

Science Curriculum Overview – Year 10 combined science

Year 10		HT1	HT2	HT3	HT4	HT5	HT6
subject	Topic	Key concepts of Biology CB1, chemistry CC1-4 and Physics CP1	CB2 Cells and control, CC5-7 Bonding and CP2 Forces	CB3 – Genetics, CC8 – Acids, CP3 – Energy stores	CB4 – Natural selection and Genetic modification, CC9 – Calculations in chemistry	CP4-5 – Waves and the Electromagnetic spectrum, CB5 – Health and Disease	CC10-12 Electrolysis, Extracting Metals and Equilibria, CP6 – Radiation
	Why this and why now?	All three build on KS3 learning and are needed to master later material. CB1- structure and function of cell organelles and how to prepare microscope slides and calculate magnification, the structure and function of specialised cells, the action of enzymes and transport of substances, which is needed to access HT3 learning. CC1- recapping the particle model to allow students to build on their prior understanding of atomic structure to determine electronic configuration and to master knowledge about the periodic table and isotopes. CP1 uses KS3 knowledge of motion the terms scalar and vector to allow for calculation speed and acceleration and how to use graphs to determine speed, acceleration and distance; effective use of graph work is needed through out the course.	CB2 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. Finally, the unit goes further into the understanding of neurones in the nervous system. CC5-7 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. CP2 builds on motion in that motion is caused by forces and that Newton proposed 3 laws of motion that must always be applied. The unit then brings together motion and forces to explore stopping distances and crash hazards.	Students have learnt about cell structures and cell control in CB1 and CB2 and CB3 genetics introduces students to the structure and function of DNA and how genes are inherited. Students also develop their understanding of cell division. Students have learnt all about particle model, separation techniques, atomic structure, periodic table and bonding in CC1-CC7 and in CC8 acids students learn what acids and alkalis are in terms of ions, the chemical reactions between acids and alkalis and separation techniques learnt in CC1 are put into practice when students make salts through neutralisation. Students have learnt about forces and motion in CP1 and CP2 and here students are introduced to the concept of energy stores and transfers.	CB4 builds on students understanding of DNA and inheritance to introduce students to natural selection, selective breeding and genetic engineering and this will allow them to learn how DNA can be manipulated and changed through scientific processes. In previous chemistry unit's students have looked at atomic structure, deducing chemical formulae and writing and balancing symbol equations. In CC9 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.	In the previous physics topic students have learnt about energy and in CP4-5 students learn that energy moves from one place to another as a wave. They learn about types of waves in particular the electromagnetic spectrum and how to calculate wave speed. 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. The final topic of paper 1 biology 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.	In the final topic of paper 1 chemistry builds on atomic structure and ionic bonding to introduce electrolysis and how this is used to extract highly reactive metals. In the final topic of paper 1 physics students extend their knowledge and understanding of energy and waves in terms of absorption, transmission and reflection to radiation as radioactive materials emit waves
	What is the essential knowledge that needs to be	B1 – Microscopes and its parts; different types of microscopes; conversions; calculating total magnification; preparing slides of plant cells; cell biology; specialised cells and adaptations;	CB2 – mitosis, growth in animals and plants, stem cells in animals and plants, nervous system and neurotransmission speeds	CB3 Genetics- Meiosis division; structure and extraction of DNA, genes and chromosome; punnet squares and pedigree crosses; sex determination;	CB4- Human Evolution; Darwin's Theory of Natural Selection; organism classification; selective breeding; genetic engineering; ethical	CP4-5 waves transfer energy, not matter. Know: the terms frequency, wavelength, amplitude, period, wave velocity; the difference between	CC10-12; Electrolytes and their states of matter; electrolytes decomposition; electrode reduction and oxidation; products of electrolysis of copper

