Key Stage 3 Science: Curriculum Outline

YEAR 7	TERM 1 AND 2	TERM 3 AND 4	TERM 5 AND 6
Biology	**Cells**: Cell structure Microscopy Specialisation/differentiation Stem cells Organisation Mitosis	**The human body** Diffusion Digestion Digestive enzymes The heart Blood vessels	**Ecology** Communities Biotic/abiotic factors Food chains Trophic levels Biomass
Chemistry	**Particles** Atomic structure and states of matter physical changes and state symbols Separating mixtures: filtration and evaporation Separating mixtures: chromatography	**Atoms** Atoms/elements/compounds and mixtures Mass/charge atom Development of the atomic model The periodic table The development of the periodic table Electronic structure Groups 1/7/0	**Acids and alkalis** Conservation of mass and chemical equations Acids/bases Salts Neutralisation Strong and weak acids
Physics	**Energy** Energy stores and systems Energy transfers Conservation/dissipation Heat transfer and temperature Renewable and non-renewable resources	**Forces** Contact/non-contact Gravity Resultant forces Forces and elasticity Speed Newton's first law: motion	**Waves** Transverse and longitudinal waves Wave properties Sound waves Using waves for detection and exploration Electromagnetic waves.

YEAR 8	TERM 1 AND 2	TERM 3 AND 4	TERM 5 AND 6
Biology	**Health and disease** Prokaryotes and eukaryotes Culturing/preventing microorganism growth Coronary heart disease and health issues Lifestyle and disease, and cancer Communicable disease	**Reproduction** Mitosis Human reproduction Hormones in reproduction Meiosis Sexual and asexual reproduction	**Genetics/inheritance** Chromosomes and DNA Inheritance Inherited disorders Sex determination Variation

	Human defence systems Vaccination, antibiotics and painkillers	Advantages and disadvantages of sexual asexual reproduction	Genetics
Chemistry	**Metals** Metals/non-metals Group 1 Metallic bonding Properties of metals and alloys Metal reactivity The reactions of metals and acids.	**Non-metals** Chemical bonding Covalent bonding Properties of small molecules and giant covalent structures Structure and bonding in carbon molecules	**Organic chemistry** Fuels Carbon compounds as fuels Alkanes and alkenes The reactions of alkenes and alcohols Polymers
Physics	**Motion** Resultant forces Work done and energy transfer Scalar and vector quantities Forces and motion (mass and acceleration)	**Energy and matter** Energy changes in systems Particle model and changes in state Internal energy and energy transfers Particle model and pressure Pressure	**Space** The solar system Planets, orbits and satellites The life cycle of a star Red shift

Key Stage 4 Science: Curriculum Outline

This curriculum aims to ensure that all Pimlico Academy students become scientifically literate who are able to recognise the importance of rational explanation, capable of scientific analysis and knowledgeable about the contribution that the sciences make to our theoretical and practical understanding of the world. It is designed so that foundational concepts taught at KS3 are carefully built upon over three years, ensuring students develop an increasingly sophisticated and specialised understanding of the separate sciences. There is a strong focus on retrieval practice and interleaving learning: each topic begins by explicitly returning to relevant prior learning and ends with an assessment and an interleaved test based on another topic. End of topic assessments are placed at the end of the unit to enable students to connect their learning to a set of practical techniques and real-world applications. All too often, learning about science involves a series of disjointed lessons and unconnected information that is difficult to remember or fully understand. As such, a key principle of this curriculum is that the sciences can and should be taught through meaningful narratives that enable students to form long-term memories.

	BIOLOGY	CHEMISTRY	PHYSICS
YEAR 9	B1 CELL BIOLOGY • Microscopy • Animal and plant cells • Specialised cells • Stem cells • Cell division • Diffusion • Osmosis • Active transport B2 ORGANISATION • Enzymes • Digestive system • Digestive enzymes • Lungs and gas exchange • The heart • Heart disease • The blood and blood vessels • Plant tissues and organs • Transpiration	C1 ATOMIC STRUCTURE • Atoms • History of the atom • Chemical equations • Separation techniques • Isotopes • Electron configuration • The periodic table • Groups 1, 7 and 0 C2 BONDING • States of matter • Ionic bonding • Giant ionic structures • Covalent bonding • Metallic bonding • Giant covalent structures • Polymers	P1 ENERGY • Energy stores • Power • Efficiency • Kinetic energy • Gravitation potential energy • Elastic potential energy • Conduction and insulation • Energy resources P2 ELECTRICITY • Series and parallel circuits • Current and charge • Potential difference • Resistance • Domestic electricity use • Electricity and power • National Grid

