Science: Long-Term Plan - Academic Year 2023 – 2024

	Autumn Term	Spring Term	Summer Term
	Autumn 1	Spring 1	Summer 1
Year 7/8	**Introduction to Science/key skills** ❖ use appropriate apparatus, during laboratory work, paying attention to health and safety ❖ ask questions and develop a line of enquiry based on observations ❖ make predictions using scientific knowledge and understanding ❖ select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate ❖ make and record observations and measurements ❖ present observations and data ❖ interpret observations and data, ❖ present reasoned explanations ❖ evaluate data ❖ understand and use SI units	**Forces** ❖ forces as pushes or pulls, arising from the interaction between two objects ❖ using force arrows in diagrams, ❖ stretching and squashing – springs; ❖ friction between surfaces ❖ measuring of forces ❖ measurements of stretch or compression as force is changed ❖ contact and non-contact forces	**Light** ❖ the similarities and differences between light waves and waves in matter ❖ light waves travelling through a vacuum ❖ speed of light ❖ the transmission of light through materials ❖ use of ray model to explain imaging in mirrors ❖ the pinhole camera ❖ the refraction of light ❖ the human eye ❖ colours and the different frequencies of light. **Sound** ❖ frequencies of sound wave ❖ measurement of sound waves ❖ echoes ❖ properties of sound ❖ how sound waves are produced ❖ the structure of the human ear ❖ auditory range of humans and animals

Autumn 2	Spring 2	Summer 2
Basic Chemistry ❖ atoms and molecules as particles ❖ The particulate nature of matter ❖ the properties of the different states of matter (solid, liquid and gas) ❖ Atoms, elements and compounds ❖ chemical symbols and formulae for elements and compounds ❖ the Periodic Table: periods and groups; ❖ metals and non-metals and their properties. **Cells & organisation** ❖ cells as the unit of living organisms ❖ how to observe, interpret and record cell structure using a light microscope ❖ the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts ❖ the similarities and differences between plant and animal cells ❖ the hierarchical organisation of multicellular organisms ❖ the role of diffusion in the movement of materials in and between cells ❖ the structural adaptations of some unicellular organisms	**The skeletal and muscular systems** ❖ the structure and functions of the human skeleton ❖ biomechanics – the interaction between skeleton and muscles, ❖ measurement of force exerted by different muscles ❖ the function of muscles and examples of antagonistic muscles. **Gas exchange systems** ❖ the structure and functions of the gas exchange system in humans, including adaptations to function ❖ the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume	**Reactions** ❖ chemical reactions as the rearrangement of atoms ❖ representing chemical reactions using formulae and using equations ❖ combustion, thermal decomposition, oxidation and displacement reactions ❖ defining acids and alkalis in terms of neutralisation reactions ❖ the pH scale for measuring acidity/alkalinity; and indicators **Reproduction** ❖ reproduction in humans ❖ the structure and function of the male and female reproductive systems, ❖ menstrual cycle ❖ gametes, fertilisation, gestation and birth ❖ effect of maternal lifestyle on the foetus through the placenta ❖ reproduction in plants ❖ flower structure ❖ pollination, ❖ fertilisation ❖ seed and fruit formation ❖ seed dispersal

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Year 9	**Health & Lifestyle** ♣ the effects of recreational drugs (including substance misuse) on behaviour, health and life processes. **Elements, Compounds & Mixtures** **Electricity**	**The Periodic Table** ♣the varying physical and chemical properties of different elements ♣ the principles underpinning the Mendeleev Periodic Table ♣ the Periodic Table: periods and groups; metals and non-metals ♣ how patterns in reactions can be predicted with reference to the Periodic Table ♣ the properties of metals and non-metals ♣ the chemical properties of metal and non-metal oxides with respect to acidity. **Magnetism** ♣ magnetic poles, attraction and repulsion ♣ magnetic fields by plotting with compass, representation by field lines ♣ Earth's magnetism, compass and navigation ♣ the magnetic effect of a current, electromagnets, D.C. motors (principles only).	**Adaptation & Inheritance** ♣ heredity as the process by which genetic information is transmitted from one generation to the next ♣ a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model ♣ differences between species ♣ the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation ♣ the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection ♣ changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction ♣ the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

