

### Science Curriculum Overview – Year 11 Triple science

Year 11		HT1	HT2	HT3	HT4	HT5	HT6
<b>subject</b>	<b>Topic</b>	SB6 Plant structures and their functions SC17-19 Groups; energy changes and rates of reaction SP8-9 Energy, Forces and their effects	SB7 Animal coordination, control and homeostasis SC20-21 Fuels, Earth and atmospheric science SP10-11 Electricity and circuits, static electricity	SB8 Exchange and transport in animals SC22-24 Hydrocarbons, alcohols and polymers SP12-13 Magnetism and the motor effect; electromagnetic induction	SB9 Ecosystems and material cycles Sc25-26 Qualitative analysis: Tests for ions: Bulk and surface properties of matter including nanoparticles SP14 Particle model; forces and matter	Revision for paper 1 and paper 2	
	<b>Why this and why now?</b>	Fundamentals of biology, chemistry and physics have been introduced in year 10 topics are taught in an interleaving way and after a sequence of 3 topics a cumulative assessment is carried out. This continues into year 11 with paper 2 topics.	Fundamentals of biology, chemistry and physics have been introduced in year 10 topics are taught in an interleaving way and after a sequence of 3 topics a cumulative assessment is carried out. This continues into year 11 with paper 2 topics.	Fundamentals of biology, chemistry and physics have been introduced in year 10 topics are taught in an interleaving way and after a sequence of 3 topics a cumulative assessment is carried out. This continues into year 11 with paper 2 topics.	Fundamentals of biology, chemistry and physics have been introduced in year 10 topics are taught in an interleaving way and after a sequence of 3 topics a cumulative assessment is carried out. This continues into year 11 with paper 2 topics.	Preparation for terminal examinations.	
	<b>What is the essential knowledge that needs to be remembered?</b>	<b>SB6 Plant structures and their functions</b> Leaf structure and function of parts. Photosynthesis equation and type of reaction, factors that affect it. Transpiration, structure and function of root hair cells. Translocation. Xylem and phloem, how	<b>SB7 Animal coordination, control and homeostasis</b> What hormones are and where they are produced. The names of some target organs. The effects of Thyroxine and Adrenaline. The role of oestrogen and progesterone in the menstrual cycle and apply this to how contraceptives	<b>SB8 Exchange and transport in animals</b> The efficient transport and exchange of substances in the body at different surfaces including surface area to volume calculations, structure and function of the heart and circulatory system, Blood composition Cardiac output calculations,	<b>SB9 Ecosystems and Material Cycle</b> Interactions of ecosystems and sampling methods. Biotic and abiotic factors and how they affect communities. Relationships between organisms (Parasitism and		

		<p>plants are adapted for photosynthesis and the action and uses of plant hormones.</p> <p><b>SC17-19 Structure and properties of groups 1, 7 and 0.</b> Factors affecting the rate of reactions including collision theory. Catalysts and activation energy. Energy changes in reactions including exothermic and endothermic reactions, calculation bond energies.</p> <p><b>SP7-8 Forces and effects:</b> Changes in Energy, Work and Power. Contact and non-contact forces and how pairs of forces are represented. Mass and gravity. Comparison of gravitational and magnetic fields. Resolving resultant forces and free-body force diagrams.</p>	<p>work. The role of FSH and LH. How blood glucose is regulated in the body including people with diabetes Types 1 and 2. How to calculate BMI, thermoregulation, osmoregulation and the kidneys further develop the understanding of homeostatic control mechanisms.</p> <p><b>SC20-21 Earth and Atmospheric Science</b> Hydrocarbons and fractional of crude oil, alkanes, complete and incomplete combustion, fuels and pollution, breaking down hydrocarbons (cracking), composition and evolution of earth's atmosphere including key events, formation of oceans, and levels of oxygen through photosynthesis. Composition of the modern atmosphere, and the effects of greenhouse gases on climate change and limiting the impact of greenhouse gases.</p> <p><b>SP10-11 Electricity and static electricity</b> Atomic structure and current flow. Series and parallel circuits. Current and Potential difference. How to calculate energy and charge. Investigate, explain and calculate resistance in</p>	<p>cellular respiration and respiration rates.</p> <p><b>SC22-24 Hydrocarbons: Alcohols and Carboxylic acids</b> Alkanes and alkenes, reactions of alkanes and alkenes, ethanol production, alcohols and combustion of alcohols, carboxylic acids, addition polymerisation, polymer properties and uses, condensation polymerisation and problems with polymers.</p> <p><b>SP12-13 Magnets and Magnetic Fields</b> The use and shape of magnetic fields, evidence of the earth's magnetic field and its effect. Construction of electromagnets and factors affecting its strength. Fleming left hand rule. Transformers including the transformer equation. The use of transformers in the national grid.</p>	<p>Mutualism). Human effects on biodiversity and conservation (Eutrophication), food security, water, carbon and nitrogen cycles, decay and decomposition rates.</p> <p><b>SC 25-26 Qualitative analysis and Bulk Properties.</b> How metal and ammonium ions are identified as well as carbonate, sulphate and halide ions, why chemists analyse substances using machines. How metals, ceramics and polymers are chosen for specific uses as well as composite materials. Students learn the properties and uses of nanoparticles and how they differ from bulk materials.</p> <p><b>SP14 Particle model, Forces and matter.</b> How particles are arranged and how they behave in the 3 states of matter, their properties and how heating affects them.</p>		
