

Our Science curriculum at The Sweyne Park School is designed to develop knowledgeable, curious and confident young scientists who understand the importance of science in explaining the world around them. We aim to provide a broad, ambitious and inclusive curriculum that builds secure scientific knowledge, develops practical and analytical skills, and enables all students to make informed decisions about their future. Across all key stages, students are encouraged to think critically, solve problems, communicate scientifically and appreciate the relevance of science to everyday life, society and future careers.

Key Stage 3 Science

At Key Stage 3, our curriculum provides students with a strong foundation across Biology, Chemistry and Physics. The curriculum is carefully sequenced so that students develop increasingly sophisticated scientific knowledge and understanding while regularly revisiting and building upon important concepts. Alongside substantive scientific knowledge, students develop disciplinary knowledge through practical investigations, data analysis, mathematical skills and evaluation of scientific evidence. Our KS3 curriculum aims to inspire curiosity and enthusiasm for science while ensuring that students develop the knowledge and skills required to access the demands of GCSE study successfully.

Key Stage 4 Science

At Key Stage 4, students follow either AQA GCSE Combined Science: Trilogy or the separate AQA GCSE qualifications in Biology, Chemistry and Physics. Both pathways provide a challenging and coherent curriculum that builds directly upon the knowledge developed at Key Stage 3. Students explore key scientific concepts in greater depth while continuing to develop practical, mathematical, analytical and problem-solving skills. The separate sciences pathway provides additional breadth and depth for students studying Biology, Chemistry and Physics as individual GCSEs. Our curriculum ensures that students are well prepared for external examinations while also developing the scientific literacy and transferable skills required for further study, employment and everyday life.

Key Stage 5 Science

At Key Stage 5, we offer a range of academic and vocational pathways that allow students to continue their scientific education in areas that match their interests, strengths and future aspirations. Students can study AQA A Level Biology and Chemistry and OCR A Level Physics. These courses develop a deeper understanding of scientific concepts alongside increasingly sophisticated practical, mathematical and analytical skills, preparing students for university study, apprenticeships and careers across science, engineering, healthcare and related fields.

Alongside our A Level provision, we offer the vocational Medical Science AAQ, providing students with an applied pathway into science and healthcare-related education and employment. The course enables students to develop scientific knowledge within relevant medical and healthcare contexts while building practical, investigative and transferable skills. Together, our Key Stage 5 curriculum provides a broad and inclusive range of progression routes and ensures that students can continue studying science through a pathway appropriate to their interests and future ambitions.

Year	Knowledge (Topics/Unit of work) What pupils will 'know'	Prior Knowledge (KS2/Previous learning)	Skills acquired What pupils will be able to 'do'	Concepts developed (What pupils will understand?)	Key Vocabulary (Tier 3)	Writing & Communication
7 Term 1	Induction topic; P1 Energy; B1 Cells; C1 The particle model. Know: laboratory routines and safety; energy stores and transfers; plant, animal and specialised cells; microscopes; particle arrangement in solids, liquids and gases; changes of state and diffusion.	KS2 scientific enquiry, safe use of simple equipment, living things, basic body systems, materials, states of matter and everyday energy/forces examples.	Do: follow safety routines, identify hazards and variables, record results in tables and graphs, use a light microscope, draw and label cells, construct particle diagrams and describe energy transfers.	Science explanations are based on evidence. Cells are the basic unit of life. The particle model explains properties and changes of matter. Energy is transferred between stores and is conserved.	hazard, risk, variable, independent variable, dependent variable, control variable, energy store, transfer, cell, nucleus, cytoplasm, cell membrane, cell wall, chloroplast, mitochondria, vacuole, microscope, particle, solid, liquid, gas, diffusion, melting, freezing, evaporation, condensation.	Write clear practical methods and risk controls. Produce labelled biological and particle diagrams. Use because/therefore to link observations to scientific explanations and write short conclusions from evidence. Begin to evaluate practical work.
7 Term 2	P2 Speed; B2 Skeletal and muscular systems and organisation; C2 Atoms, elements and compounds; P3 Forces. Know: speed, distance-time graphs, balanced/unbalanced forces, skeleton/muscles and levels of organisation, atoms, elements, compounds, formulae and conservation of mass.	Y7 Term 1 cells, particles, energy, graph drawing and variables. KS2 simple forces, human body, materials and mathematical measurement skills.	Do: calculate speed from distance/time, interpret distance-time graphs, draw force arrows, measure force/stretch, identify balanced and unbalanced forces, describe cells-tissues-organs-systems, use atomic models and simple chemical symbols/formulae.	Motion can be measured and represented mathematically. Forces are interactions that can change motion or shape. Multicellular organisms have hierarchical organisation. Matter is made from atoms which can combine to form compounds.	speed, distance, time, gradient, distance-time graph, force, newton, balanced, unbalanced, resultant force, friction, air resistance, moment, skeleton, joint, muscle, antagonistic, tissue, organ, organ system, atom, element, compound, molecule, formula, conservation of mass.	Show calculation steps with units. Describe graph trends precisely. Write cause-and-effect explanations for force effects. Compare organisation levels and define atoms, elements and compounds accurately.
7 Term 3	B3 Nutrition and digestion; C3 Pure and impure substances; B5 Reproduction; P4 Pressure in fluids. Know: nutrients and healthy diet, digestive organs and enzymes, pure substances/mixtures and separation techniques, human and plant reproduction, pressure in liquids/gases and floating/sinking.	Y7 cells, organisation, atoms, particles, states of matter and forces. KS2 healthy bodies, life cycles, reproduction in plants, materials and separating mixtures.	Do: analyse diet, explain digestion, carry out/interpret food tests and separation methods, describe filtration/evaporation/distillation/chromatography, compare human and plant reproduction, calculate and explain pressure, upthrust and atmospheric pressure.	Organ systems are adapted for nutrition and reproduction. Mixtures can be separated by physical processes because substances have different properties. Fluid pressure depends on force, area and depth/height.	nutrient, carbohydrate, lipid, protein, vitamin, mineral, fibre, enzyme, catalyst, oesophagus, stomach, small intestine, large intestine, gamete, fertilisation, gestation, pollination, pure substance, mixture, solution, solute, solvent, filtration, evaporation, distillation, chromatography, pressure, fluid, upthrust, density.	Write sequenced process explanations for digestion and reproduction. Use method-results-conclusion-evaluation structure for separation practicals. Use comparative language to link structures to functions.
8 Term 1	B3 Nutrition and digestion; P4 Pressure in fluids; B4	Y7 nutrition/digestion and pressure, cells, organ systems, particle model,	Do: explain digestion and gas exchange using organ adaptations, interpret lung/pressure data, use indicators and pH scale, write word equations,	Body systems are adapted for exchange and transport of substances. Pressure differences	nutrient, enzyme, digestive system, pressure, upthrust, density, alveoli,	Write linked explanations that connect structure and function. Use precise practical observations to

