Satit Prasarnmit
International Programme

Curriculum Pathways

Science Department

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Contents

Department Details	Assessment Types
Subject: Science Head of Department: Shalene (Lene) Sankhagowit Head of Department Email: shalene.sa@spip.in.th Subject Teachers: Ionel Dinu, Arti Duseja,Sahiba Jaggi, George Mortley,Christopher Terry, Phillip Tran and Aidan Williams	Assessment Type 1: Classwork and Homework Assessment Type 2: Topic Quizzes Assessment Type 3: Assignments (Projects and Presentations) Assessment Type 4: Unit Tests Assessment Type 5: Summative (End of Year Exam / Year 9 Checkpoint)

Year	Term	Unit(s) of Work	Core Knowledge & Concepts
7 KS3	1	[1] Cells [2] Materials and their Structure [3] Forces and Energy [4] Grouping and Identifying Organisms	Students will ● Study how the structures of organisms relate to their functions, starting with cells that all organisms are made of and expanding to tissues, organs and organ systems. ● Identify and describe the functions of cell structures, show the structures of some specialised cells relating to their functions, and compare and contrast the structures of plant and animal cells. ● Learn that all matter is made of atoms and describe a vacuum as a space devoid of matter. ● Know that each different type of atom is a different element, grouped as either a metal or non-metal, and presented on the Periodic Table in an order. ● Describe the differences between elements, compounds and mixtures, and use the particle model to represent them. ● Describe the three states of matter in terms of the arrangement, separation and motion of particles. ● Describe changes in energy that are a result of an event or process. ● Describe gravity as a force of attraction between any two objects and describe how the size of the force is related to the masses of the objects. ● Understand that there is no air resistance to oppose movement in a vacuum. ● Study life processes by first describing the seven characteristics of living organisms and then discussing for classifying viruses as living or nonliving. ● Define the term species and use and construct dichotomous keys to classify species and groups of related organisms.

	2	[5] Properties of Materials [6] Earth Physics [7] Microorganisms in the Environment	Students will ● Understand that all substances have chemical properties and physical properties. ● Understand that acidity or alkalinity of a substance is a chemical property, is measured by pH and can be distinguished using indicators. ● Use tests to identify hydrogen, carbon dioxide and oxygen gases. ● Describe common differences between metals and non-metals, referring to their physical properties. ● Describe the vibration of particles in a sound wave, explain why sound does not travel in a vacuum and explain echoes in terms of the reflection of sound waves. ● Describe the model of plate tectonics and how earthquakes, volcanoes and mountains occur near the boundaries of tectonic plates. ● Explain how solar and lunar eclipses happen. ● Know and describe the ecological role some microorganisms have as decomposers, as well as construct and interpret food chains and webs which include microorganisms as decomposers.
	3	[8] Changes to Materials [9] Electricity	Students will ● Identify whether a chemical reaction has taken place through observations and use the particle model to describe chemical reactions. ● Study types of chemical reactions, including precipitation and neutralisation reactions. ● Use a simple model to describe electricity as a flow of electrons around a circuit and distinguish the electron flow through electrical conductors and insulators. ● Know how to measure the current in a series circuit, describe how adding components into a series circuit can affect the current and use diagrams and conventional symbols to represent various circuit components.

8 KS3	1	[1] Respiration [2] Properties of materials [3] Forces and Energy [4] Ecosystems	Students will ● Describe how the structure of the human respiratory system is related to its function of gas exchange, and understand the difference between breathing and respiration. ● Describe the components of blood and their functions and describe the diffusion of oxygen and carbon dioxide between blood and the air in the lungs. ● Understand that the concentration of a solution relates to how many particles of the solute are present in a volume of the solvent. ● Describe how paper chromatography can be used to separate and identify substances in a sample. ● Calculate speed and interpret and draw simple distance-time graphs. ● Describe the effects of balanced and unbalanced forces on motion. ● Identify and calculate turning forces. ● Explain that pressure is caused by the action of a force, exerted by a substance, on an area. ● Identify different ecosystems on the Earth, recognising the variety of habitats that exist within an ecosystem. ● Describe the impact of bioaccumulation of toxic substances and new and/or invasive species on an ecosystem.

