

Science Curriculum Overview – Year 11 combined science

Year 11	HT1	HT2	HT3	HT4	HT5
Topic	CB6 Plant structures and their functions CC13-15 Groups; energy changes and rates of reaction CP7-8 Forces and their effects	CB7 Animal coordination, control and homeostasis CC16 Fuels CP9 Electricity and circuits	CB8 Exchange and transport in animals CC17 Earth and atmospheric science CP10-11 Magnetism and the motor effect; electromagnetic induction	CB9 Ecosystems and material cycles CP12-13 Particle model; forces and matter	Revision
Why this and why now?	CB6 builds prior knowledge of specialised plant cells and growth in plants to introduce how leaf design supports photosynthesis and affecting factors. In CC13-15 students build on their knowledge of the periodic table and atomic structure to explore the reactivity and properties of key groups in periodic table, which will all students to understand why some elements get more/less reactive. This leads to what happens when atoms react and how factors affect the rate of these reactions. This supports students in calculating the change in thermal energy when bonds are broken/formed during a chemical reaction. In CP7-8 students use prior mastery of forces to explain how different forces interact and the link between energy and forces.	CB7 extends knowledge of cells to organ systems in particular the endocrine system and this is compared to the nervous system taught in CB2. In CC16 students develop their knowledge of combustion as a chemical reaction to learn about fuels and that many fuels are made from compounds called hydrocarbons. Students apply previous knowledge of separation techniques to understand how crude oil is separated into useful fuel fractions. Students also look at how toxic gases can be produced from burning fuels and the impact this has on climate change. CP9 focuses on electricity as a type of energy and students link both chemistry and physics together to understand what current is and potential difference and how this is different in series and parallel circuits.	CB8 builds on knowledge of transport systems from CB1 to look at the need and importance of exchange surfaces. Students use and build on knowledge of specialist cells that make up blood. Students link previously mastery of cell organelles, enzymes in digestion and transport of oxygen to cellular respiration. CC17 concludes chemistry and builds on the last topic in terms of carbon dioxide levels in the atmosphere, how this has changed over time and the threat of rising CO ₂ levels. Students look at the early atmosphere and from the topic on metal extraction should see that early earth had little/no oxygen in the atmosphere. In CP10-11 the topic of forces is revisited to look at magnetism as a non-contact force and the effects of electricity and magnetism together.	CB9 concludes biology and in this topic, students use knowledge of organisms and the environment to look at how they interact as an ecosystem. Prior topics such as natural selection and adaptation link to biodiversity and there is linking to chemistry unit CC17 when looking at the carbon cycle. In the final topic of Physics, the fundamental ideas of energy, matter and forces come together to look at changes of state, specific and latent heat and energy changes in a stretching spring.	Revision
What is the essential knowledge that	CB6- Leaf structure and function of parts. Photosynthesis equation and type of reaction, factors that affect it. Transpiration,	CB7- hormones and where they are produced; the names of some target organs; effects of Thyroxine and Adrenaline; role of oestrogen and progesterone	CB8- The efficient transport and exchange of substances in the body at different surfaces including surface area to volume calculation,	CB9- Interactions of ecosystems and sampling methods. Biotic and abiotic factors and how they affect communities.	Revision

<p>needs to be remembered?</p>	<p>structure and function of root hair cells. Translocation. Xylem and phloem. CC13-15- Structure and properties of group 1,7 and 0 of the periodic table; 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. CP7-8: 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>in the menstrual cycle and apply this to how contraceptives 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. CP9- 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 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.</p>	<p>structure and function of the heart and circulatory system, Blood composition Cardiac output calculations, cellular respiration CC17- Composition and evolution of earth's atmosphere; formation of oceans; levels of oxygen through photosynthesis; composition of the modern atmosphere; effects of greenhouse gases on climate change; limiting the impact of greenhouse gases CP10- 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, their use in the national grid, including the transformer equation.</p>	<p>Relationships between organisms (Parasitism and Mutualism). Human effects on biodiversity and conservation (Eutrophication). Water, Carbon and Nitrogen cycles. CP12-13 Kinetic theory, investigating density, including calculations. Effects of energy on changes of state, energy calculations (specific and latent heat). Temperature scales and effects on gas pressure, relationship between force and extension of a spring, calculating work done in springs.</p>	
<p>What is the assessment intent and how will you assess?</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. Formative Baseline; End of topics test to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB6, CC13-15 and CP7-8. Extended answer questions as well as short answer, discuss and compare questions. Spring mock assessment that will allow us to identify knowledge, understanding and skill gaps that we need to</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. Formative Baseline; End of topics test to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB7, CC16 and CP9. 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. Formative Baseline; End of topics test to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB8, CC17 and CP10-11. Extended answer questions as well as short answer, discuss and compare questions. Spring mock assessment that will allow us to identify knowledge, understanding and skill gaps that we need to</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. Formative Baseline; End of topics test to identify misconceptions and gaps in learning to allow for Make It Better time. Cumulative Assessment based on CB9 and CP12-13. Extended answer questions as well as short answer, discuss and compare questions.</p>	