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	Gas exchange systems; C4 Chemical reactions. Know: digestion and diet revisited/developed; pressure in fluids revisited/developed; breathing and gas exchange adaptations; chemical reactions including acids/alkalis, neutralisation, combustion, displacement, oxidation and conservation of mass.	atoms/elements/compounds, force/area ideas and practical skills.	identify reactants/products, describe reaction types and explain observations using particle/atom models.	can cause fluid movement. Chemical reactions rearrange atoms; mass is conserved and reactions can be represented using equations.	diaphragm, ribcage, inhalation, exhalation, diffusion, reactant, product, combustion, thermal decomposition, oxidation, displacement, neutralisation, acid, alkali, pH, indicator, catalyst, conservation of mass.	support conclusions. Write word equations and explain reactions with before/after particle or atom models.
8 Term 2	P5 Sound; C5 Energy changes; P6 Light; B6 Photosynthesis. Know: sound as vibrations/longitudinal waves, frequency and amplitude, echo/reflection/absorption; qualitative exothermic/endothermic changes; light travel, reflection, refraction, colour and lenses; photosynthesis reactants/products and leaf adaptations.	Y7 energy, particles, forces and cells; Y8 gas exchange and chemical reactions. KS2 light and sound experiences.	Do: describe wave features, compare sound and light, use ray diagrams, explain reflection/refraction, classify exothermic and endothermic changes, write the photosynthesis word equation and interpret photosynthesis practical/data evidence.	Waves transfer energy/information. Sound needs a medium; light can travel through a vacuum. Energy is transferred during physical and chemical changes. Photosynthesis stores energy in organic molecules and supports food chains and atmospheric balance.	vibration, wave, longitudinal, transverse, frequency, hertz, amplitude, pitch, loudness, echo, reflection, absorption, exothermic, endothermic, light ray, incident ray, normal, refraction, lens, spectrum, photosynthesis, chlorophyll, glucose, oxygen, carbon dioxide, stomata.	Use labelled wave and ray diagrams. Compare phenomena using similarities/differences. Write word equations and evidence-based explanations for photosynthesis and energy change practicals.
8 Term 3	C6 The periodic table; P7 Electricity in circuits; C7 Materials; B7 Respiration. Know: groups/periods, metals/non-metals and patterns in the Periodic Table; current, potential difference, resistance, series/parallel circuits; properties/uses of ceramics, polymers, composites and metals; aerobic and anaerobic respiration.	Y7 atoms/elements/compounds, energy and particles; Y8 chemical reactions and photosynthesis. Prior practical work with models, measurements and equations.	Do: use the Periodic Table to classify/predict properties, build and test circuits, measure current and potential difference, calculate/use resistance relationships, compare material properties, write respiration word equations and compare aerobic/anaerobic respiration.	Patterns in elements relate to structure and properties. Electric circuits transfer energy and require complete pathways. Materials are selected for properties linked to structure. Respiration releases energy for life processes.	Periodic Table, group, period, metal, non-metal, reactivity, ceramic, polymer, composite, alloy, current, ampere, potential difference, volt, resistance, ohm, series circuit, parallel circuit, conductor, insulator, aerobic respiration, anaerobic respiration, lactic acid, fermentation.	Use tables to compare properties and circuit data. Write conclusions from measured current/p.d. Describe patterns in the Periodic Table and use equations to compare photosynthesis and respiration.
9 Term 1	C7 Materials; B7 Respiration; P8 Static electricity; C8 The Earth and its atmosphere. Know: material properties/recycling, respiration revisited, charge transfer and electric	Y8 materials, respiration, circuits/electricity, particles, energy changes and chemical reactions. KS2 rocks, Earth materials and environmental ideas.	Do: evaluate material choice and recycling, compare aerobic/anaerobic respiration, explain static charge transfer and attraction/repulsion, describe Earth structure/rock cycle/carbon cycle and interpret data on atmospheric change and climate impacts.	Materials and resources are finite and have environmental impacts. Charge transfer creates electrostatic forces. Earth systems cycle matter over different timescales. Human activity can change atmospheric composition and climate.	ceramic, polymer, composite, alloy, recycling, finite resource, respiration, aerobic, anaerobic, charge, electron, static electricity, electric field, attraction, repulsion, crust, mantle,	Write balanced evaluations of material use and climate evidence. Use diagrams for cycles and fields. Develop extended explanations that connect particle/charge models to observations.

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	fields, Earth structure, rock cycle, carbon cycle, atmosphere composition and human impacts on climate.				core, igneous, sedimentary, metamorphic, rock cycle, carbon cycle, atmosphere, greenhouse gas, climate change.	
9 Term 2	B9 Inheritance; P9 Magnets; P10 The particle model. Know: heredity, DNA/genes/chromosomes, variation and natural selection; magnetic poles, fields and electromagnets; particle arrangement/motion, density, changes of state, diffusion, internal energy and Brownian motion.	Y7/Y8 cells, reproduction, forces, electricity/circuits, particle model and materials. Y9 static electricity and Earth systems.	Do: represent inheritance using models, distinguish continuous/discontinuous variation, interpret variation graphs, explain natural selection, plot/draw magnetic field patterns, describe electromagnets and motors at principle level, use particle models to explain density, state changes and diffusion.	Genes carry inherited information. Variation affects survival and can drive natural selection. Magnetic and electric effects can act at a distance through fields. Particle motion and arrangement explain macroscopic properties of matter.	heredity, chromosome, DNA, gene, variation, continuous, discontinuous, natural selection, adaptation, extinction, biodiversity, magnetic pole, field line, compass, electromagnet, motor, density, Brownian motion, diffusion, internal energy, melting point, boiling point, sublimation.	Write step-by-step inheritance and natural selection explanations. Use field-line diagrams and particle models. Interpret graphs and use precise vocabulary to explain abstract models.
9 Term 3	GCSE transition: Chemistry of the atmosphere; Using resources; Ecology. Know: composition/evolution of the atmosphere, greenhouse gases and climate change; sustainable use of resources, water treatment, life-cycle assessment and recycling; ecosystems, biodiversity, sampling, food chains/webs, interdependence and material cycles.	Y8/Y9 Earth and atmosphere, materials/recycling, photosynthesis, respiration, particle model, practical sampling and graph/data skills. Prepares pupils for KS4 content that begins in Y10/11.	Do: analyse atmospheric/climate evidence, evaluate resource use and environmental impacts, describe potable water/waste water treatment, use quadrats/transects and sampling ideas, interpret food webs, explain interdependence, decay and carbon/water cycles.	Human activities affect Earth systems and resource availability. Sustainability requires evidence-based decisions. Ecosystems depend on interdependence and cycling of materials. GCSE science uses KS3 models in more complex contexts.	atmosphere, greenhouse effect, global warming, climate change, pollutant, resource, sustainable development, potable water, waste water, life-cycle assessment, recycling, biodiversity, ecosystem, habitat, population, community, interdependence, food chain, food web, predator, prey, quadrat, transect, carbon cycle, water cycle, decay.	Use data to support environmental arguments. Write evaluate-style paragraphs weighing benefits/risks. Use ecological sampling methods and explain conclusions with evidence, limitations and improvements.
10 Term 1	B: B1.2 Cell division; B2.1 Organisation and the digestive system; B2.2 Organising animals and plants. C: C1.2 Periodic Table; C2 Structure and bonding. P: P1.1 Conservation and dissipation of energy; P1.2 Energy transfer by heating.	KS3/Y9 cell structure, specialised cells, diffusion/osmosis basics, atoms/elements, the particle model, energy stores/transfers and simple circuits.	Use and interpret models of mitosis, organ systems and bonding. Carry out/interpret food, enzyme and plant transport practicals. Calculate efficiency, power, RFM, moles and concentration using correct units and significant figures.	Cells divide for growth and repair; tissues, organs and organ systems work together. Properties depend on bonding and structure. Energy is conserved but often dissipated; heating depends on particles and specific heat capacity.	mitosis, chromosome, enzyme, active site, xylem, phloem, periodic table, group, period, ion, covalent, giant lattice, relative formula mass, mole, energy store, efficiency, specific heat capacity.	Explain linked sequences such as the cell cycle, digestion and energy transfers. Compare structures and bonding. Present calculations clearly with units. Write practical method-conclusion paragraphs using evidence.
10 Term 2	B: B2.3 Non-communicable diseases; B3.1 Communicable disease; B3.2 Preventing and treating disease.	Year 10 Term 1 organisation, bonding, calculations and energy. KS3/Y9 health, microorganisms, atoms/ions and basic electricity.	Interpret risk-factor and disease data. Explain pathogen transmission and immune responses. Make salts/model electrolysis and write word, symbol and ionic equations.	Disease can result from lifestyle, pathogens and body-system interactions. Prevention and treatment interrupt transmission or support immunity.	non-communicable, communicable, pathogen, vector, vaccination, antibiotic, antibody, risk factor, mole,	Use data to justify health conclusions. Compare prevention and treatment strategies. Balance equations and half-equations. Write circuit explanations using cause and