	2	[5] Materials and cycles on Earth [6] Light [7] Diet and Growth	Students will ● Describe the Rutherford model of the structure of an atom, noting the relative charge of sub-atomic particles and that the electrostatic attraction between positive and negative charge holds together individual atoms. ● Know that purity is a way to describe how much of a specific chemical is in a mixture. ● Understand that there is evidence that the Earth's climate exists in a cycle between warm periods and ice ages, and that the cycle takes place over long time periods. ● Describe the difference between climate and weather and understand that the Earth's climate can change due to atmospheric change. ● Identify renewable resources and non-renewable resources, and describe how humans use them. ● Describe reflection at a plane surface using the law of reflection, and describe refraction of light at the boundary between air and glass or air and water in terms of change in speed. ● Know that white light is made of many colours that can be dispersed, using a prism, and describe how colours of light can be added, subtracted, absorbed and reflected. ● Describe a galaxy in terms of its constituents and describe the characteristic and formation of asteroids. ● Identify the constituents of a balanced diet for humans and describe the functions of these nutrients. ● Discuss how human growth, development and health can be affected by lifestyle. ● Identify ball-and-socket and hinge joints, and explain how antagonistic muscles move the bones at a hinge joint.

	3	[8] Chemical reactions [9] Magnetism	Students will ● Use word equations to describe reactions. ● Know that some processes and reactions are endothermic or exothermic, and this can be identified by temperature change. ● Describe the reactivity of metals with oxygen, water and dilute acids. ● Know that reactions do not always lead to a single pure product and that sometimes a reaction will produce an impure mixture of products. ● Describe how the solubility of different salts varies with temperature. ● Understand that some substances are generally unreactive and can be described as inert. ● Describe a magnetic field, and understand that it surrounds a magnet and exerts a force on other magnetic fields. ● Know that the reason the Earth has a magnetic field is that the core acts as a magnet. ● Describe how to make an electromagnet, know some applications of electromagnets and investigate factors that change the strength of an electromagnet.

9 KS3	1	[1] Photosynthesis and The Carbon Cycle [2] Properties of Materials [3] Forces and Energy [4] Maintaining Life [5] Reactivity	Students will ● Know that plants require magnesium and nitrates, to maintain healthy growth and life processes. ● Know that photosynthesis occurs in chloroplasts and is the process by which plants make carbohydrates, as well as describe the carbon cycle. ● Describe the historical and predicted future impacts of climate change, including extinction. ● Describe the consequences of asteroid collision with the Earth. ● Understand that the structure of the Periodic Table is related to the atomic structure of the elements and the Periodic Table that can be used to predict an element's structure and properties. ● Understand the formation of a covalent bond and an ionic bond, as well as describe molecules and ions. ● Know that elements and compounds exist in structures, and this influences their physical properties. ● Use density to explain why objects float or sink in water. ● Describe the difference between heat and temperature. ● Know that energy is conserved, meaning it cannot be created or destroyed. ● Know that thermal energy will always transfer from hotter regions or objects to colder ones, and describe thermal transfer by the processes of conduction, convection and radiation. ● Explain cooling by evaporation. ● Describe the pathway of water and mineral salts from the roots to the leaves in flowering plants; describe the structure of the human excretory system and its function. ● Discuss how the development of a foetus is affected by the health of the mother. ● Use word equations and symbol equations to describe reactions.

