Science Curriculum Plan

	Year 7	Year 8	Year 9	Year 10	Year 11
Autumn	<u>Forces and motion 7PF</u> 7PF 1 use diagrams with correctly labelled force arrows to display a range of forces in different situations 7PF 2 interpret force diagrams to determine the motion of an object 7PF 3 calculate pressure, weight and average speed using appropriate equations 7PF 4 relate the description of a journey to a distance-time graph <u>Particles 7CP</u> 7CP 1 describe the arrangement of particles in a solid, liquid and gas, and link this to their properties 7CP 2 explain changes of state in terms of the particle model 7CP 3 classify substances as pure and impure, and describe techniques to separate mixtures	<u>Ecological relationships & classification 8BE</u> 8BE 1 describe feeding relationships and food webs, and explain how a changing environment may affect them 8BE 2 explain how variation allow organisms to compete, and the way this drives natural selection 8BE 3 describe how a species may become extinct 8BE 4 describe the importance of maintaining biodiversity and how gene banks can be used for preservation <u>Light & space 8PL</u> 8PL 1 describe how light interacts with different materials 8PL 2 describe the effects of absorption of light in terms of energy 8PL 3 use ray diagrams to show how images are formed – such as mirrors, pinhole cameras and the human eye 8PL 4 describe the properties that affect the sizes of gravitational forces between different objects in the Solar system 8PL 5 calculate the weight of an object on different planets 8PL 6 explain why we experience seasons 8PL 7 compare the relative sizes of different astronomical structures within the universe using astronomical distances	<u>Plants & photosynthesis 9BP</u> 9BP 1 describe how roots take up minerals, nutrients and water from the soil 9BP 2 describe photosynthesis in a word equation representing products and reactants 9BP 3 describe how leaves are adapted to carry out photosynthesis 9BP 4 describe the role of plants in maintaining the levels of gases in the atmosphere 9BP 5 describe the importance of pollination on food security <u>Matter 9PM</u> 9PM 1 describe the factors that affect pressure in fluids 9PM 2 describe the motion of particles in different states of matter and link this to different behaviours 9PM 3 compare and explain differences in density between solids, liquids and gases <u>Reactivity 9CR</u> 9CR 1 use patterns of reactivity to make predictions for chemical reactions 9CR 2 link the properties and uses of a metal to its position in the reactivity series	B1 – Cell biology C1 – Atomic structure and the periodic table P1 – Energy B2 - Organisation	P5 – Forces P6 – Waves P7 – Magnetism and electromagnetism C6 – rate end extent of chemical change C7 – Organic Chemistry C8 – Chemical analysis

Spring	Energy 7PE 7PE 1 describe examples of energy transfers 7PE 2 describe how thermal energy transfers from one place to another 7PE 3 apply the law of conservation of energy to situations involving energy transfers 7PE 4 distinguish between power and energy 7PE 5 compare values of energy and power using appropriate SI values 7PE 6 compare different fuels and energy resources Chemical reactions 7CC 7CC 1 identify substances as acid, alkali or neutral based on observations with indicators and the pH scale 7CC 2 describe neutralisation in terms of acids and alkalis reacting	The periodic table 8CP 8CP 1 identify, with reasons, differences between atoms, elements and compounds 8CP 2 represent chemical reactions as word equations and apply this to the idea of conservation of mass 8CP 3 explain how an elements position in the periodic table links to its properties and reactivity (groups 1 and 7) Digestion & nutrition 8BD 8BD 1 describe and explain the components that make up a balanced diet, describing the consequences of an imbalanced diet 8BD 2 evaluate how different lifestyles have different energy needs 8BD 3 describe the symbiotic relationship between bacteria and the human digestive system 8BD 4 describe how and explain why foods are broken down in the digestive system, in terms of enzymes	Biological systems & processes 9BB 9BB 1 explain the functions of the skeleton, and describe the function of antagonistic muscle pairings 9BB 2 explain how the use of recreational drugs and smoking can affect biological systems, such as during gas exchange and gestation 9BB 3 explain the respiratory system as a mechanism of breathing and gas exchange (to allow substances to diffuse) 9BB 4 compare aerobic to anaerobic respiration, and describe the situations in which they occur 9BB 5 describe how genetic material can be inherited, and the role of Watson, Crick, Wilkins and Franklin in the discovery of DNA structure Forces in action 9PF 9PF 1 define and calculate a moment, and relate this to force multipliers 9PF 2 measure extension or compression and relate this to the force applied to a spring and to Hookes law 9PF 3 describe energy transfers and conservation of energy for the deformation of objects 9PF 4 describe balanced forces in relation to mechanical systems Energetics & rates 9CE 9CE 1 describe combustion, thermal decomposition and oxidation, representing them as symbol equations 9CE 2 describe how a catalyst affects the rate of a reaction 9CE 3 describe the differences between an exothermic and	C2 – Bonding, structure and properties of matter P2 – Electricity B3 – Infection and response C3 – Quantitative Chemistry P3 – Particle model of matter	C9 – Chemistry of the atmosphere C10 – using resources Revision

