

Science Curriculum Overview – Year 10 triple science

Year 10		HT1	HT2	HT3	HT4	HT5	HT6
subject	Topic	SB2 Cells and control, SC3-4 Atomic structure and the Periodic table SP3 Energy stores	SB3 Genetics, SC5-7 Ionic bonding, covalent bonding and types of substance SP4-5 Waves and the Electromagnetic spectrum,	SB4 Natural selection and Genetic modification, SC8 Acids, SC9 Calculations in chemistry	SB5 Health and Disease SC10-13 Electrolysis, Extracting Metals and Equilibria, Transition metals, alloys and corrosion, SP6 Radiation	SC14-16 Quantitative analysis, Dynamic equilibria, Calculations involving volumes of gases and chemical and fuel cells, SP7 Astronomy,	Paper 1 revision
	Why this and why now?	<p>SB2 This Biology unit builds on knowledge of cells to look at how cells divide and why this is how organisms grow if they are multicellular and differentiate into different kinds of cells. Stem cells are introduced and compared in both animals and plants as is their growth. The final part of the unit is the nervous system including how the brain and they eyes work and how damage to the spinal cord can affect the nervous system.</p> <p>SC3-4 Students build on their prior understanding of atomic structure to determine electronic configuration and draw atoms for the first 20</p>	<p>Students have learnt about cell structures and cell control in SB1 and SB2 and SB3 genetics introduces students to the structure and function of DNA and how genes are inherited by focussing on Mendell genetics and protein synthesis. Students also develop their understanding of cell division and the effects of mutations.</p> <p>SC5-7 This Chemistry unit builds on the knowledge of atomic structure and the periodic table to look at how and why atoms bond together and compare the structures of ionic, covalent, metallic and giant covalently bonded substances.</p> <p>In the previous physics topic students have learnt about</p>	<p>SB4 builds on students to natural selection and the evidence for natural selection such as fossil records and pentadactyl limbs. Students also learn the key processes involved in selective breeding, genetic engineering and tissue culture and this will allow them to learn how DNA can be manipulated and changed through scientific processes. The final part of the unit explores the use of fertilisers and biological control.</p> <p>Students have learnt all about particle model, separation techniques, atomic structure, periodic table and bonding in SC1-SC7 and in SC8 students learn what acids and alkalis are in terms of ions, the</p>	<p>The final topic of paper 1 biology SB5 builds on their previous knowledge of cells to introduce students to diseases and how the body made from cells, tissues and organs can be damaged by communicable and non-communicable diseases and how the cells of the immune system work to protect us. This unit also explores the life cycle of viruses and how pests and microorganisms are involved in plant diseases.</p>	<p>In the final topic of paper 1 chemistry SC14-16 students have previously learnt about the law of conservation in mass and how to calculate masses. In this unit students learn why the actual yield of a reaction is less than theoretical yield and to calculate the percentage mass of a reaction. They learn what is meant by atom economy of a reaction and how to calculate it. Finally, students carry out an acid – alkali titration and study the uses of chemical and fuel cells.</p> <p>In the final topic of paper 1 physics SP7 students have previously learnt about the solar system and how we find out about it. They know about the Earth's</p>	

		<p>elements. Students also learn what an isotope is and how to calculate the average atomic mass of multiple isotopes. Students not only look at the periodic table in terms of the groups and periods but also the history of the periodic table.</p> <p>Students have learnt about forces and motion in SP1 and SP2 and here in SP3 students are introduced to the concept of energy stores and transfers. Students also explore renewable and non-renewable energy resources and how the use of each type of energy resource has changed over time.</p>	<p>energy and in SP4-5 students learn that energy moves from one place to another as a wave. They learn about types of waves in particular light waves in terms of refraction, lenses and how we see colour and the electromagnetic spectrum. Linking the topic of energy and waves even further students learn that the higher the frequency of a wave the more energy it is carrying and this can make some waves dangerous. Students also learn about ultrasound and infrasound and how the Human ear works.</p>	<p>chemical reactions between acids and alkalis and separation techniques learnt in SC1 are put into practice when students make salts through neutralisation. The process of neutralisation is also examined practically through the use of titration.</p> <p>In previous chemistry unit's students have looked at atomic structure, deducing chemical formulae and writing and balancing symbol equations. In SC9 students build on previous knowledge to understand how calculate relative formula mass, conservation of mass and how this allows us to find out unknown masses and finally uses masses and relative formula masses to calculate the number of moles.</p>	<p>Finally, students learn about the use of antibiotics and monoclonal antibodies and their uses in medicine.</p> <p>In SC10-13 builds on atomic structure and ionic bonding to introduce electrolysis and how this is used to extract highly reactive metals. This includes how ions are separated using electricity including the products made. They will learn how to explain the displacement reactions and how these are applied to the reactivity and extraction methods used for different metals. Students will consider the factors that affect the life cycle of products as well as the processes involved in the production of fertilisers. Students will learn about the properties of transition metals</p>	<p>gravitational field and what causes weight and that there are stars and galaxies beyond the solar system. In this unit students further develop their understanding of Astronomy by learning about how ideas about our solar system have changed over time. How methods of observing the universe have changed over time. Why gravity is different on different bodies and how this affects orbits. What red shift is and what it shows. About different theories on the origins of the universe and the life cycles of stars.</p>	
