Subject: Year 11 Combined Science (Covid-19 revised)
Year Overview

ST. MARY MAGDALENE
C OF E SCHOOL
PENINSULA CAMPUS
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Key content – knowledge and skills	National Curriculum focus
In light of school closures during the summer term 2020, the following year 10 topics have been carried through into year 11. Work has been set via distance learning for these topics but will still need to be revisited. **Physics Forces:** Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible **Physics: Waves:** Wave behaviour is common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves. **Biology Ecology:** The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic. These ecosystems provide essential services that support human life and continued development. In order to continue to benefit from these services humans need to engage with the environment in a sustainable way. In this section we will explore how humans are threatening biodiversity as well as the natural systems that support it. We will also consider	Planning experiments to test hypotheses on distribution. Estimating population size based on sampling. Make and record observations and measurements using a range of apparatus and methods. Evaluate methods and suggest possible improvements and further investigations Using SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. Rearranging equations to change the subject.

some actions we need to take to ensure our future health, prosperity and well-being. **Chemistry Organic:** The chemistry of carbon compounds is so important that it forms a separate branch of chemistry. A great variety of carbon compounds is possible because carbon atoms can form chains and rings linked by C-C bonds. This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. **Physics Electromagnetism and magnetism:** Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this. **<u>Additional topics include (already planned for year 11):</u>** **Chemistry Chemical analysis:** Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate. **Chemistry of the Atmosphere:** The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles. Scientists use very complex software to predict weather and climate change as there are many variables that can influence this. The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity. **Chemistry Using resources:**	

Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products.	

Key assessment points

Formal assessments take place at the end of each unit.
Mock examinations

Christian ethos

British values

- Group practical work
- Team working skills and to taking responsibility
- Scientific developments may give rise to moral dilemmas
- Considering the environment
- The interdependence of all living things and materials of the Earth.

Subject: Combined Science (year 11)
Medium-term plan

Week	Month	Learning Intentions and/or Key Questions
Aut1-1	September	Physics: Forces: • I can use free body diagrams to qualitatively describe examples where several forces act on an object, and explain how that leads to a single resultant force or no force • I can use free body diagrams, and accurate vector diagrams to scale, to resolve multiple forces and show magnitude and direction of the resultant, or represent one force as two component forces at right angles • I can explain why the pressure at a point in a fluid increases with the height of the column of fluid above that point and with the density of the fluid, and calculate differences in pressure at different depths in a liquid by applying, but • I can describe upthrust in terms of a greater pressure on the bottom surface of an object than on its top surface, and so explain why the density of the fluid has an effect on the upthrust experienced by an object submerged in it • I can explain why an object floats or sinks, with reference to its weight, volume and the upthrust it experiences • I can explain, giving examples, that when an object moves in a circle at a constant speed, the direction of the object is continually changing, as is the velocity • I can calculate the speed of an accelerating object at any point by drawing a tangent to the distance-time graph and measuring its gradient • I can apply, but not recall, the equation: [v^2 – u^2 = 2as] • I can describe inertia as the tendency of objects to continue in their state of rest or of uniform motion, and inertial mass as a measure of how difficult it is to change the velocity of an object, defining it as the ratio of force over acc • I can estimate the forces involved in the deceleration of road vehicles Physics: Waves: • I can describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids, examples may include the effect of sound waves on the ear drum • I can explain why such processes only work over a limited frequency range and the relevance of this to the range of human hearing, which is from 20 Hz to 20 kHz • I can explain how different wavelengths of electromagnetic radiation are reflected, refracted, absorbed or transmitted differently by different substances and types of surface • I can describe that refraction is due to the difference in velocity of waves in different substances, and illustrate this using wave front diagrams • I can explain that radio waves can be produced by oscillations in electrical circuits, or absorbed by electrical circuits, inducing an alternating current with the same frequency • I can explain and apply the idea that the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted, such that when they are equal the temperature is constant, and when uneven the temperature • I can describe the temperature of the Earth as dependent on the rates of absorption and emission of radiation, and draw and interpret diagrams that show how this radiation affects the temperature of the Earth's surface and atmosphere.
Aut1-2		
Aut1-3		
Aut1-4		
Aut1-5	October	
Aut1-6		
Aut1-7		

