

KS4 Long Term Curriculum Plan: Separate Sciences (Year 10 2021-2022)

Curriculum Aim: In Science we aim to prepare students for their GCSE exams whilst also allowing students to be able to understand and interpret the world that they live in. GCSE Separate sciences prepares students to leave school with a strong understanding of how science works as well as preparing them for future careers, courses and employment in science.

Link to prior learning: This course will build on the knowledge and skills developed during study in KS3 and Combined Science; they will also develop their practical, problem solving and investigative skills.

Rationale of sequencing: The topics have been ordered in a way that allows them to build on knowledge and skills learnt during Combined Science.

	Focus / Topic	Knowledge & Skills (from NC/Programmes of Study)	Assessment
Autumn 1	C10 Introduction to Organic Chemistry C11 Polymerisation B18 Biodiversity and Ecosystems (& B17 Rate of Decay)	<p>C10 Students should be able to recognise substances as alkanes, alkenes, alcohols, carboxylic acids given their formulae in these forms. Make models of alkane molecules using the molecular modelling kits. Students should be able to describe in general terms the conditions and uses for catalytic cracking and steam cracking. Students should be able to describe the reactions and conditions for certain reactions of the organic compounds within this topic along with writing balanced equations. Students should know the conditions used for fermentation of sugar using yeast.</p> <p>C11 Students should be able to recognise addition polymers and monomers from diagrams in the forms shown and from the presence of the functional group C=C in the monomers; draw diagrams to represent the formation of a polymer from a given alkene monomer and relate the repeating unit to the monomer. Students should be able to explain the basic principles of condensation polymerisation by reference to the functional groups in the monomers and the repeating units in the polymers. Students should be able to name the types of monomers from which these naturally occurring polymers are made.</p> <p>B18 Students should be able to evaluate the impact of environmental changes on the distribution of species in an ecosystem given appropriate information. Students should be able to describe the differences between the trophic levels of organisms within an ecosystem. Students should be able to construct accurate pyramids of biomass from appropriate data. Students should be able to describe pyramids of biomass and explain how biomass is lost between the different trophic levels. Students should be able to calculate the efficiency of biomass transfers between trophic levels by percentages or fractions of mass. Students should be able to explain how this affects the number of organisms at each trophic level. Students should be able to describe some of the biological factors affecting levels of food security.</p> <p>B17 Students should be able to explain how temperature, water and availability of oxygen affect the rate of decay of biological material. Students should be able to calculate rate changes in the decay of biological material; translate information between numerical and graphical form; plot and draw appropriate graphs selecting appropriate scales for the axes.</p>	C10, C11 & B18 End of topic tests Required Practical for B17 topic
Autumn 2	C15 Using our resources P16 Space	<p>C15 Students should be able to describe experiments and interpret results to show that both air and water are necessary for rusting; explain sacrificial protection in terms of relative reactivity and carry out an investigation into rusting. Students should be able to recall a use of each of the alloys specified, interpret and evaluate the composition and uses of alloys other than those specified given appropriate information. Students should be able to recall some examples of composites and compare their properties. Understand the process of the Haber process, use maths skills associated with the Haber Process, apply the principles of dynamic equilibrium in Reversible reactions and dynamic equilibrium to the Haber process, explain the trade-off between rate of production and position of equilibrium, explain how the commercially used conditions for</p>	C15 & P16 End of topic test Assessment week

		<p>the Haber process are related to the availability and cost of raw materials and energy supplies, control of equilibrium position and rate. Students to understand the industrial process of making fertilisers and compare lab preparation of the same compounds.</p> <p>P16 Students should be able to explain how, at the start of a star's life cycle, the dust and gas drawn together by gravity causes fusion reactions and that fusion reactions lead to an equilibrium between the gravitational collapse of a star and the expansion of a star due to fusion energy. Students should be able to describe the life cycle of a star. Students should be able to explain how fusion processes lead to the formation of new elements. Students should be able to describe the similarities and distinctions between the planets, their moons, and artificial satellites. Students should be able to explain qualitatively the red-shift of light from galaxies that are receding; that the change of each galaxy's speed with distance is evidence of an expanding universe; how red-shift provides evidence for the Big Bang model and how scientists are able to use observations to arrive at theories such as the Big Bang theory.</p>	
Spring 1	P11 Forces and Pressure	P11 Students should be able to recall and apply the equation for pressure and calculate pressure at the surface of a liquid. Students should be able to calculate the differences in pressure at different depths in a liquid. Students should be able to explain why, in a liquid, pressure at a point increases with the height of the column of liquid above that point and with the density of the liquid. Students should be able to describe the factors which influence floating and sinking. Students should be able to describe a simple model of the Earth's atmosphere and of atmospheric pressure and explain why atmospheric pressure varies with height above a surface.	P11 End of topic test
Spring 2	B12 Homeostasis in Action B11 Plant Hormones (Separate Sciences content only) C4 Chemical Calculations (Separate Sciences content only)	<p>B12 Students should be able to explain some of the difficulties of investigating brain function and treating brain damage and disease. Evaluate the benefits and risks of procedures carried out on the brain and nervous system. Students should be able to relate the structures of the eye to their functions. Students should be able to explain mechanisms to lower or raise body temperature in a given context. Students should be able to describe the functions of the kidney in maintaining water balance. Students should be able to describe how kidney dialysis works. Evaluate the advantages and disadvantages of treating organ failure by mechanical device or transplant.</p> <p>B11 Students to understand that plants produce hormones to coordinate and control growth and responses to light (phototropism) and gravity (gravitropism or geotropism). Students should be able to describe the effects of some plant hormones and the different ways people use them to control plant growth.</p>	<p>B12, B11 & C4 End of topic tests</p> <p>Required Practical for B11 & C4 topic</p>
Summer 1	P14 Light P2 Infrared radiation (Separate Sciences content only)	P14 & P2 Students should be able to construct ray diagrams to illustrate the similarities and differences between convex and concave lenses. Students will be able to use the magnification calculation. Students should be able to explain how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object ; the effect of viewing objects through filters or the effect on light of passing through filters and why an opaque object has a particular colour. Students should be able to explain that all bodies (objects) emit radiation and that the intensity and wavelength distribution of any emission depends on the temperature of the body	P14 & P2 End of topic test
Summer 2	B5 Communicable diseases (Separate Science content only) P7 Nuclear radiation (Separate Science	<p>B5 Students should be able to describe how monoclonal antibodies are produced and can be used. Students to know the everyday application of scientific knowledge to detect and identify plant disease and understanding of ion deficiencies allows horticulturists to provide optimum conditions for plants.</p> <p>P7 Students should be able to explain why the hazards associated with radioactive material differ according to the half-life involved. Students should be able to describe and evaluate the uses of nuclear radiations for exploration of internal organs, and for control or destruction of unwanted tissue and evaluate the perceived</p>	P8, P9, C9, C10 End of topic test Required

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	content only)	risks of using nuclear radiations in relation to given data and consequences. Students should be able to draw/interpret diagrams representing nuclear fission and how a chain reaction may occur.	Practical for B5, P2 & P14 topics PPEs
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Further Information

AQA Specification: <https://www.aqa.org.uk/subjects/science/gcse/combined-science-trilogy-8464>

Chace GCSE Science website: <https://sites.google.com/chace.enfield.sch.uk/year11revision>

Seneca: <https://senecalearning.com/en-GB/>

Kerboodle: <https://www.kerboodle.com/users/login>

BBC bitesize: <https://www.bbc.co.uk/bitesize/examspecs/z8r997h>