remembered ?	<p>stem cells and cell differentiation, enzymes in nutrition; transport of substances using diffusion and osmosis</p> <p>CC1-4 – states of matter, mixtures and how to separate substances; purifying drinking water; structure, atomic numbers and mass number of atoms; isotopes and how to calculate average relative atomic mass of isotopes; periodic table; electronic configuration</p> <p>CP1 – scalars and vectors, calculating speed and acceleration, calculating velocity and using both distance / time graphs and velocity / time graphs to determine, speed, acceleration and distance</p>	<p>CC5-7 – Ionic bonds, ionic lattices and properties of ionic compounds, covalent bonds, molecular compounds, allotropes of carbon, properties of metals and bonding models</p> <p>CP2- forces; calculating resultant forces; mass and weight; Newton's three laws of motions; calculating momentum; stopping distances; crash hazards</p>	<p>human genome project; gene mutation; variation types.</p> <p>CC8 Acids- PHs; differences and reactions; balancing equations; common hazard symbols; metal and their compounds, reactions; soluble salt reactions; symbol state in equations</p> <p>CP3 Energy Stores- Energy storage and transfer; energy transfer diagrams; calculating efficiency; reduction of wasted energy; gravitational potential; kinetic energy; renewable and non-renewable energy</p>	<p>arguments around genetic modification.</p> <p>CC9- using atomic masses to calculate relative formula masses for elements and compounds; empirical and molecular formulae of compounds; calculate mass of reactants and products in reactions; calculate concentrations of solutions; Avogadro's constant; calculate particular numbers in a substance.</p>	<p>longitudinal and transverse waves, equations for Wave Speed, refraction at a boundary and investigating these concepts.</p> <p>CB5- 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; physical and chemical barriers in the body; prevention of STD's; immune system function and use of medicines including antibiotics</p>	<p>sulphate solution. Metal extraction from its ore; life-cycle assessment; reversible chemical reactions; conditions needed for the Haber process.</p> <p>CP6- change over time in atomic models, including Rutherford's work; elements' isotopes and representation; atomic electron arrangements; emission or absorption impact of EM radiation on atoms; ionised atoms; background radiation and sources; alpha and beta particles and gamma rays and their ionising and penetration abilities.</p>
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 to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB1, CC1-4 and CP1. 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 to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB2, CC5-7 and CP2. 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 to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB3, CC8 and CP3. Extended answer questions as well as short answer, discuss and compare questions.</p>	<p>Assessment intent: to inform planning, intervention and stop any gaps. Check mastery in fundamental concepts for other units and to prevent curriculum dysfluency whilst checking learning.</p> <p>Formative Baseline; End of topics test to identify misconceptions/gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB4, CC9. Extended answer questions as well as short answer, discuss and compare questions.</p>	<p>Assessment intent: to inform planning, intervention and stop any gaps. Check mastery in fundamental concepts for other units and to prevent curriculum dysfluency whilst checking learning.</p> <p>Formative Baseline; End of topics test to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB4, CC9 and CP4-5. Extended answer questions as well as short answer, discuss and compare questions.</p>	<p>Assessment intent: to inform planning, intervention and stop any gaps. Check mastery in fundamental concepts for other units and to prevent curriculum dysfluency whilst checking learning.</p> <p>Formative Baseline; End of topics test to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB5, CC10-12 and CP6. Extended answer questions as well as short answer, discuss and compare questions.</p>
What should the end point look like?	<p>CB1- Identify parts of a microscope and use it to magnify plant cells; calculate total magnification, image size, actual size and magnification; compare resolution and</p>	<p>CB2-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</p>	<p>CB3 - Compare mitosis and meiosis Describe structure of DNA Be able to extract DNA experimentally or know the method</p>	<p>CB4- Evidence human evolution. Categorise plants animals into domains and kingdoms. Discuss Darwin's theory of evolution / natural</p>	<p>CP4-5- identify the two wave types; understand how waves travel; calculate wave speed; describe a range of electromagnetic waves; describe use and harms of</p>	<p>CC10-12 Describe what electrolytes are and in what states of matter they exist; define electrolysis; identify electrodes, describe what happens during electrolysis;</p>

		<p>magnification of light and electron microscopes; convert between different size units; identify and describe the function of organelles; use standard form; identify structure and describe function of a bacterial cell; explain the difference between plasmid and chromosomal DNA; describe and explain the structure and function of enzymes and how they are involved in digestion; investigate the effect of pH on enzyme activity; describe and explain transport of substances; investigate osmosis in potatoes</p> <p>CC1-4-Describe the 3 states of matter in terms of particle movement, arrangement and energy; describe & identify substances as pure or mixtures; use practical techniques to separate substances; calculate RF factor; describe the history of the periodic table; compare Mendeleev and the modern periodic table; define atomic number and atomic mass; describe isotopes and calculate average relative atomic mass; draw the first 20 elements and state their electronic configuration</p> <p>CP1- Define scalar and vector and identify scalars and vectors, calculate speed and acceleration, use distance – time graphs, use velocity – time graphs to calculate acceleration and distance</p>	<p>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>CC5-7 -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>CP2- Identify forces, describe when forces are balanced and unbalanced, calculate resultant forces, use the formula $F=ma$ to investigate the acceleration of trolleys down a ramp, describe Newton's 3 laws of motion, calculate and describe momentum, identify features that make cars safe against crash hazards, define stopping distances, describe factors that affect thinking and braking distances, calculate stopping distances, describe and explain</p>	<p>State the causes genetic mutation and variation Draw punnett crosses and show how gender is inherited</p> <p>CC8-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 Describe using word and balanced symbol equations the reaction of metals and metal compounds with acids</p> <p>CP3- 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>selection. Compare selective breeding and genetic engineering and the ethics of both.</p> <p>CC9- calculate relative formula masses for elements and compounds; work out empirical and molecular formulae of compounds; calculate mass of reactants or products; calculate solution concentrations; discuss Avogadro's constant and the quantity 1 mol of a substance; calculate the particular number of substances.</p>	<p>EM waves; wave behaviour when travelling through different media.</p> <p>CB5- define health and disease; explain difference in communicable and non-communicable; causes of malnutrition and obesity; cause and treatment of cardiovascular disease; describe causes of infectious diseases; differences in epidemic and pandemic; describe and explain the body's physical and chemical barriers; prevention of STIs; explain immune system function; describe medicine use, including antibiotics.</p>	<p>explain how reduction and oxidation occur; state what products are formed in the electrolysis of copper sulphate solution; describe reactivity of metals; explain how reactivity relates to ore extraction; describe the life-cycle assessment for a product; state that some chemical reactions are reversible; use the symbol \rightleftharpoons in equations; state conditions needed for the Haber process; explain how factors affect the position of the equilibrium.</p> <p>CP6- describe atomic model changes over time, including Rutherford; describe and explain element isotopes 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 and its sources; describe alpha particles, beta particles and gamma rays; describe and explain their ionising and penetration abilities</p>
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	How does it cover the NC	<p>KS4 working Scientifically: Development of scientific thinking; Experimental skills and strategies; Analysis and evaluation; Vocabulary, units, symbols and nomenclature</p> <p>Key concepts of Biology (CB1) cells as the basic structural unit of all organisms; adaptations related functions; main sub-cellular structures of eukaryotic and prokaryotic cells; enzymes and factors affecting reaction rates; cellular respiration; aerobic and anaerobic respiration processes; key biological molecules; need to transport systems in multicellular organisms.</p> <p>Particle Model and Separating mixtures / Atomic structure and the periodic table (CC1-4)- changes of state of matter in terms of particle kinetics, energy transfers and the relative strength of chemical bonds and intermolecular forces; a simple model of the atom (nucleus and electrons) relative atomic mass, electronic charge and isotopes; particles in a given substance; modern Periodic Table; properties and their trends of same group elements; properties of metals and non-metals; chemical reactivity of elements</p> <p>Motion (CP1)- speed of sound, estimating speeds and accelerations in everyday contexts; interpreting quantitatively graphs of distance, time, and speed</p>	<p>Cells and Control (CB2) stem cells in animals and meristems in plants 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>Bonding (CC5-7) 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>Forces (CP2) forces as vectors acceleration caused by forces; Newton's First Law weight and gravitational field strength decelerations and braking distances involved on roads, safety</p>	<p>Genetics (CB3) Inheritance and variation</p> <p>Acids (CC8) The chemistry of acids; reactions with some metals and carbonates pH as a measure of hydrogen ion concentration and its numerical scale.</p> <p>Energy (CP3) 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>	<p>Human Evolution (CB4)</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>Calculations (CC9) determination of empirical formulae from the ratio of atoms of different kinds balanced chemical equations, ionic equations and state symbols</p>	<p>Waves (CP4-5) Amplitude, wavelength, frequency, relating velocity to frequency and wavelength transverse and longitudinal waves electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays</p> <p>Health and Disease (CB5) The relationship between health and disease communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) non-communicable diseases</p>	<p>Electrolysis and Metals (CC10-12) 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>Radiation (CP6) 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>