			● Identify examples of displacement reactions and predict products. ● Describe how to prepare some common salts by the reaction of metals with acids, and metal carbonates with acids, and purify them, using filtration, evaporation and crystallisation. ● Understand that in chemical reactions mass and energy are conserved.
	2	[6] Sound and Space [7] Genes and Inheritance [8] Rates of Reactions [9] Electricity [10] Prepare for Mocks and Checkpoint	Students will ● Draw and interpret waveforms, recognising the link to loudness and pitch, and use waveforms to show how sound waves interact to reinforce or cancel each other. ● Describe the evidence of the moon through collision theory. ● Explain the movement of tectonic plates in terms of convection currents and explain evidence for tectonic plates. ● Know that chromosomes contain genes, made of DNA, and that genes contribute to the determination of an organism's characteristics. ● Describe the process of fertilisation in producing a new combination of DNA, as well as the inheritance of sex in humans in terms of XX and XY chromosomes. ● Describe variation within a species, relating this to genetic differences between individuals, and describe the theory of natural selection and how it relates to genetic changes over time. ● Describe the effects of concentration, surface area and temperature on the rate of reaction, and explain them using the particle model. ● Know how to measure current and voltage in circuits, describing the effect of adding cells and lamps, and describe how current divides in parallel circuits. ● Calculate resistance and describe how it affects current. ● Use diagrams and conventional symbols to represent, make and compare circuits.

	3	IGCSE Foundation Course Physics: Movement and position Chemistry: Atomic structure & the Periodic Table Biology: Life processes	Students will ● Be able to describe and explain movement and position using motion graphs and some SUVAT formulae. ● Know the structure of an atom, understand the arrangement of elements in the Periodic Table that relates to their chemical properties, and be able to calculate the relative atomic mass of an element (A_r) from isotopic abundances. ● Understand the characteristics shared by living organisms, describe cell structures and their functions, understand the role of enzymes and how their function is affected by temperature and pH, describe cellular respiration and understand the processes of cellular transport.

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Department Details	Assessment Types
Subject: Biology Head of Department: Shalene (Lene) Sankhagowit Head of Department Email: shalene.sa@spip.in.th Subject Teachers: Sahiba Jaggi and Christopher Terry	Assessment Type 1: Formative (Homework and Classwork) Assessment Type 2: Practicals and Lab Reports Assessment Type 3: Assignments (Projects and Presentations) Assessment Type 4: End of Topic Assessments Assessment Type 5: Summative (Year 10: End of Unit Tests and End of Year Exam; Years 11-13: Mock Exam)

Year	Term	Unit(s) of Work	Core Knowledge & Concepts
10 IGCSE	1	Organisms and Life Processes Animal Physiology	Students will: ● Understand the characteristics shared by living organisms, describe cell structures and their functions, understand the role of enzymes and how their function is affected by temperature and pH, describe cellular respiration and understand the processes of cellular transport. ● Understand the difference between eukaryotic and prokaryotic organisms; describe the features of plants, animals, fungi, protoctists, bacteria and viruses; and understand the term 'pathogen' and know their examples. Students will: ● Describe the structure and function of the respiratory system, explain adaptations for gas exchange, and understand how exercise and smoking affects the lungs and circulatory system. ● Describe the structure of biomolecules and their digestion, and identify other constituents of a balanced diet, naming their sources, their functions and the conditions due to their deficiencies. ● Describe the structure and function of the human digestive system and understand how food is moved through the gut by peristalsis. ● Complete a number of practicals to test various samples for the presence of biomolecules. ● Understand the need for a transport system in multicellular organisms and understand the general structure of the circulatory system, including the heart and blood vessels.

