radioactive materials, half-life, irradiation, contamination and their associated hazardous effects, and waste disposal | Using historical information models and data to show an understanding of why and describe how scientific methods and theories develop over time. |
| **Summer Term**  **(HT 5)** | **Paper 1 Biology:**  Bioenergetics  Photosynthesis  Respiration | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Students should have a strong grasp of cell structure and function, including the anatomy of typical animal and plant cells, the functions of organelles such as mitochondria and chloroplasts, and the basics of cellular respiration and photosynthesis. | Aerobic  Anaerobic  Fermentation Limiting Factor  Metabolism  Oxygen Debt  Photosynthesis  Respiration  Synthesise | Reading for meaning.  Opportunities to share related news stories. |
| Describe what the process of photosynthesis.  Describe what the process of aerobic respiration and anaerobic respiration in animals and in plants.  Describe the changes that happen to heart rate, breathing rate and breathing volume when you exercise.  Describe what metabolism is and the chemical reactions involved. | Draw and interpret graphs which demonstrate the effects of different factors on the rate of photosynthesis.  Describe and explain in detail the effects of changing light intensity on the rate of photosynthesis (RP5). |
| **Summer Term**  **(HT 5)** | **Paper 1 Chemistry:**  Quantitaive Chemistry | Core Substantial Knowledge | **Core Disciplinary Knowledge** |  | Uncertainty | Students should recognise the industrial applications of quantitative analysis in fields such as pharmaceuticals, chemical manufacturing, environmental monitoring, and quality control. |
| State the law of conservation of mass.  Describe and calculate uncertainty.  Calculate the relative atomic mass and relative formula mass.  Define the Avogadro constant and state what one mole of a substance means relating to atoms, molecules and ions.  Calculate the mass of solute in a volume of solution when you know the concentration. | Investigate mass changes using various apparatus.  Represent the distribution of results and make estimations of uncertainty  Use the range of a set of measurements about the mean as a measure of uncertainty. |
| **Summer Term**  **(HT5)** | **Paper 1 Physics:**  Electricity  Electric circuits  Electricity in the home | Core Substantial Knowledge | **Core Disciplinary Knowledge** | Understanding that matter is composed of atoms, which contain positively charged protons, negatively charged electrons, and neutral neutrons. They should know that like charges repel each other, and opposite charges attract.  Familiarity with the basic components of an electric circuit, including resistors, capacitors, diodes, and switches. | Alternating current Amperes  Component  Coulomb  Current  Diode  Direct current  Direct proportion  Earth wire  Ohms  Resistor  Volt  Watt | Reading for meaning.  Opportunities to share related news stories.  Students should understand the importance of electrical safety practices, including the hazards of electric shock, fire, and electrical overloads. Students should recognise safety symbols, precautions, and procedures for working with electrical equipment and circuits. |
| Draw and interpret circuit symbols and diagrams.  Describe the difference between series and parallel circuits.  Explain that, for some resistors, the value of R remains constant but that in others it can change as the current changes.  Explain the difference between direct and alternating potential difference.  Explain why the National Grid system is an efficient way to transfer energy. | Design and use of a circuit to measure the resistance of a component by measuring the current through, and potential difference across, the component.  Use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature (RP16)  Using apparatus to investigate the relationship between the resistance of a thermistor and temperature.  Using apparatus investigate the relationship between the resistance of an LDR and light intensity. |

| **Key Assessments** | | | |
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|  | **What will be assessed?** | **Why is this being assessed?** | **How will results be stored & students receive feedback?** |