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What should the end point look like?	<p>CB6-Identify leaf structures and describe their function; State the photosynthesis equation and explain reaction type; identify and describe affecting factors on photosynthesis; explain transpiration; describe the structure and function of root hair cells; describe and explain how water, sucrose and amino acids are transported through both transpiration and translocation via xylem and phloem.</p> <p>CC13-15- State names of group 1,7 and 0 and describe their atomic structure in terms of outer electrons; describe physical and chemical properties of each group; explain collision theory and factors that change collision rate; describe and explain the action of catalysts and how they lower activation energy; identify energy changes in reactions (exothermic and endothermic); describe that endothermic involves breaking bonds and exothermic is forming bonds; calculate overall energy changes.</p> <p>CP7-8- Describe changes in energy; describe 'work done' and power including equation; identify contact and non-contact forces; show how pairs of forces are represented; explain the difference between Mass and gravity; compare gravitational and magnetic fields; solve resolving resultant</p>	<p>CB7-Describe what hormones are, identify hormones by name and state where they are produced, state the names of some target organs, describe and explain the effects of Thyroxine and Adrenaline, explain the role of hormones in menstrual cycle and apply this to how contraceptives work, explain how blood glucose is regulated in the body including people with diabetes Types 1 and 2, Calculate BMI and explain how obesity is linked to type 2 diabetes</p> <p>CP9 Electricity and circuits Describe atomic structure and current flow, draw series and parallel circuits and describe the current and potential difference in series and parallel circuits, describe how to measure current and potential difference in a series and a parallel circuit, calculate energy and charge, investigate, explain and calculate resistance in series and parallel circuits. Identify resistance curves, Explain the heating effect caused by resistance, calculate electrical power, describe electrical safety devices including fuses and circuit breakers and Earth wire, describe the national grid, compare AC and DC, describe the power rating of appliances and explain what the power rating shows</p>	<p>CB8-State substances that need to be transported, describe and explain what makes an efficient exchange surface and calculate surface area to volume ratio, describe the structure and function of the heart including valves and circulatory system, describe blood composition and calculate cardiac output and stroke volume, describe cellular respiration and compare aerobic and anaerobic respiration</p> <p>CC17-Identify and describe the composition and evolution of earth's atmosphere including key events, formation of oceans, and levels of oxygen through photosynthesis, describe composition of the modern atmosphere, and explain the effects of greenhouse gases on climate change and limiting the impact of greenhouse gases</p> <p>CP10-Draw magnetic fields around a bar magnet and a wire, suggest evidence of the earth's magnetic field and its effect, construction of electromagnets and factors affecting its strength, describe Fleming left hand rule and the motor effect, describe and explain transformers including the transformer equation, explain the use of transformers in the national grid.</p>	<p>CB9-Demonstrate interactions of ecosystems by drawing food chains, describe sampling methods, identify biotic and abiotic factors and describe how they affect communities, describe and explain relationships between organisms (Parasitism and Mutualism), identify and describe human effects on biodiversity and conservation (Eutrophication), describe and explain key processes in water, Carbon and Nitrogen cycles.</p> <p>CP12-13 -Explain kinetic theory, investigate and calculate density in solids and liquids, explain effects of energy on changes of state, energy calculations (specific and latent heat), compare temperature scales, describe and explain effects on gas pressure, explain relationship between force and extension of a spring, calculate work done in springs.</p>	

		forces and draw free-body force diagrams.			
How does it cover the NC	<p>CB6- photosynthesis as the key process for food production and therefore biomass for life; the process of photosynthesis; factors affecting the rate of photosynthesis</p> <p>CC13-15 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; Measurement of energy changes in chemical reactions (qualitative); Bond breaking, bond making, activation energy and reaction profiles (qualitative). factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst</p> <p>CP7-8 forces and fields: electrostatic, magnetic, gravity; forces as vectors; calculating work done as force x distance</p>	<p>CB7- 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; principles of hormonal coordination and control in humans; hormones in human reproduction, hormonal and non-hormonal methods of contraception; homeostasis.</p> <p>CC16- fractional distillation of crude oil and cracking to make more useful materials</p> <p>CP9- measuring resistance using p.d. and current 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>CB8; the need for transport systems in multicellular organisms, including plants; the relationship between the structure and functions of the human circulatory system.</p> <p>CC17- 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</p> <p>CP10-11- 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>CB9- levels of organisation within an ecosystem; some abiotic and biotic factors which affect 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 human interactions with ecosystems.</p> <p>CP12-13- 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 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).</p>	