KS4 Long Term Curriculum Plan: Separate Sciences (Year 11 2022-2023)

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	**B5 /B6** Bacteria growth, plant disease and Monoclonal antibodies **P16 Space** **P7, P4 Nuclear Physics & Electrical field** **P15 Generators and Transformers**	**B5/B6** Students should be able to describe how to prepare an uncontaminated culture using aseptic technique. 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. **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.. **P7/P4** To know that nuclear fission is the splitting of a large and unstable nucleus (eg uranium or plutonium) and that spontaneous fission is rare. To be able to compare fission to fusion and know that nuclear fusion is the joining of two light nuclei to form a heavier nucleus. In this process some of the mass may be converted into the energy of radiation. To be able to interpret diagrams that represent fission and fusion. **P15** To know that if an electrical conductor moves relative to a magnetic field or if there is a change in the magnetic field around a conductor, a potential difference is induced across the ends of the conductor. To be able to explain how the generator effect is used in an alternator to generate ac and in a dynamo to generate dc and to be able to draw and interpret graphs of potential difference generated in the coil against time.	End of topic tests for: B5/6, P16, P7/P4 & P15 Required Practical for B5 topic
Autumn 2	**B13/B14/B15** DNA, Genetics and Evolution **P8/10 Moments and impact forces**	**B13/B14/B15** To be able to discuss historical developments of our understanding of the causes and prevention of malaria. To be able to appreciate that the theory of evolution by natural selection developed over time and from information gathered by many scientists and to be able to explain how the theory of speciation has developed over time. To be able to explain how our current understanding of genetics has developed over time and to be able to appreciate why the fossil record is incomplete.	End of topic tests for B13/B14/B15, & P8/P10 PPEs

		P8/10 To be able to describe that the pressure in fluids causes a force normal (at right angles) to any surface and that the pressure at the surface of a fluid can be calculated using an equation. To be able to describe examples in which forces cause rotation and to know the turning effect of a force is called the moment of the force. To be able to recall and apply the equation used to calculate moments. To be able to estimate how the distance for a vehicle to make an emergency stop varies over a range of speeds typical for that vehicle and to be able to explain what makes a vehicle's stopping distance.	
Spring 1	**C2/C3/C7** Transition elements, Nanoparticles and Fuel cells	**C2/C3/C7** To know that many transition elements have ions with different charges, form coloured compounds and are useful as catalysts. To be able to use SI units and the prefix and to recognise numbers in standard form. To know that carbon nanotubes are cylindrical fullerenes with very high length to diameter ratios. To be able to describe how their properties make them useful for nanotechnology, electronics and materials. To know that the overall reaction in a hydrogen fuel cell involves the oxidation of hydrogen to produce water and to be able to explain that hydrogen fuel cells offer a potential alternative to rechargeable cells and batteries and evaluate how this can impact the planet.	End of topic test for C2/C3/C7 PPEs
Spring 2	**C4** Titrations **P12 Waves** ***P2 Infrared radiation***	**C4** To be able to describe how to carry out titrations using strong acids and strong alkalis (sulfuric, hydrochloric and nitric acids) to find the reacting volumes accurately and to be able to calculate the chemical quantities in titrations involving concentrations in mol/dm3 and in g/dm3 . **P12** To be able to show how changes in velocity, frequency and wavelength, in transmission of sound waves from one medium to another, are inter-related. To know that waves can be reflected at the boundary between two different materials and waves can be absorbed or transmitted at the boundary between two different materials ***P2*** *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. To know that a perfect black body is an object that absorbs all of the radiation incident on it. A black body does not reflect or transmit any radiation. To be able to explain that since a good absorber is also a good emitter, a perfect black body would be the best possible emitter*	End of topic tests for C4, P12 & P2 Required Practical for C4 & P2 topic

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