| **HT1**  **WC 14 Oct** | **AO1 Essential Knowledge Check**  **Substantial:**  Biology Unit 1 Cell Biology  **Substantial:**  Chemistry Unit 1 Atomic Structure & The Periodic Table  **Disciplinary:**  **Practical Skills**   1. Required Practical ‘Microscopy’ 2. Required Practical ‘Osmosis’   **25 marks each assessment** | To gauge a clear understanding on how well our students understand specific concepts that are being taught.  Have a clear idea of progression for both substantive and disciplinary knowledge overtime | **Storage:**  Internal data tracker – This consists of an electronic QLA (Question Level Analysis) collection process to clearly identifying area of strengths and areas of improvements. This will help with future planning, and any remedial staff and student actions.  **Student Feedback:**  Question Level Analysis tracking sheets with bespoke follow up tasks. |
| **HT2**  **WC 6 Dec** | **AO1 Essential Knowledge Check**  **Substantial:**  Physics Unit 1 Energy  **Substantial:**  Biology Unit 2 Organisation  **Disciplinary:**  **Practical Skills**   1. Required Practical 4 ‘Effects of changing temperature and pH on enzyme action’. 2. Required Practical 3 ‘Reagents used in food tests for starch, glucose, protein and fat and recall what a positive result looks like’. 3. Required Practical 5 ‘Specific Heat Capacity’   **25 marks each assessment** |
| **HT3**  **WC 8 Jan** | **Mid-Year Assessment**  **Paper 1**  **Substantial:**  Biology Unit 1 Cell Biology  Biology Unit 2 Organisation  **Substantial:**  Chemistry Unit 1 Atomic Structure & The Periodic Table  **Substantial:**  Physics Unit 1 Energy  **50mins in total** |
| **HT4**  **WC 25 Mar** | **AO1 Essential Knowledge Check**  **Substantial:**  Chemistry Unit 2 Bonding, Structure and Properties  **Substantial:**  Physics Unit 3 Particle Model and Matter  **Disciplinary:**  **Practical Skills**   1. Required Practical 17 ‘Determine the density of regularly and irregularly shaped objects’.   **25 marks each assessment** |
| **HT5**  **WC 28 April** | **AO1 Essential Knowledge Check**  **Substantial:**  Biology Unit 3 Infection & Response  **Substantial:**  Chemistry Unit 4 Chemical Changes  **Disciplinary:**  **Practical Skills**   1. Required Practical ‘Preparation of a dry soluble salt’ 2. Required Practical ‘Investigate what happens when aqueous solutions are electrolysed using inert electrodes.   **25 marks each assessment** |  |  |
| **HT5**  **WC 20 May** | **AO1 Essential Knowledge Check**  **Substantial:**  Biology Unit 4 Bioenergetics  **Substantial:**  Chemistry Unit 5 Energy Changes  **Substantial:**  Physics Unit 4 Atomic Structure  **Disciplinary:**  **Practical Skills**   1. Required practical 6 ‘Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed. 2. Required practical 10 ‘Investigate the energy changes in a reaction’.   **25 marks each assessment** | To gauge a clear understanding on how well our students understand specific concepts that are being taught  Have a clear idea of progression for both substantive and disciplinary knowledge overtime | **Storage:**  Internal data tracker – This consists of an electronic QLA (Question Level Analysis) collection process to clearly identifying area of strengths and areas of improvements. This will help with future planning, and any remedial staff and student actions  **Student Feedback:**  Question Level Analysis tracking sheets with bespoke follow up tasks. |
| **HT6**  **WC 17 Jun** | **End of Year Exams**  Biology Paper 1  Chemistry Paper 1  Physics Paper 1  Combined Science 1hr 15mins each (70 marks each)  **Separate Sciences 1hr 45mins (100 marks each) Only if completed.** | To identify students specific needs early with a full AQA Paper 1 assessment type.  Enable students to experience the ‘real’ exam situations they are preparing for in Yr 11.  Adjust instruction and set appropriate goals to close their learning gaps in preparation for their rehearsal exams in December of Y11.  Track the effectiveness of their intervention and instruction  Monitor student progress in preparation for the external exams | **Storage:**  Internal data tracker – This consists of an electronic QLA (Question Level Analysis) collection process to clearly identifying area of strengths and areas of improvements. This will help with future planning, and any remedial staff and student actions  **Student Feedback:**  Question Level Analysis tracking sheets with bespoke follow up tasks. | |