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<p>What is the essential knowledge that needs to be remembered?</p>	<p><u>SB2 Cells and control</u> – importance of mitosis and the stages involved, growth in animals and plants, stem cells in animals and plants, nervous system and neurotransmission speeds. The parts of the brain and how we can monitor the brain using different technologies. Spinal cord injuries and how the eye works and the causes of long and short sightedness.</p> <p><u>Sc3-4 Atomic structure and the periodic table</u> structure of an atom, atomic number and mass number, isotopes and how to calculate average relative atomic mass of isotopes, periodic table, atomic number and the periodic table and its historical development, electronic configuration</p> <p><u>SP3 Energy Stores</u> Energy storage and transfer; energy transfer diagrams; calculating efficiency; reduction of wasted energy; gravitational potential; kinetic energy; renewable and non-renewable energy.</p>	<p><u>SB3 Genetics</u> Meiosis division, the structure and extraction of DNA and how to extract it; genes, chromosomes and DNA key terms and relations; use of punnet squares and pedigree crosses; sex determination; the process of protein synthesis including transcription and translation and genetic variation, Human genome project and the ethics of its use.</p> <p><u>SC5-7 – Bonding</u> What an ion is and why they become charged. Why atoms form bonds and how ionic bonds, and ionic lattices can be represented as a diagram. A comparison of the properties of ionic, covalent and giant covalent compounds. covalent bonds and how to represent them, molecular compounds, allotropes of carbon, properties of metals and metallic bonding. The strengths and limitations of bonding models.</p> <p><u>SP4-5 Waves and the Electromagnetic Spectrum</u> That waves transfer energy and not matter. Know: the terms</p>	<p><u>SB4 Natural Selection and Genetic Modification</u> Evidence of Human evolution (stone tools & fossils). Darwin’s theory of natural selection, organism classification (prokaryote, eukaryote & Archae). Selective breeding in plants & animals. Genetic engineering including function of restriction & sticky ends. Ethical arguments for genetic modification in Agriculture & animals. The use of tissue culture in genetic modification.</p> <p><u>SC8 Acids</u> PH of acids and alkaline and their respective differences and reactions; methods such as neutralising acids and producing soluble salt ; balancing equations; common hazard symbols; metal and metal compounds and their reactions; soluble salt reactions; symbol state in equations.</p> <p><u>SC9 Calculations involving masses</u> How to use relative atomic masses to calculate</p>	<p><u>SB5 health and disease</u> Definition of health and disease; difference between communicable and non-communicable; causes of malnutrition and obesity; treatment and cause of cardiovascular disease; causes of different infectious diseases; difference between an epidemic and a pandemic; life cycle of viruses; plant diseases and defenses; physical and chemical barriers in the body; prevention of STD’s; immune system function and use of medicines including antibiotics and monoclonal antibodies</p> <p><u>SC10-13 Electrolysis,</u></p>	<p><u>SC14-16 Quantitative analysis, Dynamic equilibria, Calculations involving volumes of gases and chemical and fuel cells.</u> What is meant by atom economy and how to calculate it, calculating percentage yield from actual yield and theoretical yield, what is meant by dynamic equilibrium and how factors such as temperature and concentration affect the position of equilibrium, how to use calculations to calculate volumes and the uses and limitations of chemical and fuel cells.</p> <p><u>SP7 Astronomy</u> How ideas about the solar system have changed over time, how evidence is used in the development of theories, how to explain red shift, the life cycle of stars, how telescopes and technology have allowed us to explore how universe and how this has changed over time and theories of how the universe began including the big bang theory.</p>	
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					<p>dynamic equilibrium, The conditions needed for the Haber process. Where transition metals are in the periodic table and how they compare to group 1 metals. The uses of alloys and the process of corrosion.</p> <p><u>SP6 Radiation</u> Know how atomic models changed over time leading to the current atomic model including Rutherford's work; What isotopes of an element are and how we can represent them; The electron arrangement in atoms; Know what happens to atoms if they emit or absorb EM radiation; how atoms become ionised; Know what background radiation is and its sources; What alpha particles, beta particles and</p>		
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					gamma rays are; know their ionising and penetration abilities. The process of decay and how to calculate half lives and nuclear fission and fusion.		