	BIOLOGY	CHEMISTRY	PHYSICS
YEAR 10	B3 INFECTION AND RESPONSE • Disease • Microbes • Human defence system • Vaccinations • Drug trials • Non-communicable diseases Triple only: • Monoclonal antibodies • Plant disease B4 BIOENERGETICS • Photosynthesis • Rate and factors limiting • Aerobic and anaerobic respiration • Exercise and Metabolism B5 HOMEOSTASIS • Homeostasis and the nervous system • Reflexes • Endocrine system • Blood glucose and diabetes • Reproduction and the menstrual cycle • Artificial fertilisation Triple only: • The Brain	C3 QUALITATIVE CHEMISTRY • Conservation of mass • Relative molecular mass • Moles • Reacting masses • Concentration Triple only: • Percentage yield • Atom economy • Titration calculations • Gas volume C4 CHEMICAL CHANGES • Reactivity series • Displacement reactions • Extracting metals • Acids and metals • Acids and bases • Making salts • Electrolysis Triple only: • Titration practical C5 ENERGY CHANGES • Exothermic and endothermic • Calculating bond energies Triple only: • Chemical cells and batteries • Fuel cells	P3 PARTICLE OF MATTER • Particle model • Density • Specific heat capacity • Internal energy • Specific latent heat • Gas pressure P4 ATOMIC STRUCTURE • Atomic structure • Models of the atom • Radiation + safety • Half life Triple only: • Nuclear fission and fusion P5 FORCES • Vectors/ scalar • Resultant forces • Resolution of forces • Hooke's law • Speed/ distance time graphs • F=ma and terminal velocity • Forces and breaking • Momentum Triple only: • Moments • Collisions and car safety • Pressure in liquids

	• The eye • Kidneys • Plant hormones	C6 RATE AND EXTENT OF CHEMICAL CHANGE • Rates of reaction • Reversible reactions • Dynamic equilibrium	• Atmospheric pressure
YEAR 11	**BIOLOGY**	**CHEMISTRY**	**PHYSICS**
	B6 INHERITANCE • Types of reproduction • Meiosis • DNA structure • Inheritance • Inherited diseases • Genetic screening • Variation • Evolution • Evidence for evolution • Genetic engineering • Selective breeding • Antibiotic resistance • Classification Triple only: • Cloning • History of genetics • Theories of evolution B7 ECOLOGY • Communities • Competition • Adaptations • Feeding relationships • Measuring distribution and abundance • Cycles • Human effects on the environment • Maintaining biodiversity	C7 ORGANIC CHEMISTRY • Hydrocarbons – alkanes and alkenes • Fractional distillation • Combustion • Cracking Triple only: • Alcohols • Carboxylic acids • Esters • Polymerisation • Natural polymers and DNA C8 CHEMICAL ANALYSIS • Pure substances and mixtures • Chromatography Triple only: • Testing for ions • Instrumental analysis C9 CHEMISTRY AND THE ATMOSPHERE • Evolution of the atmosphere • Greenhouse gases and climate change • Pollutants C10 USING RESOURCES • Finite and renewable resources • Water • Extracting metals	P6 WAVES • Nature and properties of waves • Reflection and refraction • Electromagnetic spectrum • Communication • Using UV, gamma and x-rays Triple only: • Sound waves • Ultrasound and seismic waves • Visible light and colour • Lenses P7 MAGNETISM • Magnetic fields • Motor effect • Electromagnets Triple only: • Generator effect • Transformers P8 SPACE – TRIPLE ONLY • Formation of the solar system • Life cycle of a star • Satellites • Red shift • The Big Bang

	Triple only: • Decomposition • Impact of environmental change • Food security and production	• Life cycle assessments Triple only: • Rusting • Alloys • Polymers and composites • Haber process	

Science Rationale

The Science Curriculum splits the study of science into three subjects: Physics, Biology and Chemistry. Each of these subjects has its own separate internal structure and important underpinning concepts. Physics is about energy, forces and their interactions. It allows us to understand the rules that govern the universe we live in, from the smallest atoms to the vastness of deep space. Chemistry is about the elements and particles that make up the universe. Biology is about the study of living things and the way that living things are able to survive and reproduce.

Each separate science is organised very clearly around one underpinning concept. That concept is explored in a variety of different contexts; cells are introduced in Year 7, revisited in eukaryotic and prokaryotic cells in the 'Health and disease' topic in Year 8 and then again in B1 'cell Biology' in Year 9. Data and experiments are also used to develop an understanding of the topic being studied and an understanding of the scientific method, with sufficient curriculum time set aside to teach both the underlying substantive and disciplinary knowledge. The material in each subject and in each year has been carefully sequenced so that it builds logically and that it complements what is being studied in the other sciences; Year 9 C1 Atomic structure links to year 10 P4 Radiation.

The scientific insights of the modern era are one of the greatest achievements of humanity. This curriculum will enable all pupils to understand these great insights and the methods by which they have been gained. It will also allow students to make informed choices regarding the crical challenges facing society today, such as climate change and more recently covid.

Science at KS4

The curriculum aims to ensure that all Pimlico Academy students become scientifically literate who are able to recognise the importance of rational explanation, capable of scientific analysis and knowledgeable about the contribution that the sciences make to our theoretical and practical understanding of the world. It is designed so that foundational concepts taught at KS3 are carefully built upon over three years, ensuring students develop an increasingly sophisticated and specialised understanding of the separate sciences. There is a strong focus on retrieval practice and interleaving learning: each topic begins by explicitly returning to relevant prior learning and ends with an assessment and an interleaved test based on another topic. End of topic assessments are placed at the end of the unit to enable students to connect their learning to a set of practical techniques and real-world applications. All too often, learning about science involves a series of disjointed lessons

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