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	C: C3 Chemical calculations; C4.1 Chemical changes; C4.2 Electrolysis. P: P2.1 Electric circuits.		Build circuits and calculate current, potential difference, resistance, charge and power.	Chemical reactions conserve mass; electrolysis uses energy to decompose ionic compounds. Electrical quantities are linked by circuit relationships.	concentration, salt, acid, alkali, redox, electrolyte, electrode, current, potential difference, resistance.	effect and PEEL/claim-evidence-reasoning structures.
10 Term 3	B: B4.1 Photosynthesis; B4.2 Respiration; B5.1 The nervous system. C: C5 Energy changes; C6 Rates and equilibrium. P: P2.2 Electricity in the home; P3 Molecules and matter; P4 Radioactivity.	Cells, plant organisation, chemical reactions, energy transfers, circuits and particle model from Y9/Y10. Builds directly from B2, C4 and P2.	Plan, carry out and evaluate photosynthesis, reaction-time, energy-change/rate and density investigations. Interpret graphs, calculate rates, density, specific heat capacity/latent heat and half-life. Explain mains electricity and radiation safety.	Photosynthesis stores energy and respiration releases it. Nervous coordination helps maintain internal conditions. Reaction rate depends on collision frequency and activation energy. The particle model explains material behaviour. Unstable nuclei emit radiation.	photosynthesis, chlorophyll, limiting factor, aerobic, anaerobic, neurone, synapse, reflex arc, exothermic, endothermic, activation energy, catalyst, equilibrium, alternating current, density, specific latent heat, isotope, alpha, beta, gamma, half-life.	Analyse graphs and limiting factors. Evaluate practical validity, accuracy and errors. Explain processes in logical steps. Compare radiation types and justify safety precautions.
11 Term 1	B: B11 Hormonal coordination; B12 Reproduction; B13 Variation and evolution. C: C9 Crude oil and fuels; C10 Chemical analysis. P: P8 Forces in balance; P9 Motion; P10 Forces and motion.	Y10 nervous system, cells, genetics foundations, rates/energy, hydrocarbons from KS3, and KS3/Y10 forces and motion graphs.	Interpret hormone and glucose-control data. Use genetic/evolutionary evidence and simple inheritance models. Explain fractional distillation, combustion, cracking and chromatography. Calculate resultant force, work done, speed, acceleration and momentum; interpret distance-time and velocity-time graphs.	Hormones coordinate body responses and reproduction. Variation and selection drive evolution. Crude oil is a finite mixture of hydrocarbons; analytical chemistry identifies substances. Forces change shape or motion and can be represented mathematically.	hormone, endocrine gland, insulin, menstrual cycle, IVF, DNA, allele, genotype, phenotype, mutation, evolution, hydrocarbon, alkane, fractional distillation, cracking, chromatography, Rf value, resultant force, acceleration, velocity, momentum, stopping distance.	Compare nervous and hormonal coordination. Evaluate fertility treatments and fuel use. Describe natural selection with evidence. Use graph descriptions and calculation working to explain motion.
11 Term 2	B: B14 Genetics and evolution; B15 Adaptations, interdependence and competition. C: C11 The atmosphere; C12 The Earth's resources. P: P11 Wave properties; P12 Electromagnetic spectrum; P13 Electromagnetism.	Y11 Term 1 variation/evolution; Y9/Y10 ecology and atmosphere links; C9 fuels/combustion; P10 forces and Y10 electricity/energy.	Use genetic diagrams and interpret ecological fieldwork data. Evaluate climate/resource evidence, potable water and life-cycle assessments. Calculate wave speed, frequency and wavelength; interpret ray diagrams and wave traces. Explain electromagnets, motor effect and electromagnetic applications.	Inheritance and natural selection explain biodiversity. Organisms interact with each other and their environment. Human activity affects atmosphere and resources. Waves transfer energy/information; magnetism and electricity are linked by fields.	gene, allele, homozygous, heterozygous, natural selection, adaptation, ecosystem, community, abiotic, biotic, greenhouse gas, carbon footprint, potable water, life-cycle assessment, amplitude, wavelength, frequency, refraction, electromagnetic spectrum, electromagnet, motor effect.	Construct extended genetic and ecology explanations. Evaluate environmental solutions using evidence. Compare wave types and electromagnetic uses/risks. Link scientific claims to data and limitations.
11 Term 3	Revision and exams: interleaving all GCSE Biology, Chemistry and Physics topics, required practicals, equations, mathematical skills and exam technique.	All KS4 content and KS3 foundations: cells, particles, atoms, energy, forces, ecosystems, Earth science, electricity and waves.	Retrieve and apply knowledge to unfamiliar contexts. Select and rearrange equations. Analyse unseen data. Evaluate methods. Plan answers, self-assess from mark schemes and correct misconceptions.	Key ideas are linked across science: systems, models, interactions, energy, particles, forces, change and evidence. Understanding is transferred across the six GCSE papers.	AO1, AO2, AO3, command words, evaluate, compare, explain, calculate, anomaly, uncertainty, validity, accuracy, precision, repeatability, reproducibility.	Timed GCSE responses; structured six-mark answers; because/therefore reasoning; annotations of command words; correction and redrafting of exam answers using mark schemes.

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7 Term 1	Induction topic; P1 Energy; B1 Cells; C1 The particle model. Know: laboratory routines and safety; energy stores and transfers; plant, animal and specialised cells; microscopes; particle arrangement in solids, liquids and gases; changes of state and diffusion.	Diagnostic: KS2 baseline/retrieval quiz on safety, equipment, cells/living things, states of matter and simple graphs. Summative: safety/induction check; end-of-topic quizzes for energy, cells and particle model; microscope/practical skills observation; cumulative retrieval.	Revisits KS2 enquiry, materials/states, living organisms and everyday energy. Establishes common routines for variables, graphs, diagrams, units and practical safety used throughout KS3 and KS4.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	Foundation for all KS3 science and GCSE working scientifically. Directly supports Y7 speed/forces/nutrition, Y8 photosynthesis/respiration and Y9/GCSE cells, particle model, energy, atomic structure and required practical skills.
7 Term 2	P2 Speed; B2 Skeletal and muscular systems and organisation; C2 Atoms, elements and compounds; P3 Forces. Know: speed, distance-time graphs, balanced/unbalanced forces, skeleton/muscles and levels of organisation, atoms, elements, compounds, formulae and conservation of mass.	Diagnostic: retrieval from Term 1 cells, particles, energy, variables and graph skills. Summative: speed/forces calculation and graph test; organisation and atoms/elements quizzes; assessed force/stretch practical; cumulative spring assessment.	Builds on cell structure, particle model and energy. Reuses graphing, variables, units and model-based explanations from Term 1.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	Prepares for Y7 pressure/nutrition, Y8 circuits/materials and Y9/GCSE forces/motion, organisation and atomic structure. Strengthens mathematical and modelling skills needed for GCSE.
7 Term 3	B3 Nutrition and digestion; C3 Pure and impure substances; B5 Reproduction; P4 Pressure in fluids. Know: nutrients and healthy diet, digestive organs and enzymes, pure substances/mixtures and separation techniques, human and plant reproduction, pressure in liquids/gases and floating/sinking.	Diagnostic: retrieval of cells, organs, particles, atoms and forces. Summative: digestion/reproduction and separation-technique quizzes; pressure calculation/application task; practical write-up for separation/food evidence; end-of-year cumulative assessment.	Revisits cells-to-systems, particles/mixtures and forces. Links physical properties to separation and force/area to pressure in fluids.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	Foundation for Y8 gas exchange, reactions, photosynthesis, respiration and materials, plus GCSE organisation, infection/response, chemical analysis/separation, pressure and particle ideas.
8 Term 1	B3 Nutrition and digestion; P4 Pressure in fluids; B4 Gas exchange systems; C4 Chemical reactions.	Diagnostic: retrieval from Y7 nutrition/digestion, pressure, cells/organs, particles and atoms. Summative: digestion/pressure retrieval check; gas exchange assessment; chemical reactions topic test; pH/reaction practical evidence; cumulative autumn assessment.	Revisits Y7 nutrition and pressure directly. Connects organ systems to gas exchange and atoms/elements to chemical reactions, while	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical	Prepares for Y8 sound/energy/light/photosynthesis, Y9 Earth/atmosphere and GCSE organisation, chemical changes,

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	Know: digestion and diet revisited/developed; pressure in fluids revisited/developed; breathing and gas exchange adaptations; chemical reactions including acids/alkalis, neutralisation, combustion, displacement, oxidation and conservation of mass.		continuing graphing, variables and practical observations.	demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	rates/energy changes and required practical analysis.
8 Term 2	P5 Sound; C5 Energy changes; P6 Light; B6 Photosynthesis. Know: sound as vibrations/longitudinal waves, frequency and amplitude, echo/reflection/absorption; qualitative exothermic/endothermic changes; light travel, reflection, refraction, colour and lenses; photosynthesis reactants/products and leaf adaptations.	Diagnostic: retrieval of energy, particles, reactions, gas exchange and light/sound prior ideas. Summative: sound/light wave quiz, ray-diagram assessment, energy-change practical task, photosynthesis practical/data task and cumulative spring assessment.	Builds from Y7 energy and particles, Y8 reactions and gas exchange. Links light energy to photosynthesis and wave behaviour to evidence from ray boxes and sound observations.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	Builds towards Y8 circuits/respiration/materials, Y9 ecology and GCSE bioenergetics, energy changes, waves and electromagnetic spectrum.
8 Term 3	C6 The periodic table; P7 Electricity in circuits; C7 Materials; B7 Respiration. Know: groups/periods, metals/non-metals and patterns in the Periodic Table; current, potential difference, resistance, series/parallel circuits; properties/uses of ceramics, polymers, composites and metals; aerobic and anaerobic respiration.	Diagnostic: retrieval of atoms/elements, energy transfers, reactions and photosynthesis. Summative: Periodic Table quiz; circuit practical/test; materials/reactivity comparison; respiration assessment; end-of-year cumulative assessment.	Links atoms/elements to Periodic Table patterns and materials. Links energy transfer in circuits and respiration. Revisits practical measurement, tables, graphs and equation use.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	Prepares for Y9 static electricity, materials/Earth resources, magnets and particle model, plus GCSE electricity, electrolysis, bioenergetics, materials/resources and atomic/charge models.
9 Term 1	C7 Materials; B7 Respiration; P8 Static electricity; C8 The Earth and its atmosphere. Know: material properties/recycling, respiration revisited, charge transfer and electric fields, Earth structure, rock cycle, carbon cycle,	Diagnostic: retrieval of Y8 materials, respiration, circuits/electricity, particles and Earth science. Summative: materials/resources evaluation task; respiration quiz; static electricity explanation task; Earth/atmosphere assessment; cumulative autumn assessment.	Revisits Y8 C7 materials and B7 respiration immediately, then extends electricity through static charge and links resources/materials to Earth systems and atmosphere.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking	Directly supports GCSE chemistry of the atmosphere, using resources, energy/electricity, particle/charge models and evaluative writing across GCSE science.