What is the assessment intent and how will you assess?	<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.</p> <p>Formative Baseline; End of topics test and rewind grids to identify misconceptions and gaps in learning to allow for Make It Better time.</p> <p>Cumulative Assessment based on SB2, SC3-4 and SP3. Extended answer questions as well as short</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.</p> <p>Formative Baseline; End of topics test and rewind grids to identify misconceptions and gaps in learning to allow for Make It Better time.</p> <p>Cumulative Assessment based on SB3, SC5-7 and SP4-5. 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.</p> <p>Formative Baseline; End of topics test and rewind grids to identify misconceptions and gaps in learning to allow for Make It Better time.</p> <p>Cumulative Assessment based on SB4, SC8 and SC9. Extended answer questions as well as short answer,</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.</p> <p>Formative Baseline; End of topics test and rewind grids to identify misconceptions and gaps in</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.</p> <p>Formative Baseline; End of topics test and rewind grids to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on SC14-16 and SP7. Extended answer questions as well as short answer,</p>	Cumulative Assessment	Paper 1 mock exams.

	answer, discuss and compare questions.		discuss and compare questions.	learning to allow for Make It Better time. Cumulative Assessment based on SB5, SC10-13 and SP6. Extended answer questions as well as short answer, discuss and compare questions.	discuss and compare questions.	
What should the end point look like?	<p>SB2 Cells and control Describe mitosis as a type of cell division, identify and describe the stages of mitosis using microscopic images of cell division, define and understand the terms diploid and haploid, describe what is meant by growth and explain how to use percentile growth charts and use them to determine whether or not growth is healthy or not, describe growth in plants and explain the function of meristems, describe and explain the function of stem cells and compare embryonic and adult stem cells, identify and describe the structure of sensory, motor and relay neurones, describe and explain the nervous response from stimulus to response and compare the reflex and conscious action</p>	<p>SB3 Genetics Compare mitosis and meiosis Describe structure of DNA Be able to extract DNA experimentally or know the method State the causes genetic mutation and variation Draw punnett crosses and show how gender is inherited</p> <p>SC5-7 Chemistry Describe how atoms form ions, describe how ions form ionic bonds, describe and explain the properties of ionic compounds, deduce ionic formula from charged ions, describe covalent bonds, compare ionic and covalent bonds and draw both types of bonding, describe metallic bonding, explain the properties and bonding of allotropes of carbon, use bonding models</p> <p>SP4-5 Waves and the Electromagnetic spectrum,</p>	<p>SB4 Human Evolution and Selective Breeding: Evidence human evolution. Categorise plants animals into domains and kingdoms. Discuss Darwin's theory of evolution / natural selection. Compare selective breeding and genetic engineering and the ethics of both.</p> <p>SC8 Acids Identify and explain the ions in acids and alkalis Define pH and link to concentration Describe neutralisation using word and symbol equations and balancing equations Compare the use of different indicators Describe the preparation of soluble and insoluble salts Explain the difference between strength and concentration of acids</p>	<p>SB5 Health and Disease Define health and disease, explain the difference between communicable and non-communicable, identify causes of malnutrition and obesity, describe treatment and cause of cardiovascular disease, describe causes of different infectious diseases, explain the difference between an epidemic and a pandemic, describe and explain physical and chemical</p>	<p>SC14-16 Quantitative analysis, Dynamic equilibria, Calculations involving volumes of gases and chemical and fuel cells</p> <p>Define theoretical yield and actual yield, calculate the percentage yield of a reaction, explain why the actual yield is always less than the theoretical yield, describe what is meant by atom economy, calculate atom economy, decide what is the best way to manufacture a product using data, carry out an acid – alkali titration and calculate moles and concentrations, describe what is meant by the molar volume of gas, describe Avogadro's law, calculate gas volumes, describe the use of fertilisers and compare how they are made in a laboratory and a factory, explain the Haber process and dynamic equilibrium including</p>	

		<p>SC3-4 Atomic structure and the periodic table Draw the structure of an atom and describe the position, mass and charge of the subatomic particles, define atomic number and atomic mass, describe isotopes and calculate average relative atomic mass, draw the first 20 elements of the periodic table and state their electronic configuration</p> <p>SP3 Energy Explain and represent in diagrams how energy is stored and transferred Explain how to calculate energy efficiency and identify ways to reduce wasted energy Calculate GPE and KE Describe how the use of non renewable and renewable energy resources as changed over time</p>	<p>Identify that there are two types of wave, Understand how waves travel Calculate wave speed Describe a range of electromagnetic waves Describe EM waves can as useful as well as harmful Explain how light waves behave when travelling through different media.