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			<p>series and parallel circuits. Identify resistance curves. Explain the heating effect caused by resistance. Calculating electrical power. Electrical safety including fuses and circuit breakers. The national grid, AC and DC. Understand the power rating of appliances, electrical safety, charges and static electricity, dangers of static electricity and electric fields.</p>		<p>Calculating how changes in thermal energy relate to mass, heat capacity and temperature difference. How temperature affects gas pressure and volume. Students learn how forces affect the extension of springs and the relationship between force and extension. How force distributed over area affects the pressure exerted on substances including upthrust in liquids, pressure and upthrust.</p>		
	<p><b>What is the assessment intent and how will you assess?</b></p>	<p>Assessment intent: to inform planning, intervention and identify any gaps. Check mastery in fundamental concepts ready for other units and to prevent curriculum dysfluency whilst checking learning and performance. <b>Formative Baseline; End of topics test</b> to identify misconceptions and gaps in learning to allow for Make It Better time. <b>Cumulative Assessment</b> based on SB7, SC17-19 and SP8-9. Extended answer questions as well as short answer, discuss and compare questions.</p>	<p>Assessment intent: to inform planning, intervention and identify any gaps. Check mastery in fundamental concepts ready for other units and to prevent curriculum dysfluency whilst checking learning and performance. <b>Formative Baseline; End of topics test</b> to identify misconceptions and gaps in learning to allow for Make It Better time. <b>Cumulative Assessment</b> based on SB8, SC20-21 and SP10-11. Extended answer questions as well as short answer, discuss and compare questions.</p>	<p>Assessment intent: to inform planning, intervention and identify any gaps. Check mastery in fundamental concepts ready for other units and to prevent curriculum dysfluency whilst checking learning and performance. <b>Formative Baseline; End of topics test</b> to identify misconceptions and gaps in learning to allow for Make It Better time. <b>Cumulative Assessment</b> based on SB9, SC22-24 and SP12-13. Extended answer questions as well as short answer, discuss and compare questions.</p>	<p>Assessment intent: to inform planning, intervention and identify any gaps. Check mastery in fundamental concepts ready for other units and to prevent curriculum dysfluency whilst checking learning and performance. <b>Formative Baseline; End of topics test</b> to identify misconceptions and gaps in learning to allow for Make It Better time. <b>Cumulative</b></p>		

				<p><b>Assessment</b> based on SC25-26 and SP14-15. Extended answer questions as well as short answer, discuss and compare questions.</p>		
<p><b>What should the end point look like?</b></p>	<p><b>SB6 Plant structures and their functions</b> Describe what happens during photosynthesis, why it is important and how leaves are adapted for photosynthesis, describe limiting factors of photosynthesis and how the rate of photosynthesis is related to light intensity, compare transport systems in plants including diffusion, osmosis and active transport, explain how root hair cells are adapted for their functions, describe and explain transpiration and translocation and explain how xylem and phloem are adapted for their function, explain how a leaf is adapted for gas exchange, explain why some plants have needle shaped leaves and how plants reduce water loss, identify plant hormones and describe their uses, explain negative phototropism and gravitropism and explain the action of auxins, explain the commercial</p>	<p><b>SB7 Hormones</b> Describe hormones, where they are produced and identify the names of key target organs, explain negative feedback mechanisms and the action of thyroxine and adrenaline, explain the menstrual cycle in particular the roles of oestrogen and progesterone, evaluate the use of hormonal and barrier methods of contraception, explain how hormones and contraception control pregnancy, describe the use of ART technology and IVF, describe homeostasis, explain how blood glucose concentration is regulated and explain how type 1 diabetes can be controlled, explain how type 2 diabetes is caused and controlled, explain the correlation between type 2 diabetes and obesity, explain thermoregulation and how the skin, muscles and the brain are involved in this process, explain vasoconstriction and vasodilation, explain why osmoregulation is important, describe the structure of the</p>	<p><b>SB8 Efficient transport and exchange</b> Describe substances need to be transported in the body and the importance of surface area to volume ratio, describe factors that affect the rate of diffusion including Ficks law, describe the components of the circulatory system and explain how the different blood vessels are adapted to their function, the structure and function of blood, explain the structure and function of the heart and how to calculate cardiac output, explain cellular respiration and why it is an exothermic process, compare aerobic and anaerobic respiration, investigate the rate of respiration in living organisms. <b>SC22-24 Hydrocarbons, alcohols and polymers</b> Describe the structures and formulae of the four smallest alkanes, describe the functional group of alkanes, describe the structures of the reactants and products when bromine and ethene react, describe how alcoholic drinks</p>	<p><b>SB9 Ecosystems</b> Explain how ecosystems are structured and the importance of interdependence, describe how energy is transferred through a food chain and why this decreases along the chain, calculate the efficiency of energy transfer between trophic levels, describe abiotic factors and how they affect communities, describe the effects of pollution on communities, investigate the relationship between organisms and their environment using field work including quadrats and transects, describe biotic factors and explain how both competition and predators can affect communities, identify indicator species and explain how they can</p>		