			endothermic reaction, and link these to energy changes		
Summer	<u>Cells, tissues & organs 7BC</u> 7BC 1 use a microscope to produce an image of a cell in focus 7BC 2 label plant and animal cells; state the function of the organelles; and compare plant and animal cells 7BC 3 describe the relationship between cells, tissues and organs; and describe the function of the main organ systems <u>Reproduction & variation 7BR</u> 7BR 1 label the parts of the structure of the male and female reproductive system, and describe their function 7BR 2 describe the processes of menstruation and fertilisation, and identify the stages of gestation and birth 7BR 3 describe the function of each part of the flower, and explain how pollination occurs 7BR 4 evaluate different seed dispersal techniques in plants 7BR 5 identify variation between individuals of a species and state the differences between species, describing the difference between continuous and discontinuous variation	<u>Materials & the Earth 8CM</u> 8CM 1 describe the structure and composition of the earth and link this to the rock cycle 8CM 2 explain how carbon is recycled in the Earth's atmosphere and link the impact of human activity to climate change <u>Electricity & magnetism 8PE</u> 8PE 1 define current, and describe its behaviour in series and parallel circuits 8PE 2 correctly use apparatus to measure current and potential difference 8PE 3 identify conductors and insulators and calculate resistance values using appropriate units 8PE 4 explain how insulators are charged by friction, and describe the forces between charged objects 8PE 5 draw and interpret simple magnetic field diagrams 8PE 6 describe how electromagnets and direct current motors work	<u>Sound waves 9PS</u> 9PS 1 compare light, mechanical and sound waves 9PS 2 describe the process of reflection, absorption and superposition (add or cancel waves) 9PS 3 compare human and animal auditory ranges using appropriate units 9PS 4 describe uses of sound and ultrasound, including industrial and medical uses	B4 – Bioenergetics C4 – Chemical changes P4 – Atomic structure C5 – Energy Changes	

Science Curriculum Topic and Content

Year	Topic	NC Statement
7	Cells, tissues and organs	• B1 cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope • B2 the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts • B3 the similarities and differences between plant and animal cells • B6 the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • B5 the structural adaptations of some unicellular organisms • B13 the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food […] • B16 the structure and functions of the gas exchange system in humans, […]
7	Reproduction and variation	• B20 reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, […] • B21 reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. • B35 differences between species • B36 the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation
7	Particles	• C1 the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure • C2 changes of state in terms of the particle model. • C6 conservation of mass changes of state […] • C7 the concept of a pure substance • C8 mixtures, including dissolving • C9 diffusion in terms of the particle model • C10 simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography • C11 the identification of pure substances. • C20 energy changes on changes of state (qualitative)
7	Chemical Reactions	• C6 conservation of mass […] chemical reactions. • C12 chemical reactions as the rearrangement of atoms (as shown in word equations) • C13 representing chemical reactions […] using (word) equations • C15 defining acids and alkalis in terms of neutralisation reactions (as intro to this for Y9) • C16 the pH scale for measuring acidity/alkalinity; and indicators • C18 reactions of acids with alkalis to produce a salt plus water
7	Forces and motion	• P15 forces as pushes or pulls, arising from the interaction between two objects • P16 using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces • P18 forces: associated with […] rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water • P19 forces measured in newtons […]

		• P27 forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • P 28 change depending on direction of force and its size. • P25 pressure measured by ratio of force over area – acting normal to any surface. • P59 gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, […] • P12 speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time) • P13 the representation of a journey on a distance-time graph • P14 relative motion: trains and cars passing one another
7	Energy	• P8 other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. • P7 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 • P9 energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change • P10 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 • P1 comparing energy values of different foods (from labels) (kJ) • P2 comparing power ratings of appliances in watts (W, kW) • P3 comparing amounts of energy transferred (J, kJ, kW hour) • P4 domestic fuel bills, fuel use and costs • P5 fuels and energy resources
8	Ecological relationships and classification	• B30 the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • B32 how organisms affect, and are affected by, their environment, including the accumulation of toxic materials. • B37 the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • B38 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 • B39 the importance of maintaining biodiversity […] • B39 […] the use of gene banks to preserve hereditary material.
8	Digestion and nutrition	• B10 content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed • B11 calculations of energy requirements in a healthy daily diet • B12 the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • B14 the importance of bacteria in the human digestive system • B13 [...] how the digestive system digests food (enzymes simply as biological catalysts)
8	Materials and the Earth	• C30 properties of ceramics, polymers and composites (qualitative). • C31 the composition of the Earth • C32 the structure of the Earth • C33 the rock cycle and the formation of igneous, sedimentary and metamorphic rocks • C34 Earth as a source of limited resources and the efficacy of recycling • C35 the carbon cycle