</p>	<p>Describe using word and balanced symbol equations the reaction of metals and metal compounds with acids</p> <p>SC9 Calculations involving masses: Calculate relative formula masses for elements and compounds Work out empirical and molecular formulae of compounds Calculate the mass of reactants or products in a reaction Calculate the concentration of a solution Discuss Avogadro's constant and the quantity 1 mol of a substance Calculate the numbers of particles in a substance</p>	<p>barriers in the body, describe the prevention of STD's, describe and explain the immune system function and describe use of medicines including antibiotics</p> <p>SC10-13 Electrolysis, Extracting Metals and Equilibria; Transition metals and alloys</p> <p>Describe what electrolytes are and in what states of matter they exist, define electrolysis, identify electrodes, describe what happens during electrolysis and explain how reduction and oxidation occur, state what products are formed in the electrolysis of copper sulfate solution, using copper electrodes, describe reactivity</p>	<p>factors that affect it, explain why batteries go flat and evaluate the strengths and weaknesses of fuel cells.</p> <p>SP7 Astronomy</p> <p>Describe what objects make up our solar system and how they are arranged, explain how ideas about the solar system have changed over time, how have methods of observing the universe changed over time, explain why gravity is different on different bodies in the solar system, describe the life cycle of stars, explain how the balance between thermal expansion and gravity affect stars, describe red shift, explain how red shift provides evidence for the expansion of the universe, describe the steady state and big bang theory, give evidence that supports the big bang theory and explain why it is currently the most accepted model.</p>	
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					<p>of metals and explain how reactivity relates to how they are extracted from ores, describe what the life-cycle assessment for a product involves, state that some chemical reactions are reversible and use the symbol \rightleftharpoons in equations, state the equation to show the formation of ammonia and describe it as a reversible reaction that can reach a dynamic equilibrium, State conditions needed for the Haber process, explain how factors affect the position of the equilibrium.</p> <p>SP6 Radiation</p> <p>Describe how atomic models have changed over time leading to the current atomic model</p>	
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				including Rutherford's work; Describe and explain what isotopes of an element are and how we can represent them, describe the electron arrangement in atoms, explain what happens to atoms if they emit or absorb EM radiation, explain how atoms become ionised, state what background radiation is and its sources, describe what alpha particles, beta particles and gamma rays are, describe and explain their ionising and penetration abilities		
How does it cover the NC	<u>Atomic structure and the periodic table</u>	Cells and Control (SB2) stem cells in animals and meristems in plants	Genetics (SB3) Inheritance and variation	Human Evolution (SB4)	Health and Disease (SB5) The relationship between health and disease	Rate and extent of chemical change

	<p>A simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes the number of particles in a given mass of a substance the modern Periodic Table, showing elements arranged in order of atomic number 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 in the same group characteristic properties of metals and non-metals chemical reactivity of elements in relation to their position in the Periodic Table</p>	<p>principles of nervous coordination and control in humans the relationship between the structure and function of the human nervous system the relationship between structure and function in a reflex arc</p> <p><u>Bonding (SC5-7)</u> types of chemical bonding: ionic, covalent, and metallic bulk properties of materials related to bonding and intermolecular forces 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 structures, bonding and properties of diamond, graphite, fullerenes and graphene</p>	<p><u>Acids (SC8)</u> The chemistry of acids; reactions with some metals and carbonates pH as a measure of hydrogen ion concentration and its numerical scale.</p> <p><u>Energy (SP3)</u> Energy changes in a system involving heating, doing work using forces, or doing work using an electric current: calculating the stored energies and energy changes involved.</p>	<ul style="list-style-type: none"> • The evidence for evolution Developments in biology affecting classification • The importance of selective breeding of plants and animals in agriculture • The uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology. <p><u>Calculations (SC9)</u> determination of empirical formulae from the ratio of atoms of different kinds balanced chemical equations, ionic equations and state symbols</p> <p><u>Waves (SP4-5)</u> Amplitude, wavelength, frequency, relating velocity to frequency and wavelength transverse and longitudinal waves</p>	<p>communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) non-communicable diseases</p> <p><u>Electrolysis and Metals (SC10-13)</u> Electrolysis of molten ionic liquids and aqueous ionic solutions reduction and oxidation in terms of loss or gain of oxygen. Extraction and purification of metals related to the position of carbon in a reactivity series</p> <p><u>Radiation (SP6)</u> ionisation; absorption or emission of radiation related to changes in electron orbits radioactive nuclei: emission of alpha or beta particles, neutrons, or gamma-rays, related to changes in the nuclear mass and/or charge</p>	<p>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><u>Space physics Science</u></p> <ul style="list-style-type: none"> • the main features of the solar system
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					electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays		
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