	2	Animal Physiology (continued) Plant Physiology	Students will: ● Understand risk factors for developing coronary heart disease. ● Describe the composition of blood and understand the role of plasma, the adaptations of red blood cells and the immune response using white blood cells. ● Understand how organisms are able to respond to changes in their environment, describe how the central nervous system control responses and describe the structure and function of the eye. ● Describe how responses can be controlled by hormones and distinguish this from nervous control. ● Understand homeostasis and be able to describe the structure and function of the excretory system in controlling water content. ● Understand the difference between sexual and asexual reproduction, and understand the structure and functions of the male and female reproductive system (the latter including during pregnancy). Students will: ● Investigate photosynthesis and its limiting factors. ● Understand the process of photosynthesis and its importance towards plant growth, and understand how the structure of the plant leaf and stem is adapted for photosynthesis.
	3	Plant Physiology (continued)	Students will: ● Understand that plants respond to stimuli with roots and stems. ● Understand the role of auxin in the phototropic response of stems. ● Describe the differences between sexual and asexual reproduction in plants, and describe the structure of flowers to aid pollination and of seeds to aid dispersion.

11 IGCSE	1	Plant Physiology Ecology and the Environment Variation and Selection	Students will: ● Investigate photosynthesis and its limiting factors. ● Understand the process of photosynthesis and its importance towards plant growth, and understand how the structure of the plant leaf and stem is adapted for photosynthesis. ● Understand that plants respond to stimuli with roots and stems. ● Understand the role of auxin in the phototropic response of stems. ● Describe the differences between sexual and asexual reproduction in plants, and describe the structure of flowers to aid pollination and of seeds to aid dispersion. Students will: ● Understand how biotic and abiotic factors affect the population size and distribution of organisms. ● Understand feeding relationships, ways to represent them and the energy transfer involved. ● Describe the stages in the carbon cycle and in the nitrogen cycle. ● Understand human influences on the environment including use of fertilisers, pest control, pollution by sulphur dioxide and carbon monoxide and their consequences. ● Describe how glasshouses and polythene tunnels can be used to increase the yield of certain crops. Students will: ● Understand the biology of nucleus, gene and DNA, and describe the DNA and RNA molecules. ● Understand what mutation is and describe the ways mutation can occur. ● Understand the roles of mitosis and meiosis. ● Describe patterns and predict probabilities of outcomes from monohybrid crosses. ● Explain Darwin's theory of evolution by natural selection and the process of selective breeding.
	2	Variation and Selection (Continued) Microorganisms and Genetic Modification	Students will: ● Understand the roles of mitosis and meiosis. ● Describe patterns and predict probabilities of outcomes from monohybrid crosses. ● Explain Darwin's theory of evolution by natural selection and the process of selective breeding. Students will: ● Understand the role of microorganisms in various industrial, agricultural and clinical applications.
	3	Exam leave	

12 AS Level	1	Molecules, Transport and Health Membranes, Proteins, DNA and Gene Expressions Cell Structure	● Students will review the biochemistry topic that considers water, carbohydrates, lipids and proteins. They will additionally study the structure of and cellular processes involving nucleic acids. ● The relevance of diet to health and the cardiovascular system, in particular, will be discussed at length. Important skills to be developed include analysing data and making inferences towards health risks. ● The unit includes cell membrane transport processes, such as diffusion and active transport, proteins, enzymes and protein synthesis. ● Students will be expected to understand the importance of the genetic code and how mutations can result in disorders. We will consider techniques for genetic screening and the associated ethical and social issues. ● The first topic towards Paper 2 begins with the cell as the basic unit of all living organisms
	2	Reproduction and Development Plant Structure and Function, Biodiversity and Conservation	● Students will study cell division, formation of gametes, fertilisation and the continuity of life. ● The roles of stem cells, gene expression and the influence of the environment and epigenetics on phenotypes will be discussed. ● Students will study the structure and functions of plant cells, and how plants may be exploited by humans for fibres and as sources of drugs ● The unit considers the diversity of life and how biodiversity can be measured. It ends with an account of reasons for changes in populations over time and methods for the conservation of endangered species and their genetic diversity.
	3	Exam Leave Foundation Course	● Students will review the topics in energy and environment that describes the biochemistry of photosynthesis as where energy first enters a food chain. Key terms in ecology and effects of biotic and abiotic factors on populations will be discussed.