		• C36 the composition of the atmosphere • C37 the production of carbon dioxide by human activity and the impact on climate.
8	The periodic table	• C3 a simple (Dalton) atomic model • C4 differences between atoms, elements and compounds • C5 chemical symbols and formulae for elements and compounds • C6 conservation of mass […] chemical reactions. • C12 chemical reactions as the rearrangement of atoms (as shown in symbol equations) • C13 representing chemical reactions using formulae and using (symbol) equations • C22 the varying physical and chemical properties of different elements • C23 the principles underpinning the Mendeleev Periodic Table • C24 the Periodic Table: periods and groups; metals and non-metals • C25 how patterns in reactions can be predicted with reference to the Periodic Table
8	Light and space	• P36 light waves travelling through a vacuum; speed of light • P37 the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface • P38 use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye • P39 light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • P40 colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. • P22 non-contact forces: gravity forces acting at a distance on Earth and in space […] • P59 gravity force, weight […] different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only) • P60 our Sun as a star, other stars in our galaxy, other galaxies • P61 the seasons and the Earth's tilt, day length at different times of year, in different hemispheres • P62 the light year as a unit of astronomical distance.
8	Electricity and magnetism	• P41 electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • P42 potential difference, measured in volts, battery and bulb ratings […] • P42 […] resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • P43 differences in resistance between conducting and insulating components (quantitative). • P44 separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects • P45 the idea of electric field, forces acting across the space between objects not in contact. • P22 non-contact forces: […] forces due to static electricity. • P46 magnetic poles, attraction and repulsion • P47 magnetic fields by plotting with compass, representation by field lines • P48 Earth's magnetism, compass and navigation • P49 the magnetic effect of a current, electromagnets, D.C. motors (principles only). • P22 non-contact forces: […] forces between magnets […] • P41 (Link to: P41 electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge)

9	Biological systems and processes	• B7 the structure and functions of the human skeleton, to include support, protection, movement and making blood cells • B8 biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles • B9 the function of muscles and examples of antagonistic muscles. • B22 the effects of recreational drugs (including substance misuse) on behaviour, health and life processes. • B16 the structure and functions of the gas exchange system in humans, including adaptations to function • B4 the role of diffusion in the movement of materials in and between cells • B17 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 • B18 the impact of exercise, asthma and smoking on the human gas exchange system • B20 reproduction in humans (as an example of a mammal), [...] to include the effect of maternal lifestyle on the foetus through the placenta • B26 aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life • B27 a word summary for aerobic respiration • B28 the process of anaerobic respiration in humans and microorganisms, including fermentation, and a word summary for anaerobic respiration • B29 the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism. • B33 heredity as the process by which genetic information is transmitted from one generation to the next • B34 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
9	Plants and photosynthesis	• B15 plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots. • B19 the role of leaf stomata in gas exchange in plants. • B23 the reactants in, and products of, photosynthesis, and a word summary for photosynthesis • B24 the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere • B25 the adaptations of leaves for photosynthesis. • B31 the importance of plant reproduction through insect pollination in human food security
9	Reactivity	• C13 representing chemical reactions using formulae and using (symbol) equations • C14 […] displacement reactions • C17 reactions of acids with metals to produce a salt plus hydrogen • C26 the properties of metals and non-metals • C27 the chemical properties of metal and non-metal oxides with respect to acidity. • C28 the order of metals and carbon in the reactivity series • C29 the use of carbon in obtaining metals from metal oxides
9	Energetics and rates	• C14 combustion, thermal decomposition, oxidation […] reactions • C19 what catalysts do. • C21 exothermic and endothermic chemical reactions (qualitative).

9	Sound waves	• P29 waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. • P30 frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound • P31 sound needs a medium to travel, the speed of sound in air, in water, in solids • P32 sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • P33 auditory range of humans and animals. • P34 pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound; waves transferring information for conversion to electrical signals by microphone.
9	Forces in action	• P6 simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged • P17 moment as the turning effect of a force • P18 forces: associated with deforming objects; stretching and squashing – springs […] • P19 […] measurements of stretch or compression as force is changed • P20 force-extension linear relation; Hooke's Law as a special case • P21 work done and energy changes on deformation • P58 internal energy stored in materials. • P26 opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface. • P11 using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.
9	Matter	• P23 atmospheric pressure, decreases with increase of height as weight of air above decreases with height • P24 pressure in liquids, increasing with depth; upthrust effects, floating and sinking • P50 conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving • P51 similarities and differences, including density differences, between solids, liquids and gases • P52 Brownian motion in gases • P53 diffusion in liquids and gases driven by differences in concentration • P54 the difference between chemical and physical changes. • P55 the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition • P56 atoms and molecules as particles. • P57 changes with temperature in motion and spacing of particles