	<p>uses of plant hormones namely auxins and gibberellins. <b>SC17-19 Groups; rates of reaction and heat energy changes</b> Describe the properties of group 1, 7 and 0 elements and explain their reactivity, describe how to test for chlorine gas, explain how different factors affect the rate of chemical reactions and how graphs can be used to show rates of reactions, investigate how changing conditions can affect the rate of chemical reactions, describe what is meant by a catalyst and explain how they work, describe exothermic and endothermic reactions and investigate heat energy changes in chemical reactions, explain exothermic and endothermic reactions in terms of bonds and calculate energy changes from bond enthalpies.</p> <p><b>SP8-9 Forces and their effects</b> Describe how the energy of a system can be changed, calculate work done and power, describe the interaction of forces between two objects, show how pairs of forces can be represented, draw free body diagrams and vector</p>	<p>urinary system and explain how kidney failure can be treated, explain the structure and function of the kidneys including the effects of ADH. <b>SC20-21 Fuels and Earth and atmospheric science</b> Describe hydrocarbons and explain why crude oil is a useful finite resource, describe the process of fractional distillation and explain the properties of the different fractions, explain why alkanes form an homologous series and the trends in their physical and chemical properties, describe what happens during complete and incomplete combustion and explain the problems caused by incomplete combustion, explain how fuels cause pollution and their affect on the environment, explain why cracking is needed to breakdown long chain hydrocarbons and evaluate the use of hydrogen as a fuel, identify gases in the Earths early atmosphere and how the composition of these gases has changed over time, explain how oceans are formed, describe the test for oxygen gas and explain how primitive organisms changed carbon dioxide and oxygen levels, explain global warming and the impact of climate change.</p>	<p>are produced and the chemical reaction of fermentation, explain how we can make alcohol more concentrated, describe the functional groups in all alcohols and the chemical properties of alcohols, investigate the combustion of different alcohols, describe how carboxylic acids are produced and their structure and formulae and explain how this influences their chemical properties, describe what is meant by a polymer and addition polymerisation, explain the properties of polymers and their uses, evaluate the uses of polymers and discuss the problems they cause, explain condensation polymerisation.</p> <p><b>SP12-13 Magnetism and the motor effect; electromagnetic induction</b> Describe how magnets are used and how to plot magnetic fields, state the evidence that shows Earth has a magnetic field, explain how the magnetic field around a wire is related to current, describe factors that affect the strength of an electromagnet, explain the motor effects and electromagnetic induction, describe how transformers work and explain why they are used to transmit electricity around the</p>	<p>provide evidence of pollution, Describe parasitism and mutualism and the relationships in terms of dependency, define biodiversity and how fish farming and eutrophication can affect biodiversity, explain why high biodiversity is important and how we can protect biodiversity, describe what is meant by food security and the factors that affect food security, explain how water, carbon and nitrogen are cycled, describe decomposition, explain the conditions needed for decomposition and how to calculate the rate of decay. <b>Sc25-26 Qualitative analysis: Tests for ions: Bulk and surface properties of matter including nanoparticles</b> Explain how metal ions are identified in flame tests, describe how metal ions are identified using sodium hydroxide and ammonia, describe how to test for negative ions</p>		
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		<p>diagrams to resolve forces, how to calculate the turning effect of a force.</p>	<p><b>SP10-11 Electricity and static electricity</b> Describe how the structure of an atom affects the flow of electric charge, identify the names and symbols of components used in electric circuits, compare series and parallel circuits, describe how electric current is measured and what is meant by potential difference, explain the connection between current, and the amount of charge that flows, explain electrical resistance and how to calculate, explain how potential difference affects current and resistance in fixed resistors, lamps and diodes, investigate resistance, explain how energy transfer can cause heating and evaluate the effects of this, describe power and how to calculate it, explain the difference between AC and DC and identify the voltage and frequency of the UK domestic electricity supply, describe how plug wires, fuses and circuits keep us safe from electricity, explain static electricity, describe the uses and dangers of static electricity, describe what is meant by an electric field and how to represent one using arrows.