13 A Level	1	Energy Flow, Ecosystems and the Environment Microbiology, Immunity and Forensics Respiration and Muscles	● The carbon cycle and its disruption that may lead to climate change will be discussed at length. ● Students will also consider changes that occur in populations, both in the short term and long term, as a result of mutation and natural selection. ● The diversity and features of microorganisms will be introduced; how hosts respond to infections by pathogens will be discussed. ● Microorganisms will also be considered for their role in biotechnology. The techniques and applications of polymerase chain reaction (PCR) and gel electrophoresis will be studied. ● This unit includes an opportunity to develop mathematical skills that include tabulation and graphical treatment of data, understanding the principles of sampling, exponential and logarithmic functions and the use of statistics. ● This topic considers energy within organisms and how energy is made available for processes, including muscle contraction.
	2	The Internal Environment Coordination, Response and Gene Technology	● Students will consider some aspects of maintenance of the internal environment, with specific references to kidney function and the mode of action of hormones. ● Coordination in mammals is considered through the study of the nervous system and the effect of drugs on neurone communication. The role of phytochrome for coordination in plants will be discussed. ● Modern aspects of gene technology are studied; techniques to be discussed include microarrays and bioinformatics.
	3	Exam Leave	

Department Details	Assessment Types
Subject: Chemistry Head of Department: Shalene (Lene) Sankhagowit Head of Department Email: shalene.sa@spip.in.th Subject Teachers: Arti Duseja, Shalene Sankhagowit and Phillip Tran	Assessment Type 1: Formative (Homework and Classwork) Assessment Type 2: Practicals and Lab Reports Assessment Type 3: Assignments (Projects and Presentations) Assessment Type 4: End of Topic Assessments Assessment Type 5: Summative (Year 10: End of Unit Tests and End of Year Exam; Years 11-13: Mock Exam)

Year	Term	Unit(s) of Work	Core Knowledge & Concepts
10 IGCSE	1	Principles of Chemistry States of Matter Elements, Compounds and Mixtures. Atomic Structure The Periodic Table Formulae, Equations and Amount of Substance Bonding and Structure Electrolysis	Students will ● Understand the three states of matter in terms of the arrangement, movement and energy of the particles, and understand the interconversions between the three states of matter. ● Describe experimental techniques for the separation of mixtures: simple distillation, fractional distillation, filtration, crystallisation, paper chromatography. ● Know the structure of the atom and isotopes, atomic orbitals, electronic configurations, ionisation energies. ● Understand how elements are arranged in the Periodic Table and the classification of elements based on their properties. ● Write word equations and balanced chemical equations (including state symbols) and understand how to carry out calculations involving amount of substance, relative atomic mass and relative formula mass. ● Study ionic bonding, covalent bonding, shapes of molecules, metallic bonding and solid lattices. ● Investigate electrolysis, using inert electrodes, of molten compounds and aqueous solutions and to predict the product. ● Write ionic half equations representing the reactions at the electrodes during electrolysis.

	2	Inorganic Chemistry The Alkali Metals and Halogens. Gases in the Atmosphere Reactivity Series Extraction and Uses of Metals	Students will ● Understand the similarities and differences of alkali metals with air and water. ● Know the colours, physical states and trends in physical properties of the halogens, and understand the reactions and reactivity of halogens. ● Describe the combustion of elements in oxygen and formation of carbon dioxide from the thermal decomposition of metal carbonates. ● Understand how metals can be arranged in a reactivity series based on their reactions with water, acids, metal and metal oxides. ● Understand oxidation, reduction, redox, oxidising agent and reducing agent. ● Understand metal extraction process and how it's related to its position in the reactivity series. ● Understand alloy and its properties.
	3	Acids, Alkalis and Titrations Acids, Bases and Salt Preparations	Students will ● Describe the use of litmus, phenolphthalein, methyl orange and universal indicator to distinguish between acidic and alkaline solutions. ● Know the general rules for predicting solubility of ionic compounds in water. ● Describe the reaction of acids with metals, bases and metal carbonates to form salts.