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	atmosphere composition and human impacts on climate.			of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	
9 Term 2	B9 Inheritance; P9 Magnets; P10 The particle model. Know: heredity, DNA/genes/chromosomes, variation and natural selection; magnetic poles, fields and electromagnets; particle arrangement/motion, density, changes of state, diffusion, internal energy and Brownian motion.	Diagnostic: retrieval of cells/reproduction, particles, forces and circuits. Summative: inheritance/variation assessment; magnetic field practical/diagram task; particle model/density assessment; GCSE-readiness retrieval checks.	Builds on Y7 cells/reproduction/particles/forces, Y8 circuits/materials and Y9 static electricity. Uses models to connect unseen structures/fields to observable effects.	Explicit routines, visual safety/equipment cards, live modelling, word banks, sentence stems, guided diagrams, practical demonstrations before independent work, chunked instructions, retrieval grids and stretch questions using unfamiliar examples, checking of understanding regularly. Low-stake quizzes/do now tasks. Interleaving, directly addressing misconceptions, Frayer Models	Prepares for GCSE inheritance/evolution, particle model, atomic structure, forces and electromagnetism. Strengthens abstract modelling before GCSE transition.
9 Term 3	GCSE transition: Chemistry of the atmosphere; Using resources; Ecology. Know: composition/evolution of the atmosphere, greenhouse gases and climate change; sustainable use of resources, water treatment, life-cycle assessment and recycling; ecosystems, biodiversity, sampling, food chains/webs, interdependence and material cycles.	Diagnostic: retrieval of Y8/Y9 atmosphere, resources, materials, photosynthesis, respiration and fieldwork/data skills. Summative: GCSE-style KPI checks for atmosphere/resources/ecology; ecological sampling/data task; environmental evaluation extended response; end-of-KS3 cumulative assessment.	Revisits Earth/atmosphere, materials/recycling, photosynthesis, respiration and ecosystems-style interdependence. Bridges KS3 National Curriculum content into GCSE terminology and assessment style.	Modelling, writing frames, PEEL, Frayer models, worked examples, step by step practical instructions, break down of command words, correcting scientific language, teacher demonstrations, mini whiteboards, adaptive questioning, chunking, checklists, using retrieval to build confidence eg Do now low-stake quizzes, key word checks, equation recall, interleaving, specific feedback. Past-paper question practice.	Direct foundation for GCSE Combined Science ecology, chemistry of the atmosphere and using resources, and for Year 10/11 application of data, evaluation and working scientifically.
10 Term 1	B: B1.2 Cell division; B2.1 Organisation and the digestive system; B2.2 Organising animals and plants. C: C1.2 Periodic Table; C2 Structure and bonding. P: P1.1 Conservation and dissipation of energy; P1.2 Energy transfer by heating.	Diagnostic: Y9 retrieval/baseline quiz on cells, atoms, energy and circuits. Summative: Exampro end-of-topic tests for B1/B2, C1/C2 and P1; required practical write-ups; cumulative autumn assessment.	Revisits Y9 B1/cell basics, B16/B17 where relevant, C1 atomic structure/periodic table, P1 energy and KS3 particles/circuits.	Modelling, writing frames, PEEL, Frayer models, worked examples, step by step practical instructions, break down of command words, correcting scientific language, teacher demonstrations, mini whiteboards, adaptive questioning, chunking, checklists, using retrieval to build confidence eg Do now low-stake quizzes, key word checks, equation recall,	Foundation for Biology Paper 1 organisation, Chemistry Paper 1 bonding/quantitative chemistry and Physics Paper 1 energy. Supports later A-level biology cells/transport, chemistry bonding and physics energy.

Year	Knowledge (Topics/Unit of work? What pupils will 'know'	Assessment (KPIs: Diagnostic + Summative)	Cumulative Links (What is revisited?)	Adaptive Teaching (How all pupils access learning)	Future Links (KS4/KS5)
				interleaving, specific feedback. Past-paper question practice.	
10 Term 2	B: B2.3 Non-communicable diseases; B3.1 Communicable disease; B3.2 Preventing and treating disease. C: C3 Chemical calculations; C4.1 Chemical changes; C4.2 Electrolysis. P: P2.1 Electric circuits.	Diagnostic: hinge questions/retrieval from Term 1 calculations, bonding and organ systems. Summative: Exampro topic tests for disease, calculations, chemical changes/electrolysis and circuits; assessed practical skills; mid-year cumulative assessment.	Links organisation to health and disease; uses C1/C2 ideas to explain ions, salts and electrolysis; builds on P1 energy and KS3/Y9 electricity.	Modelling, writing frames, PEEL, Frayer models, worked examples, step by step practical instructions, break down of command words, correcting scientific language, teacher demonstrations, mini whiteboards, adaptive questioning, chucking, checklists, using retrieval to build confidence eg Do now low-stake quizzes, key word checks, equation recall, interleaving, specific feedback. Past-paper question practice.	Completes much of Biology Paper 1 infection/response and Chemistry Paper 1 chemical changes. Provides essential quantitative and practical skills for later GCSE papers and KS5 science.
10 Term 3	B: B4.1 Photosynthesis; B4.2 Respiration; B5.1 The nervous system. C: C5 Energy changes; C6 Rates and equilibrium. P: P2.2 Electricity in the home; P3 Molecules and matter; P4 Radioactivity.	Diagnostic: cumulative retrieval of cells, organisation, reactions and electricity. Summative: Exampro tests for bioenergetics/homeostasis, energy changes/rates, electricity/matter/radioactivity; required practicals; end-of-year assessment using GCSE-style questions.	Revisits energy transfers across biology, chemistry and physics; connects C4 reactions to C5/C6; connects P2 circuits to mains electricity and P3 particle model to radioactivity.	Modelling, writing frames, PEEL, Frayer models, worked examples, step by step practical instructions, break down of command words, correcting scientific language, teacher demonstrations, mini whiteboards, adaptive questioning, chucking, checklists, using retrieval to build confidence eg Do now low-stake quizzes, key word checks, equation recall, interleaving, specific feedback. Past-paper question practice.	Completes Biology Paper 1 bioenergetics and starts Paper 2 homeostasis. Builds Chemistry Paper 2 rates and Physics Paper 1 matter/atomic structure links; prepares for Year 11 Paper 2 content.
11 Term 1	B: B11 Hormonal coordination; B12 Reproduction; B13 Variation and evolution. C: C9 Crude oil and fuels; C10 Chemical analysis. P: P8 Forces in balance; P9 Motion; P10 Forces and motion.	Diagnostic: Paper 1 retrieval and question-level analysis from Year 10. Summative: Exampro tests for hormones, reproduction/evolution, organic/analysis and forces/motion; GCSE-style extended responses; autumn PPE/mock paper practice.	Revisits B5 nervous system before hormonal control; uses cell/DNA ideas for inheritance; links C9 fuels to energy and atmospheric content; revisits KS3/Y10 forces and graphs.	Modelling, writing frames, PEEL, Frayer models, worked examples, step by step practical instructions, break down of command words, correcting scientific language, teacher demonstrations, mini whiteboards, adaptive questioning, chucking, checklists, using retrieval to build confidence eg Do now low-stake quizzes, key word checks, equation recall, interleaving, specific feedback. Past-paper question practice.	Covers major Biology Paper 2, Chemistry Paper 2 and Physics Paper 2 units. Supports A-level biology homeostasis/genetics, chemistry organic/analytical chemistry and physics mechanics.
11 Term 2	B: B14 Genetics and evolution; B15 Adaptations,	Diagnostic: mock analysis, RAG/PLC review and retrieval of Year 10/11 misconceptions.	Builds from variation/evolution to genetics and ecology; links	Modelling, writing frames, PEEL, Frayer models, worked	Completes taught GCSE content and links to all six final papers.