</p>	<p>country, explain how the law of conservation of energy applies to transformers and how to calculate the current and voltage produced by transformers.</p>	<p>including carbonates, sulfates and halides, investigate the ions in unknown substances, describe ceramics in terms of their structure, properties and use, describe composite material in terms of their structure, properties and use, explain the uses and risks of nanoparticles.</p> <p><b>SP14-15 Particle model; forces and matter</b> Explain how the particle arrangements in solids, liquids and gases explain their properties, calculate density, explain what happens to particles when they change state, investigate density of liquids and solids, explain what is meant by specific heat capacity and specific latent heat, calculate the energy needed to make a substance melt or evaporate, calculate the energy released when a substance condenses or freezes, investigate the specific heat capacity of water, explain gas</p>		
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					pressure and the effects of heat on pressure, describe the difference between Kelvin and Celsius, Calculate the volume or pressure of a gas at a fixed temperature, explain the difference between elastic and inelastic distortion, explain how forces cause objects to change shape, describe the spring constant of a spring, and how to calculate the work done in stretching a spring, investigate stretching springs, explain how pressure is related to force and area, calculate force, pressure and area, explain how the pressure in a liquid depends on its density and depth.		
How does it cover the NC	<b>SB6</b> Photosynthesis as the key process for food production and therefore biomass for life • the process of photosynthesis •	<b>SB7</b> Principles of hormonal coordination and control in humans • hormones in human reproduction, hormonal and non-hormonal methods of	<b>SB8</b> The importance of cellular respiration; the processes of aerobic and anaerobic respiration the need for transport systems in multicellular organisms, including	<b>SB9</b> Levels of organisation within an ecosystem • some abiotic and biotic factors which affect			

	<p>factors affecting the rate of photosynthesis</p> <p><b><u>SC17-19</u></b> Position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons • properties and trends in properties of elements • chemical reactivity of elements in relation to their position in the Periodic Table factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst • factors affecting reversible reactions</p> <p><b><u>SP8-9</u></b> Forces and fields: electrostatic, magnetic, gravity • forces as vectors</p>	<p>contraception Science • homeostasis</p> <p><b><u>SC20-21</u></b> Fractional distillation of crude oil and cracking to make more useful materials evidence for composition and evolution of the Earth's atmosphere since its formation • evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change • potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate • common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources • the Earth's water resources and obtaining potable water</p> <p><b><u>SP10-11</u></b> Measuring resistance using p.d. and current</p>	<p>plants • the relationship between the structure and functions of the human circulatory system.</p> <p><b><u>SC22-24</u></b> Bonding of carbon leading to the vast array of natural and synthetic organic compounds that occur due to the ability of carbon to form families of similar compounds, chains and rings</p> <p><b><u>SP12-13</u></b> Exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass • magnetic effects of currents, how solenoids enhance the effect • how transformers are used in the national grid and the reasons for their use.</p>	<p>communities; the importance of interactions between organisms in a community • how materials cycle through abiotic and biotic components of ecosystems • the role of microorganisms (decomposers) in the cycling of materials through an ecosystem • organisms are interdependent and are adapted to their environment • the importance of biodiversity • methods of identifying species and measuring distribution, frequency and abundance of species within a habitat • positive and negative</p>		
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			<p>measurements • exploring current, resistance and voltage relationships for different circuit elements; including their graphical representations • quantity of charge flowing as the product of current and time • drawing circuit diagrams; exploring equivalent resistance for resistors in series • the domestic a.c. supply; live, neutral and earth mains wires, safety measures • power transfer related to p.d. and current, or current and resistance.</p>		<p>human interactions with ecosystems</p> <p><b>SC25-26</b> Concentrations of solutions in relation to mass of solute and volume of solvent. Bulk properties of materials related to bonding and intermolecular forces.</p> <p><b>SP14</b> Relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities • melting, evaporation, and sublimation as reversible changes • calculating energy changes involved on heating, using specific heat</p>		
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					capacity; and those involved in changes of state, using specific latent heat • links between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative).		
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