11 IGCSE	1	Physical Chemistry Energetics Rate of Reaction Reversible Reactions and Equilibria	Students will ● Explain exothermic and endothermic reactions, including with energy level diagrams. ● Calculate the molar enthalpy change from the heat energy change. ● Know that a catalyst is a substance that increases the rate of a reaction, by providing an alternative pathway with lower activation energy, but is chemically unchanged at the end of the reaction. ● Draw and explain reaction profile diagrams showing enthalpy change and activation energy. ● Know that some reactions are reversible and describe some reversible reactions, and know the characteristics of a reaction at dynamic equilibrium. ● Know the effect of changing either temperature or pressure on the position of equilibrium in a reversible reaction.

	1-2	Organic Chemistry Introductory Organic Chemistry Crude Oil Alkanes Alkenes Alcohols	Students will ● Know what is meant by the terms hydrocarbon, homologous series, functional group and isomerism. ● Understand how to name compounds using the IUPAC rules and how to write the possible structural and displayed formulae of an organic molecule given its molecular formula. ● Understand how to classify reactions of organic compounds such as substitutions, addition and combustion. ● Know that crude oil is a mixture of hydrocarbons and describe how fractional distillation separates crude oil into fractions. ● Know the names, descriptions and uses of the main fractions obtained from crude oil: refinery, gasoline, kerosene, diesel, fuel oil and bitumen. ● Know that a fuel is a substance that, when burned, releases heat energy and know the possible products of complete and incomplete combustion of hydrocarbons with oxygen in the air. ● Know the general formula of alkanes and explain why they are classified as saturated hydrocarbons. ● Describe the reactions of alkanes with halogens in the presence of UV radiation, limited to mono-substitution. ● Study alkenes and their bonding; geometric isomerism; addition reactions of alkenes and their mechanisms. ● Know that alkenes contain the functional group C=C, know the general formula for alkenes and explain why alkenes are classified as unsaturated hydrocarbons. ● Know that alcohols contain the functional group –OH and examples of how they are oxidised. ● Know how ethanol is manufactured and the reasons for fermentation in the absence of air and at an optimum temperature.

	3	Organic Chemistry Carboxylic Acids Esters Synthetic Polymers Chemical Tests	Students will ● Know that carboxylic acids contain the functional group -COOH. ● Describe the reactions of aqueous solutions of carboxylic acids with metals and metal carbonates. ● Know that esters contain the functional group -COO- and that ethyl ethanoate is the ester produced when ethanol and ethanoic acid react in the presence of an acid catalyst. ● Know that esters are volatile compounds with distinctive smells and their applications. ● Know that an addition polymer is formed by joining up many small molecules called monomers. ● Understand how to draw the repeat unit of an addition polymer, including poly(ethene), poly(propene), poly(chloroethene) and poly(tetrafluoroethene). ● Understand how to deduce the structure of a monomer from the repeat unit of an addition polymer and vice versa. ● Explain problems in the disposal of addition polymers. ● Describe various tests to identify gases, cations, anions, and the presence of water, as well as to determine whether a sample of water is pure.
	3	Exam Leave	
12 AS Level	1	Structure, Bonding and Introduction to Organic Chemistry Energetics	● Students will develop the basic chemical skills of writing formulae and equations, and calculating chemical quantities. ● The study of atomic structure includes a description of *s*, *p*, and *d* orbitals and shows how electronic configurations can account for the arrangement of elements in the Periodic Table. ● Three types of strong chemical bonding are studied: ionic, covalent and metallic; shapes of molecules are also considered. These are used to explain the physical properties of substances. ● Students will study alkane and alkenes, and develop and use conventions for mechanisms in organic chemistry to represent the movement of electrons in reactions. ● Students will define, measure and calculate enthalpy changes for understanding chemical bonding.