Year	Knowledge (Topics/Unit of work? What pupils will 'know'	Assessment (KPIs: Diagnostic + Summative)	Cumulative Links (What is revisited?)	Adaptive Teaching (How all pupils access learning)	Future Links (KS4/KS5)
	interdependence and competition. C: C11 The atmosphere; C12 The Earth's resources. P: P11 Wave properties; P12 Electromagnetic spectrum; P13 Electromagnetism.	Summative: Exampro topic tests for genetics/ecology, atmosphere/resources and waves/electromagnetism; required practical review; second PPE/full paper practice.	fuels/combustion to atmosphere and resources; revisits electricity/forces/energy in waves and electromagnetism.	examples, step by step practical instructions, break down of command words, correcting scientific language, teacher demonstrations, mini whiteboards, adaptive questioning, chucking, checklists, using retrieval to build confidence eg Do now low-stake quizzes, key word checks, equation recall, interleaving, specific feedback. Past-paper question practice.	Strong transition to KS5 biology ecology/genetics, chemistry environmental/resources and physics waves/electromagnetism.
11 Term 3	Revision and exams: interleaving all GCSE Biology, Chemistry and Physics topics, required practicals, equations, mathematical skills and exam technique.	Diagnostic: PLCs, RAG ratings, mini quizzes and question-level analysis. Summative: timed past papers, walking-talking mocks, required practical tests, equation/vocabulary checks and final external GCSE examinations.	Interleaves all Biology, Chemistry and Physics content, required practicals, maths skills and working-scientifically skills from Years 9-11.	Use personalised revision checklists, targeted intervention groups, modelled exam technique.	Preparation for GCSE certification and progression to A-level science, vocational science, health, engineering, environmental science and science-rich employment pathways.

A Level Biology

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (KS5)
12 Term 1	Biological Molecules & Cell Structure (3.1, 3.2.1, 3.2.3)	Microscopy, magnification calculations, modelling DNA, Practical enzyme investigations (RP1), membrane permeability (RP4), osmosis (RP3)	GCSE cells, enzymes, diffusion, active transport, biological molecules	practical write-ups, Biological Molecules test, end of term assessment CPAC exams	Retrieval practice, visual models, scaffolded calculations, vocabulary support, structured practicals	Provides foundation for genetics, respiration, immunity and physiology
12 Term 2	Cell Division, Exchange & Immune System (3.2.2, 3.2.4, 3.3.3 plus remaining 3.1 content)	Interpretation, immune response modelling Practical Root tip squash (RP2), aseptic technique and antimicrobial practical (RP6), data	DNA structure, protein synthesis, membranes, transport across membranes	Topic tests, practical competency checks, immunology assessment, mock preparation CPAC exam	Sequencing tasks, scaffolded diagrams, exam-question practice, practical modelling	Links to pathology, medicine, microbiology and biotechnology
12 Term 3	Exchange, Transport, Biodiversity & Genetic Variation (3.3, 3.4)	Practical Heart and lung dissections (RP5), potometer investigations, biodiversity sampling, statistical analysis, genetic calculations Fieldwork investigation (RP12), statistical testing, ecological sampling, data evaluation,	Cell transport, DNA, mitosis, enzymes, immunity	synoptic tasks End of topic tests. CPAC Exam	Guided calculations, retrieval grids, practical demonstrations, exam skills workshops	Preparation for inheritance, evolution, ecology and Year 13 topics
13 Term 1	Energy Transfers in and Between Organisms (3.5)	Practical Chromatography (RP7), chloroplast investigations (RP8), respiration practical (RP9), biomass and productivity calculations	ATP, enzymes, membranes, gas exchange, transport systems	Topic tests, practical assessments, Paper 2-style exam questions	Dual coding, scaffolded pathways, retrieval practice, mathematical modelling	Biochemistry, ecology, environmental science, biological sciences

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (KS5)
13Term 2	Responses, Coordination & Homeostasis (3.6)	Practical Animal behavior investigation (RP10), glucose calibration curve (RP11), physiological data analysis	Transport systems, enzymes, membranes, respiration, ATP	Topic assessments, Y13 mock examinations, practical competency checks	Modelled pathways, structured exam responses, maths support, retrieval activities	Medicine, neuroscience, sports science, physiology
13 Term 3	Genetics, Evolution, Ecosystems & Gene Expression (3.7, 3.8)	synoptic essay writing	Entire specification revisited through genetic, ecological and cellular themes	Full A-Level papers, synoptic assessments, essay practice, intervention programme	Personalised revision, interleaving, scaffolded extended responses, targeted retrieval	University-level biology, genetics, medicine, biotechnology, ecology and research careers

A Level Chemistry

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (later A-level / HE)
12 Term 1	Foundations of chemistry • Atomic structure + Periodicity • Amount of substance (RP1) • Bonding • Introduction to organic chemistry • Redox reactions • Alkanes	• Use atomic models, electron configurations and ionisation-energy evidence. • Quantitative chemistry: moles, concentration, gas equation, formulae, equations, yield and atom economy. • Explain structure/property relationships and molecular shape. • Apply oxidation states and half-equations. • Represent and interpret organic structures, nomenclature and reaction types. • Practical accuracy: volumetric solution preparation and titration (RP1).	GCSE atomic structure, periodic table, bonding, quantitative chemistry, equations, redox and hydrocarbons are revisited and made more mathematical. Links are built between electron structure → periodicity → bonding and between moles → stoichiometry → practical analysis.	Diagnostic: transition-from-GCSE baseline / retrieval checks. Summative: EoT tests after the first teaching blocks, including Atomic structure/Periodicity/Amount of substance and later Bonding/Organic/Redox/Alkanes. RP1 practical evidence and data-processing questions.	• Explicit modelling of multi-step calculations with worked examples and fading scaffolds. • Formula/ion/nomenclature retrieval practice and low-stakes quizzes. • Molecular models and visual representations for bonding and shapes. • Chunked practical methods, pre-lab checks and exemplar titration calculations. • Extension through unfamiliar mass spectra, multi-step mole problems and synoptic questions.	Provides the core language and mathematics for all later physical chemistry. Bonding/electron structure underpin Group chemistry, transition metals and thermodynamics. Organic foundations lead into alkenes, halogenoalkanes, alcohols and later synthesis/spectroscopy.
12 Term 2	Reactivity, energetics and organic mechanisms • Group 2 • Alkenes • Group 7 / halogens (RP4) • Halogenoalkanes • Energetics (RP2) • Alcohols (RP5)	• Explain periodic/group trends using structure and bonding. • Use observations and ionic equations to identify ions (RP4). • Apply curly-arrow mechanisms to electrophilic addition and nucleophilic substitution/elimination. • Use enthalpy definitions, calorimetry, Hess cycles and bond enthalpies. • Plan and carry out distillation and purification (RP5) and evaluate experimental error.	Revisits Term 1 electron configuration, bonding, polarity, redox, moles and organic nomenclature. Organic reaction knowledge becomes cumulative: alkane → alkene → halogenoalkane → alcohol. Energetics reuses quantitative skills and equation balancing.	Diagnostic: retrieval of Term 1 bonding, moles and organic language. Summative: EoT tests across Group 2/alkenes, halogens/halogenoalkanes and energetics/alcohols. Practical assessment through RP2, RP4 and RP5 plus exam-style practical/data questions.	• Reaction maps and mechanism frames before independent mechanisms. • Trend tables and particle-level explanations linked to observable reactions. • Scaffolded Hess cycles/calorimetry before mixed calculations. • Practical demonstrations/visual method cards, with targeted roles where appropriate. • Stretch through unfamiliar organic pathways and evaluation of practical limitations.	Group trends prepare students for Period 3 and transition metals. Energetics feeds directly into Year 13 thermodynamics. Mechanisms and functional-group chemistry underpin carbonyls, aromatics, amines, polymers and organic synthesis.
12 Term 3	Rates, equilibrium, analysis and first A-level-only content • Kinetics (RP3) • Organic analysis (RP6) • Chemical equilibrium and Kc • Revision + mock	• Interpret Maxwell–Boltzmann distributions and rate data. • Investigate temperature/rate and determine rates by initial-rate and continuous methods (RP3/RP7). • Use qualitative tests and	Builds on collision theory from GCSE and on Term 2 energetics. Kc/Kp reuse mole/concentration/gas skills. Transition metals revisit redox, bonding, periodicity and ionic equations. Organic analysis consolidates all Year 12 functional groups.	Diagnostic: cumulative retrieval before each new block. Summative: EoT tests in kinetics/organic analysis/equilibrium, then a Year 12 mock. Further EoT assessment of rate equations, transition metals and Kp before summer.	• Graph annotation and stepwise rate/equilibrium calculations. • Practical data sets before independent interpretation. • Retrieval grids spanning the full Year 12 course before mock. • Colour/structure diagrams for	Rate equations and Kp are A-level-only content required for final papers. Transition metals links to electrochemistry and aqueous-ion chemistry. Year 12 analytical and practical skills are revisited in Year 13 synthesis, chromatography and Paper 3.