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Ecosystem processes ♣ importance and process of photosynthesis ♣ the structure and function of a leaf including the distribution of chloroplasts in a leaf ♣ how plants use minerals for healthy growth ♣ the role of nitrates in plant growth ♣ the process of chemosynthesis and where it takes place ♣ importance and process of aerobic respiration ♣ the process and importance of anaerobic respiration ♣ the interdependence of organisms in an ecosystem, including food chains and webs ♣ how organisms affect, and are affected by, their environment, including the accumulation of toxic materials. ♣ resources that plants and animals compete for ♣ how organisms are adapted to their environments **Separation Techniques** ♣ the concept of a pure substance ♣ mixtures, including dissolving ♣ diffusion in terms of the particle model ♣ simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography ♣ the identification of pure substances. **Forces & Motion** ♣ speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) ♣ the representation of a journey on a distance-time graph ♣ relative motion: trains and cars passing one another	**Chemical Reactions** **Energy** ♣ comparing energy values of different foods (from labels) (kJ) ♣ comparing power ratings of appliances in watts (W, kW) ♣ comparing amounts of energy transferred (J, kJ, kW hour) ♣ domestic fuel bills, fuel use and costs ♣ fuels and energy resources. simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged ♣ heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators ♣ other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels ♣ energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change ♣ comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions ♣ using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes	**Metals & Acids** ♣ compare the reactions of different metals with dilute acids, oxygen and water ♣ performing the test for hydrogen gas ♣ the reactivity series & metal displacement reactions ♣ extracting metals by heating with carbon ♣ properties and uses of ceramics ♣ properties and uses of polymers ♣ properties and uses of composites **Forces & Pressure** ♣ moment as the turning effect of a force ♣ pressure in gases, atmospheric pressure, decreases with increase of height as weight of air above decreases with height ♣ pressure liquids, increasing with depth; upthrust effects, floating and sinking ♣ pressure measured by ratio of force over area – acting normal to any surface.

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Year 10	Autumn 1	Spring 1	Summer 1
	Atomic structure and radiation ❖ *Atomic structure* ❖ A simple model of the atom, symbols, relative atomic mass, electronic charge and isotopes ❖ *Atoms and nuclear radiation* ❖ The periodic table	**Bonding and structure (cont.)** ❖ Chemical bonds, ionic, covalent and metallic ❖ How bonding and structure are related to the properties of substances ❖ Structure and bonding of carbon **Energy** ❖ Energy changes in a system, and the ways energy is stored before and after such changes ❖ Conservation and dissipation of energy ❖ National and global energy resources	**Non-communicable Disease** **Quantitative Chemistry** ❖ Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations ❖ Use of amount of substance in relation to masses of pure substances (HT) ❖ Concentration of solutions **Chemical changes** ❖ Reactivity of metals ❖ Reactions of acids ❖ Electrolysis
	Autumn 2	Spring 2	Summer 2
	Cell Biology ❖ Cell structure ❖ Cell division ❖ Transport in cells **Particle model of matter** ❖ Changes of state and the particle model ❖ Internal energy and energy transfers ❖ Particle model and pressure **Bonding and structure.** ❖ Chemical bonds, ionic, covalent and metallic ❖ How bonding and structure are related to the properties of substances ❖ Structure and bonding of carbon	**Energy changes** ❖ Exothermic and endothermic reactions **Organisation: Animals** ❖ Principles of organisation ❖ Animal tissues, organs and organ systems **Bioenergetics: Animals** ❖ Aerobic and anaerobic respiration ❖ Response to exercise ❖ Metabolism **Communicable Disease** ❖ Communicable (infectious) diseases ❖ Human defence systems ❖ Vaccination ❖ Antibiotics and painkillers ❖ Discovery and development of drugs	**Organisation: Plants** ❖ Plant tissues, organs and systems **Bioenergetics: Plants** ❖ Photosynthetic reaction ❖ Rate of photosynthesis ❖ Uses of glucose from photosynthesis **Electricity** ❖ Current, potential difference and resistance ❖ Series and parallel circuits ❖ Domestic uses and safety ❖ Energy transfers

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Year 11	**Year 10 Biology Catch up** ❖ Non-communicable & Communicable Disease ❖ Organisation: Plants ❖ Bioenergetics: Plants **Year 10 Chemistry Catch up** ❖ Energy changes & Chemical changes ❖ Quantitative Chemistry **Year 10 Physics Catch up** ❖ Radiation & Electricity	**Using resources** ❖ Using the Earth's resources and obtaining potable water ❖ Life cycle assessment and recycling **Rate of reaction** ❖ Rate of reaction ❖ Reversible reactions and dynamic equilibrium	**Inheritance, variation and evolution** ❖ Reproduction ❖ Variation and evolution ❖ The development of understanding of genetics and evolution ❖ Classification of living organisms **Magnetism and electromagnetism** ❖ Permanent and induced magnetism, magnetic forces and fields & The motor effect
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	Homeostasis and response ❖ Homeostasis ❖ The human nervous & endocrine system ❖ Control of blood glucose concentration ❖ Hormones in human reproduction, Contraception ❖ The use of hormones to treat infertility (HT) ❖ Feedback systems (HT) **Forces** ❖ Forces and their interactions ❖ Work done and energy transfer ❖ Forces and elasticity & Forces and motion ❖ Accelerations and Newton's Laws of motion ❖ Forces and braking ❖ Momentum (HT only) **Chemistry of the atmosphere** ❖ The composition and evolution of the Earth's atmosphere ❖ Carbon dioxide and methane as greenhouse gases ❖ Common atmospheric pollutants and their sources	**Organic chemistry** ❖ Carbon compounds as fuels and feedstock **Chemical analysis** ❖ Purity, formulations and chromatography ❖ Identification of common gases **Waves** ❖ Waves in air, fluids and solids ❖ Electromagnetic waves	**Ecology** ❖ Adaptations, interdependence and competition ❖ Organisation of an ecosystem ❖ Biodiversity and the effect of human interaction on ecosystems **Revision**