	2	Group Chemistry, Halogenoalkanes and Alcohols	● Students will learn about intermediate types of bonding and explore the nature and effects of intermolecular forces. ● The reaction trends of Groups 1, 2 and 7 will be discussed, with redox reactions considered for reactions of halogens and their compounds. ● Students will define, measure and calculate enthalpy changes and relate to chemical bonding. ● Students will understand the ways to control the rate, directions and extent of chemical change in reactions. ● The study of organic chemistry continues here and covers halogenoalkanes and alcohols and the mechanisms of selected reactions. ● Spectroscopy is considered towards accurate and sensitive methods of analysis of chemical changes.
	3	Exam Leave Foundation Course	● The unit begins with a quantitative study of chemical kinetics that helps students extend the study of organic reaction mechanisms.
13 A Level	1	Rates, Equilibria and Further Organic Chemistry Transition Metals	● Students will be introduced to the topics of entropy and equilibria to predict quantitatively the direction and extent of chemical change. ● The equilibrium laws will be discussed and students will study the changes taking place during acid-base reactions, notably the changes to pH during titrations. ● The organic chemistry in this unit covers carbonyl compounds, and carboxylic acids and their derivatives. ● The chemical application of synthesis will be illustrated by reactions of carbonyl compounds. ● The main analytical technique learned is nuclear magnetic resonance (NMR), including coverage of magnetic resonance imaging. ● Students will study further chemistry related to redox, including transition metals. ● Cell e.m.f. and equilibrium constants will be used to predict feasibility of a chemical reaction.

	2	Organic Nitrogen Chemistry	● The organic chemistry section of this unit focuses on arenes and organic nitrogen compounds such as amines, amides, amino acids and proteins. ● Students will study isomerism, bond polarity and bond enthalpy, reagents and reaction conditions, reaction types and mechanisms. ● Students will be able to deduce information about an unknown species from analytical data such as IR spectra, mass spectra and NMR spectra. ● Various techniques for preparation and purification of organic compounds will be discussed.
	3	Exam Leave	

Department Details	Assessment Types
Subject: Physics Head of Department: Shalene (Lene) Sankhagowit Head of Department Email: shalene.sa@spip.in.th Subject Teachers: Ionel Dinu and George Mortley	Assessment Type 1: Formative (Homework and Classwork) Assessment Type 2: Practicals and Lab Reports Assessment Type 3: Assignments (Projects and Presentations) Assessment Type 4: End of Topic Assessments Assessment Type 5: Summative (Year 10: End of Unit Tests and End of Year Exam; Years 11-13: Mock Exam)

Year	Term	Unit(s) of Work	Core Knowledge & Concepts
10 IGCSE	1	Forces and Motion Electricity	Students will ● Be able to describe and explain movement and position using motion graphs and some SUVAT formulae. ● Study different types of forces and the effect of a force on the motion and shape of an object. ● Know, use and apply the relationship between momentum, mass and velocity. ● Identify the centre of gravity of a body and use the principle of moments. Students will ● Study mains electricity: using it safely, how resistance is affected by temperature, using a.c. and d.c., and important relationships involving power, current, voltage, energy transferred and time. ● Describe and understand types of circuits and the flow of current through a wire and various circuit components. ● Identify electrical conductors and insulators, and explain the accumulation and effects of electrostatic charges.