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (later A-level / HE)
	• Rate equations (RP7) • Transition metals (incl. RP11) • Kp	spectra to identify organic functional groups (RP6). • Apply Le Chatelier, construct Kc/Kp expressions and perform equilibrium calculations. • Analyse transition-metal oxidation states, complex ions, ligand exchange and aqueous tests; identify ions experimentally (RP11). • Integrate practical uncertainty, graphing and data interpretation.		RP3, RP6, RP7 and RP11 practical evidence/questions.	transition-metal complexes and modelled ionic equations. • Challenge via synoptic problems combining kinetics, equilibrium and thermodynamics ideas.	
13 Term 1	Energetic feasibility, electrochemistry and acid–base chemistry • Thermodynamics • Electrode potentials / electrochemical cells (RP8) • Carbonyl compounds (RP10) • Acids and bases (RP9)	• Construct Born–Haber/solution cycles and calculate lattice enthalpies. • Use entropy and ΔG to judge feasibility and temperature effects. • Use electrode potentials to predict redox reactions and calculate EMF; construct cells (RP8). • Explain and use carbonyl reactions/mechanisms and organic preparation/purification (RP10). • Calculate pH, Ka/pKa, Kw and buffer behaviour; interpret titration curves (RP9).	Thermodynamics builds directly on Year 12 energetics, bonding and ionisation energy. Electrochemistry revisits redox and transition-metal chemistry. Acid–base calculations reuse equilibrium, moles and logarithms. Carbonyl chemistry extends alcohol oxidation and nucleophilic mechanisms.	Diagnostic: Year 12 retrieval in energetics, redox, equilibrium and organic mechanisms. Summative: EoT assessment after Thermodynamics/Electrode potentials and after Carbonyls/Acids & bases. RP8, RP9 and RP10 practical evidence with exam-style calculation/evaluation questions.	• Cycle templates and sign-convention checks before independent thermodynamics. • Cell diagrams and stepwise E° reasoning. • pH calculation ladders from strong acids/bases to weak acids and buffers. • Organic mechanism scaffolds and synthesis flowcharts. • Mixed synoptic questions for higher prior attainers, with targeted calculation practice for gaps.	Direct preparation for Paper 1 physical/inorganic content and Paper 2 organic content. Thermodynamics/electrochemistry support university chemistry, materials and energy topics; acids/bases link strongly to biological, environmental and analytical chemistry.
13 Term 2	Advanced organic chemistry, analytical chemistry and Period 3 • Aromatic chemistry • Structure determination / NMR • Amines • Chromatography (RP12) • Polymers • Amino acids, proteins and DNA • Organic synthesis	• Apply electrophilic substitution and compare aromatic/aliphatic reactivity. • Interpret mass spectra, IR and ^1H NMR together to determine structures. • Explain amine basicity and reactions. • Separate/identify compounds by TLC and calculate Rf (RP12). • Connect monomers, polymer structures and hydrolysis. • Apply acid–base/stereochemical ideas to	Highly synoptic: revisits bonding, periodicity, mechanisms, functional groups, acid–base chemistry and all earlier analytical tests. Organic synthesis explicitly requires retrieval across the entire organic course. Period 3 revisits Year 12 periodicity and bonding.	Diagnostic: cumulative organic reaction-map retrieval and spectroscopy recall. Summative: EoT tests across Aromatics/Structure determination and Amines/Chromatography, followed by cumulative organic/inorganic assessment as appropriate. RP12 practical evidence; continued CPAC/practical-skills review.	• Cumulative reaction maps and spaced retrieval of reagents/conditions. • Spectroscopy worked examples with progressive removal of prompts. • Molecular models for stereochemistry, polymers and biomolecules. • Chromatography practical exemplars and structured data interpretation. • Synoptic synthesis routes differentiated by number of steps and degree of scaffolding.	Completes specification content needed for Papers 1 and 2 and supplies the synoptic breadth required by Paper 3. Spectroscopy, chromatography and synthesis mirror core techniques used in higher education and laboratory chemistry.

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (later A-level / HE)
	Properties of Period 3 elements and oxides	amino acids and proteins. - Design multi-step syntheses using reaction pathways and purification/analysis. - Explain Period 3 trends and acid–base behaviour of oxides.				
13 Term 3	Synoptic consolidation and examination preparation - Whole-course revision - Past papers - Practical skills/data analysis - Targeted reteaching from assessment evidence	- Select and combine knowledge from physical, inorganic and organic chemistry. - Interpret unfamiliar data, practical methods, spectra and multi-step calculations. - Evaluate experimental design, uncertainty, accuracy and conclusions. - Develop examination strategy: command words, extended responses, calculation checking and time management.	Revisits the complete two-year curriculum through interleaving rather than isolated topic blocks. Particular emphasis on links between quantitative chemistry, equilibrium, energetics/thermodynamics, redox/electrochemistry and cumulative organic synthesis/analysis.	Diagnostic: question-level analysis from mocks/past papers to identify gaps. Summative/formative: timed Paper 1, Paper 2 and Paper 3 practice; targeted Exampro/past-paper sets; re-testing after intervention. Final checks of required practical knowledge and practical endorsement evidence.	- Personalised gap lists and targeted retrieval. - Graduated past-paper practice (scaffolded → timed independent). - Model answers, examiner-language feedback and live worked calculations. - Small-group reteaching of common misconceptions. - Stretch through unfamiliar synoptic/data-analysis questions rather than extra content.	Supports transition to chemistry, medicine, pharmacy, engineering and other STEM study by consolidating independent problem solving, quantitative reasoning, laboratory understanding and critical analysis.

A Level Physics

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (KS5)
12 Term 1	T1: Mechanics (Vectors, Motion, SUVAT, Forces, Work/Energy) T2: Electricity (Current, Potential Difference, Resistance, Power)	• Dimensional Analysis: Using base SI units to check formula consistency. • Linearisation: Plotting I-V and V-R graphs to find internal resistance/resistivity. • Uncertainty Tracking: Calculating absolute/percentage uncertainties in length/diameter via micrometers. • PAG 1 & 3: Motion tracking, circuit construction, and multimeter optimization.	• KS4 Core Forces: Velocity-time graphs, Newton's Laws, and kinetic energy conversions. • KS4 Electricity: Series/parallel laws, Ohm's law, and I-V characteristics. • Mathematical Basics: Rearranging complex equations and basic trigonometry.	• Diagnostic: Entry quizzes on vector components; live targeted questioning on Kirchhoff's laws. • SENECA: Foundations of Physics modules. • Summative: Formal End of Topic Tests (Paper 1 & 2 style multiple-choice + long structural calculations).	• Provision of formula triangles and step-by-step vector resolution prompt sheets. • Colour-coded circuit schematics matching physical lab components. • Scaffolding multi-step SUVAT algebraic derivations with guided fill-in gaps.	• Links directly to 12 T2 Materials, 12 T3 Circular Motion, and 13 T1 Capacitors (exponential discharge circuits).
12 Term 2	T1: Mechanics (Cont.) (Materials, Spring Constants) T2: Electricity (Cont.) & Waves/Quantum (Wave properties, Superposition, Photoelectric effect, Duality)	• Graphical Extraction: Finding Young Modulus from stress-strain gradients and strain energy from area under the curve. • Wave Calculus: Calculating phase/path difference. • Quantum Modelling: Linearising the photoelectric equation (E_k vs f) to determine Planck's constant (h) as the gradient. • PAG 2, 5 & 6: Young Modulus rig, double-slit interference, diffraction gratings, and LED threshold voltages.	• 12 T1 Mechanics: Hooke's Law links back to forces and work done. • KS4 Waves: Wave equation, reflection, refraction, and electromagnetic spectrum characteristics. • KS4 Atomic Structure: Discrete electron energy transfers and light emission basics.	• Diagnostic: Whiteboard checks on wave phase differences; pre-lab quizzes on laser safety protocols. • SENECA: Wave properties and Quantum mechanics tracks. • Summative: Combined End of Term 2 Examination (incorporating structural 6-mark practical design questions).	• Graphic organizers for wave terminology (period vs frequency, phase vs path). • Text-to-speech option for heavy reading in quantum theory historical experiments. • Visual models and animations of wave superposition and photon collisions.	• Links to 13 T1 Astrophysics (stellar spectra, Doppler shift) and 13 T2 Medical Imaging (X-rays, CAT scans, Ultrasound mechanics).