	2	Waves Energy Resources and Energy Transfer	Students will ● Explain the difference between types of waves and be able to describe them using key terms. ● Explain different behaviour of waves, including the Doppler effect. ● Know the parts of the electromagnetic spectrum and explain some of the uses and detrimental effects of electromagnetic radiation. ● Describe and quantify light reflection and refraction. ● Describe the characteristics of a sound wave and understand how they relate to the vibration of the source. Students will ● Describe energy transfers involving energy stores and use the principle of conservation of energy. ● Describe and explain thermal energy transfer as conduction, convection and radiation. ● Know and use the relationship to describe work as energy transferred and use conservation of energy to solve problems involving energy transfer. ● Describe the energy transfers involved in and compare different methods of generating electricity.
	3	Solids, Liquids and Gases	Students will ● Know the relationship of and be able to do calculations for density and for pressure. ● Describe the changes that occur during a change of state. ● Be able to calculate specific heat capacity of materials including water and some solids.
11IGCSE	1	Magnetism and Electromagnetism Radioactivity and Particles	Students will ● Know and describe properties and behaviour of magnetic substances. ● Describe magnetic field patterns around an electric current and explain the force exerted on a current-carrying wire in a magnetic field. ● Describe the induction of a voltage in a conductor moving through a magnetic field and explain the use of transformers, with calculation. Students will ● Describe the nature, application and dangers of ionising radiations, as well as activities of radioactive sources, including with the calculation of half-life. ● Understand the processes of nuclear fusion and nuclear fission and describe their examples.

	2	Astrophysics	Students will ● Know what makes up the universe and understand the effects of gravitational forces on orbits. ● Understand how to classify stars according to their colour, describe the evolution of stars. ● Describe evidence that support the Big Bang theory: red-shift and cosmic microwave background (CMB) radiation.
	3	Exam Leave	
12 AS Level	1	Mechanics Materials	● The topic covers rectilinear motion, forces, energy and power. ● Students will develop mathematical skills that include: plotting two variables from experimental data; calculating rate of change from a graph showing a linear relationship; drawing and using the slope of a tangent to a curve as a measure of rate of change; and more. ● This topic covers density, flow of liquids, Hooke's law, the Young modulus and elastic strain energy. ● Students will carry out experiments to study stress-strain relationships described by Hooke's law and the Young modulus for a variety of materials.
	2	Waves and Particle Nature of Light Electric Circuits	● This topic covers the properties of different types of wave, including standing waves. ● Students will study refraction, polarisation and diffraction. ● In studying the wave/particle nature of light, students will understand evidence provided by diffraction experiments and the photoelectric effect. ● This topic covers the definitions of various electrical quantities: current, potential difference and resistance; Ohm's law and non-ohmic conductors; potential dividers, e.m.f and internal resistance of cells; and negative temperature coefficient thermistors ● Students will carry out experiments to determine electrical resistivity of a material and to determine the e.m.f. and internal resistance of an electric cell.
	3	Exam Leave Foundation Course	● Further mechanics: impulse and conservation of momentum in two dimensions. Students will investigate the relationship between force exerted on an object and its change of momentum and use ICT to analyse collisions between small spheres.

13 A Level	1	Further Mechanics Electric and Magnetic Fields Nuclear and Particle Physics	● A continuation from the foundation course; this topic also covers circular motion. ● This topic covers Coulomb's law, capacitors, magnetic flux density and the laws of electromagnetic induction. ● Students will be able to use equations for the force between two charges, the electric field due to a point charge, an electric field between parallel plates and a radial field. ● This topic covers atomic structure, particle accelerators and the standard quark-lepton model. ● Students will understand the role of electric and magnetic fields in particle accelerators (linac and cyclotron) and detectors (general principles of ionisation and deflection only) that are instrumental towards the study of particle physics.
	2	Thermodynamics Nuclear Decay Oscillations Astrophysics and Cosmology	● This topic covers specific heat capacity, specific latent heat, internal energy and the gas equation. ● Students will carry out several core practical work, such as investigating the relationship between pressure and volume of a gas at fixed temperature. ● Students will study radioactive decay and its applications that relate to, for example, medical physics and carbon dating. ● In this topic students will study simple harmonic motion and damping and its applications that relate to, for example, the construction of buildings in earthquake zones. ● This topic covers gravitational fields and the physical interpretation of astronomical observations, the formation and evolution of stars and the history and future of the universe.
	3	Exam Leave	

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