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (KS5)
12 Term 3	T1: Circular Motion & Oscillations (Radials, Centripetal acceleration, SHM, Damping) T2: Thermal Physics (Temperature, Specific Heat, Ideal Gases, Kinetic theory)	• Phase Geometry: Relating SHM displacement, velocity, and acceleration curves over time. • Statistical Modelling: Using Boltzmann distributions and root-mean-square speed derivations ($\overline{pV} = \frac{1}{3}Nm\overline{c^2}$). • PAG 10 & 11: Simple/torsion pendulum tracking, SHM verification, and continuous flow calorimetry for specific heat capacity.	• 12 T1 Mechanics: Circular acceleration built from Newton's Second Law ($F=ma$). Energy conservation applied directly to SHM. • KS4 Thermal: States of matter, heating curves, latent heat transformations, and gas pressure mechanisms.	• Diagnostic: Rapid-fire verbal Q&A on SHM boundary conditions ($v_{\max}$ vs $a_{\max}$). • SENECA: Circular motion, SHM, and Thermal tracking modules. • Summative: Year 12 Synoptic Progression Exam (PAG evaluation, short steps, multiple choice).	• Dynamic simulation tools (PhET) used to slow down SHM cycles and trace energy shifts. • Structured tables for tracking the differences between macroscopic and microscopic variables. • Dual-coded gas law equations ($pV=nRT$ vs $pV=NkT$).	• Bridges directly into 13 T1 Gravitational Fields (orbital mechanics) and 13 T2 Nuclear Physics (thermal energy transitions).
13 Term 1	T1: Gravitational Fields & Astrophysics (Newton's laws, Kepler's laws, Stellar evolution, Cosmology) T2: Electric Fields & Capacitors (Coulomb's Law, Field strength, Capacitance, Exponential decay)	• Inverse-Square Analysis: Log-log scaling to verify Kepler's 3rd Law ($T^2 \propto r^3$) from astronomical parameters. • Exponential Linearisation: Plotting $\ln(V)$ vs t to evaluate the RC time constant ($\tau = RC$). • PAG 9: Oscilloscope measurement of capacitor charging and discharging behaviors over time.	• 12 T3 Circular Motion: Orbits mapped as circular loops driven by centripetal gravity forces. • 12 T1 Mechanics/Electricity: Work done moving charges through potentials ($W=QV$). Gravitational vs Electric potential fields.	• Diagnostic: Desmos graph-matching for field strength vs distance functions. • SENECA: Field theory and Capacitor behavior checkpoints. • Summative: Mid-Year 13 Exam (Testing structural integration of fields, astrophysics, and exponential mathematics).	• Differentiated calculus tracking sheets showing parallel derivations for g-fields and E-fields. • Visual matching exercises linking specific star lifecycles to their final positions on the H-R Diagram. • Step-by-step logs for managing exponential algebra.	• Feeds directly into 13 T2 Electromagnetism (combining electric and magnetic field interactions) and 13 T2 Medical Imaging.
13Term 2	T1: Nuclear & Particle Physics (Radioactivity, Binding energy, Fission/Fusion, Fundamental particles)	• Statistical Decay Analysis: Modelling radioactive half-life using random dice simulations and corrected count rates. • Three-Dimensional Spatial Reasoning: Applying Fleming's Left-Hand Rule and Lenz's Law	• 13 T1 Electric Fields: Charged particle acceleration inside particle accelerators ($eV = \frac{1}{2}mv^2$). • 12 T2 Waves/Quantum: Photon energy thresholds applied to X-ray creation,	• Diagnostic: Peer-marking checks on conservation laws in nuclear reaction equations. • SENECA: Nuclear physics, Electromagnetism, and Medical Imaging tracks. • Summative: Mock Paper 1	• 3D physical models (wire frameworks) used to visualize magnetic fields and current directions. • Structured prompt cards mapping medical	• Prepares students for university-level Engineering, Physics, and Medical Sciences courses. • Consolidates OCR A Paper 3 (Unified

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (KS5)
	T2: Electromagnetism & Medical Imaging (Magnetic fields, Flux, Induction, X-ray, Ultrasound, MRI, PET)	to changing flux vectors. • PAG 7: Investigating absorption characteristics of ionizing radiation over distance using a GM tube.	attenuation, and PET scan gamma generation.	(Modelling Physics) and Mock Paper 2 (Exploring Physics).	diagnostics based on tissue type (A-scan vs B-scan vs MRI). • Quark balance sheets to track conservation of charge and baryon numbers.	Physics) structural expectations.
13 Term 3	Synoptic Revision & Practical Endorsement Review (Full specification integration, Paper 1, 2, & 3 preparation)	• Meta-Cognitive Problem Solving: Deconstructing complex, unfamiliar contexts across multiple modules simultaneously. • Uncertainty Consolidation: Compounding errors from disparate measurements into a singular synoptic conclusion. • PAG Portfolio Sign-off: Final synthesis and verification of student practical skills competency tracker.	• Re-visiting and cross-linking all Year 12 and Year 13 modules via synoptic themes (e.g., energy transformations from mechanics through to nuclear physics).	• Diagnostic: Live timed breakdowns of legacy OCR Paper 3 synoptic problem questions. • SENECA: Synoptic A-Level Physics review assignments. • Summative: Full A-Level Mock Series (Paper 1, Paper 2, and Paper 3 under true exam conditions).	• Custom-tailored personal revision planners built around specific performance gaps identified in the mock exams. • Structural writing frames provided for high-tariff synoptic long-answer descriptions. • Open-book formula sheet navigation guides.	• Directly prepares students for the terminal OCR A A-Level Physics Board Examinations. • Establishes independent scientific research skills for STEM fields.

Medical Science

Year	Unit/Big idea	Disciplinary Thinking & Methods	Cumulative Links (What is revisited?)	Assessments (KPIs: Diagnostic + Summative)	Adaptive Teaching (How all pupils access learning)	Future Links (KS5)
12 Term 1	Unit 1: Principles of Human Physiology, Anatomy and Pathology. • 90 GLH; mandatory; externally assessed. • Big ideas: biological molecules, cells and organisation; nervous/endocrine; musculoskeletal; cardiovascular/respiratory; renal/digestive systems.	• Use structure-function reasoning from molecules and organelles through tissues, organs and body systems. • Apply scientific concepts to unfamiliar contexts; interpret graphs, diagrams and text. • Use microscopy and quantitative skills: magnification/true size, surface-area:volume and physiological-rate calculations. • Compare processes and systems and explain how disruption leads to pathology; critical thinking is signposted in the unit.	• Revisits prior biology/chemistry foundations: cells, biological molecules, transport, respiration, cell division, organisation, homeostasis and body systems. • Establishes the cellular, molecular and systems knowledge that later units repeatedly apply to health, disease, microbiology and treatments.	• Diagnostic: baseline/retrieval check on prerequisite cell biology, systems, calculations and data interpretation. • KPI/formative: topic checks and Pearson-style short/long-answer practice across AO1-AO3. • Summative: Pearson external examination - 80 marks, 1 hour 30 minutes; short- and long-answer questions; available January and May/June.	• Suggested: dual-coded diagrams/models and organ-system knowledge organisers; explicit vocabulary instruction. • Worked examples and stepwise scaffolds for magnification, SA:V and rate calculations, then fade support. • Use partially completed diagrams/data questions and targeted retrieval where prerequisite knowledge is insecure.	• Direct foundation for Unit 2 diagnostic/health content, Unit 3 microbiology and Unit 4 molecules/pathways and disease. • Supports progression to HE routes identified by Pearson, including nursing, psychology and physiotherapy, alongside wider medical-science study.
12 Term 2	Unit 2: Health Issues and Scientific Reporting. • 120 GLH; mandatory; externally assessed. • Big ideas: diagnostic techniques; immune response/dysfunction; genetics and health; cancer; interpretation, analysis and evaluation of scientific information.	• AO1-AO4 progression: know/understand, apply, analyse/interpret, then make reasoned judgements and conclusions. • Interpret diagnostic results and relate abnormal values to health conditions. • Analyse quantitative and qualitative evidence; calculate averages/percentage change, use lines of best fit and identify trends/patterns. • Evaluate validity, reliability, bias, errors, funding/source influence and the quality of scientific reporting; secondary/primary research skills are signposted.	• Revisits Unit 1 body systems through diagnostic testing and abnormal physiology. • Builds on cell division/genetics when studying genetic technologies and cancer, and on physiological knowledge when considering immune dysfunction and disease. • Extends existing data-handling skills into reliability/validity, source evaluation and scientific reporting.	• Diagnostic: retrieval of Unit 1 physiology/genetics plus an initial scientific-data/source-evaluation task. • KPI/formative: diagnostic-data questions, source reliability/validity tasks and AO1-AO4 exam practice. • Summative: Pearson external examination - 80 marks, 2 hours; short- and long-answer questions using contexts and data; available January and May/June.	• Suggested: model how to read diagnostic data, graphs and scientific articles using a consistent annotation routine. • Provide source-reliability checklists, command-word prompts and structured data tables before moving to independent evaluation. • Pre-teach technical vocabulary and chunk genetics/immune/cancer pathways with diagrams and sequencing activities.	• Unit 3 is explicitly synoptic: students apply underpinning knowledge, ideas and concepts from Unit 2. • Research literacy, data interpretation and source evaluation support Unit 4 and the independent/self-directed learning expected in higher education.
12 Term 3	Unit 3: Practical Microbiology and Infectious Diseases - Learning aims A-B. • Classification/nature of microorganisms; pathogenicity; infectious disease transmission, progression, prevention and treatment.	• Use secondary research to compare prokaryotes, eukaryotic microorganisms, viruses and prions and explain classification strategies. • Explain and compare virulence mechanisms and how pathogens cause disease. • Analyse chains/modes of transmission, disease progression, vaccination, prevention and treatment, including current issues such as resistance and uptake. • Develop critical thinking and evidence-based scientific	• Explicitly draws on Unit 1 cells, tissues and biological molecules and Unit 2 immune response plus qualitative/quantitative research methods. • Revisits infection-and-response ideas while increasing depth through pathogen classification, virulence and transmission.	• Diagnostic: retrieval of cell structure, immunity, disease transmission and research-method knowledge. • KPI/formative: research products and criterion-style tasks for learning aims A-B; checks on classification, pathogenicity, transmission and treatment. • Summative: Unit 3 is assessed through the mandatory Pearson Set Assignment Brief (PSAB) after the full unit is taught; total PSAB time is approximately 19 hours, centre marked and Pearson verified.	• Suggested: microorganism comparison grids, labelled micrographs and transmission-chain diagrams to reduce cognitive load. • Use curated source sets and research templates before independent secondary research; model the difference between describe/explain/discuss/evaluate. • Frequent retrieval of immune/cell knowledge and explicit links to real infectious-disease examples.	• Prepares for Unit 3 learning aims C-D, where microorganism knowledge is applied in practical culture, identification and antimicrobial testing. • Links to clinical microbiology, pathology, infection science and veterinary science highlighted in the unit introduction.

		explanation before practical work.				
13 Term 1	• Unit 3: Practical Microbiology and Infectious Diseases - Learning aims C-D. • Health and safety, microscopy/staining, culture and quantitative analysis; antimicrobial investigation and evaluation.	• Follow SOPs, risk assessment/COSHH, PPE, aseptic technique and safe microbiological practice. • Use microscopy/staining, culture methods, serial dilution/counting and quantitative analysis of microbial growth. • Design/undertake antimicrobial susceptibility investigations; measure zones of inhibition and manage repeats/anomalies. • Present data using tables/graphs/statistics (including standard deviation/error bars), evaluate error/limitations and draw evidence-based conclusions. Critical thinking is embedded.	• Builds directly on Unit 3 learning aims A-B: microorganism structure, pathogenicity, transmission and treatment. • Applies Unit 1 cell/biological-molecule knowledge and Unit 2 quantitative/qualitative methods to a synoptic practical investigation. • Reuses data quality, validity, error and conclusion skills when evaluating antimicrobial results.	• Diagnostic: practical-readiness checks for risk assessment, aseptic technique, microscopy and quantitative skills. • KPI/formative: skills checkpoints and a laboratory record/log of procedures, observations, analysis and reflection (Pearson recommends a lab book, though it is not formal assessment evidence). • Summative: mandatory Unit 3 PSAB, approximately 19 hours in total; centre marked and Pearson verified. Practical and written evidence addresses learning aims C-D and draws synoptically on earlier units.	• Suggested: teacher demonstration plus visual SOP/checklists before independent practical work; rehearse equipment and aseptic technique in low-stakes stages. • Provide calculation/data templates for serial dilution, counts, standard deviation and graphing, then gradually remove scaffolds. • Use structured evaluation prompts for validity, error, limitations and improvements; adapt practical roles/access while preserving the intended scientific skill.	• Develops independent investigation and laboratory skills intended to benefit progression to higher education. • Relevant to microbiology, biomedical science, pathology, clinical/infection sciences and laboratory-based health careers.
13 Term 2	• Unit 4: Diseases, Disorders, Treatments and Therapies. • 60 GLH; optional; internally assessed. • Biological molecules/pathways; physiological disease and treatment; drug development, innovative therapies and ethical/legal/moral issues.	• Undertake secondary research into biological molecules/pathways, disease mechanisms and treatment effects. • Move from explain/describe to discuss and evaluate: impact on the individual, treatment benefits/risks and evidence quality. • Trace drug discovery from natural/synthesised compounds through modelling, clinical trials and regulatory approval. • Evaluate innovative treatments and ethical, legal and moral issues; creativity/innovation is signposted.	• Revisits Unit 1 proteins, lipids, nucleic acids, cell processes and endocrine/cardiovascular/nervous physiology as explanations for disease. • Connects to Unit 2 cancer, genetics, diagnostics, evidence evaluation and clinical-trial thinking. • Draws on the wider course theme of how scientific evidence informs prevention, treatment and future therapies.	• Diagnostic: retrieval of biological molecules, disease mechanisms, treatments and scientific evidence. • KPI/formative: case-study research and explain/discuss/evaluate tasks aligned to learning aims A-C. • Summative: mandatory Pearson Set Assignment Brief (PSAB), approximately 11 hours; centre marked and Pearson verified, using Pass/Merit/Distinction criteria across learning aims A-C.	• Suggested: case-study organisers linking molecule/pathway → disease → symptoms → treatment → impact. • Use treatment-comparison matrices, research-source ladders and writing frames for explain/discuss/evaluate before independent extended writing. • Structure ethical debate with sentence stems/evidence prompts and provide extension through recent/innovative therapy examples.	• Prepares students for HE study involving pharmacology, biomedical science, healthcare, clinical research and drug development. • Strengthens independent research, critical evaluation and ethical reasoning identified across the qualification as preparation for higher education.
13 Term 3	• Revision and resit preparation for Units 1 and 2. • Consolidation of external-unit content, quantitative skills, data interpretation and exam technique.	• Use retrieval, interleaving and spaced practice across both external units. • Practise command terms, calculations, graph/data interpretation and application to unfamiliar contexts. • Use timed responses, mark-scheme comparison and error analysis to refine scientific reasoning and exam technique.	• Cumulative review of all Unit 1 and Unit 2 content, including links to the synoptic knowledge later applied in Unit 3. • Use knowledge from Units 3-4 as fresh application contexts for disease, treatment, research and data evaluation.	• Diagnostic: question-level analysis of mocks/previous assessment to identify content and skills gaps. • KPI/formative: targeted retrieval, topic tests, timed sections and full-paper practice. • Summative/resit: Units 1 and 2 external assessments. Pearson permits two resits after the initial attempt (three attempts in total); the best grade achieved counts. May/June is the relevant Year 13 Term 3 window, with January also available.	• Suggested: personalised revision plans from question-level analysis; small-group re-teaching of common misconceptions. • Use spaced retrieval, worked examples, model responses and targeted timed practice; fade scaffolds as confidence improves. • Prioritise high-frequency calculation/data skills and command terms for pupils whose knowledge is secure but exam performance is weaker.	• Secures the external-unit grades that contribute to the final Extended Certificate and supports transition to higher education. • Consolidates critical thinking, research/data analysis and independent-learning habits that Pearson identifies as foundations for academic success.