		Half term holiday
Aut2-1 Aut2-2 Aut2-3 Aut2-4 Aut2-5	November	<u>Biology: Ecology</u> • I can define the terms community, population, habitat, ecosystem, abiotic factor, biotic factor. • I can describe what a stable community is and give an example. • I can suggest how one species relies on another. • I can describe how a factor influences the distribution of organisms. • I can record measurements of abiotic factors. • I can explain how to use a quadrat and transect to estimate population size. • I can design a method to estimate a population using a sampling technique. • I can calculate range, mean, median and mode in order to analyse results.
Aut2-6 Aut2-7	December	• I can use information to suggest factors that animals are competing for in a given habitat. • I can explain tactics that help an animal compete for a resource. • I can describe how the distribution of a species has changed because of competition. • I can suggest factors that plants are competing for in a given habitat. • I can explain why plants use seed dispersal. • I can describe the methods plants use to outcompete others of avoid competition. • I can suggest features that an organism may have in order to survive in a given habitat. • I can explain how adaptations allow an organism to survive in its habitat. • I can classify adaptations as structural, behavioural or functional. • I can calculate surface area to volume ratio. • I can describe how animals are adapted to live in hot, dry and cold habitats. • I can explain how a plant adaptation allows it to survive in its habitat. • I can explain why plants need to reduce water loss by transpiration. • I can display data using a graph and describe what it shows. • I can identify producers, primary consumers, secondary consumers, tertiary consumers, predators and prey in a food web. • I can describe what happens to a population in a food web when another changes. • I can plot data as a line graph and explain the pattern of predator and prey populations. • I can explain why decomposers are important to a stable ecosystem. • I can explain the importance of recycling substances. • I can describe the events in the decay cycle. • I can describe the events in the carbon cycle. • I can explain why the carbon cycle is vital to life on Earth. • I can identify factors that speed up or slow down decay. • I can choose a suitable dependent variable and plan a way to measure it accurately. • I can plot a line graph with more than one line plotted on the same axes. • I can describe why a good level of biodiversity is important to the future of the human species. • I can describe some effects of human population growth.

		• I can analyse and interpret data and information concerning human population growth. • I can describe how sewage, fertilisers, pesticides and herbicides pollute the land and water. • I can describe the process of eutrophication and bioaccumulation. • I can draw conclusions from data. • I can describe how acid rain is formed. • I can plan an investigation to find out how acid rain affects the germination of seeds. • I can choose a suitable method for analysing data. • I can explain the effects of deforestation and peat removal. • I can categorise reasons for and effects of deforestation as environmental, social, economic and/or political. • I can describe why there is a conflict between using peat to increase food production and the need to conserve peat bogs. • I can use the terms greenhouse effect, global warming and climate change correctly. • I can describe in detail the biological consequences of global warming. • I can state some examples of environmental changes that affect the distribution of species in an ecosystem. • I can explain how humans can cause environmental changes. • I can describe an example of how environmental change has affected the distribution of species. • I can describe programmes to reduce negative effects on ecosystems and explain how they work. • I can use information to explain the conflicting pressures on maintaining biodiversity. • I can number the trophic levels on a food chain, food web and pyramid of biomass. • I can describe how decomposers feed. • I can use data to draw a pyramid of biomass and explain what it shows. • I can calculate the percentage of biomass passed between trophic levels. • I can calculate the efficiency of transfers with guidance. • I can explain how the loss of biomass at each trophic level affects the number of organisms at each level. • I can define sustainable food production and describe how it could help increase food security. • I can explain how factors affect food security. • I can present information based on research. • I can explain why there could be more food for everyone if we ate less meat. • I can explain why there are ethical objections to some 'factory farming' techniques. • I can explain how 'factory farming' techniques increase rate of growth. • I can describe the reasons why fish stocks in the ocean are decreasing. • I can describe the techniques used to conserve fish stocks <u>Chemistry: Organic</u> • I can describe how to separate crude oil into fractions in a school laboratory. • I can classify a hydrocarbon as an alkane. • I can state the names and describe the first four alkanes.

		• I can describe how the trend in colour, viscosity, flammability, and boiling point changes as the length of the hydrocarbon chain changes. • I can describe how the properties of a fraction of crude oil make it appropriate for its use. • I can explain the differences between complete and incomplete combustion. • I can write balanced symbol equations for the complete and incomplete combustion of hydrocarbons. • I can explain how to test for the products of complete combustion. • I can describe the process of cracking, including conditions. • I can generate a balanced symbol equation to describe cracking. • I can describe a chemical test to show an alkene is present. • I can draw the displayed structural formulae for the first four alkenes. • I can draw the displayed structural formulae for the products of the addition reactions between alkenes and hydrogen, water (steam), or a halogen. • I can predict the word and balanced symbol equations for the complete combustion of an alkene when the number of carbon atoms is given.
		Christmas holiday
Spr1-1 Spr1-2 Spr1-3 Spr1-4 Spr1-5	January	<u>Physics: Electromagnetism and magnetism:</u> • I can state and use Fleming's left-hand rule and explain that the size of the induced force depends on the magnetic flux density, current in, and length of, the conductor in the magnetic field • I can calculate the force on a conductor carrying a current at right angles to a magnetic field by applying, but not recalling, the equation: [F = B I L] • I can explain how rotation is caused in an electric motor
Spr1-6	February	<u>Chemistry: Chemical analysis:</u> • I can justify the classification of pure substances, impure substances, and formulations when data is supplied. • I can explain in detail the use of formulations. • I can calculate percentage compositions of components in a range of formulations. • I can explain why different substances and different conditions will have different Rf values. • I can calculate Rf values from a chromatogram, using an appropriate number of significant figures. • I can interpret a chromatogram to identify unknown substances. • I can write balanced symbol equations, including state symbols, for the reactions of limewater with carbon dioxide and hydrogen with oxygen. • I can explain why a glowing splint re-ignites in oxygen. • I can explain why chlorine gas turns damp indicator paper colourless. <u>Chemistry: Atmosphere:</u> • I can state the composition, including formulae, of the Earth's early atmosphere.

		• I can describe a theory for the development of the Earth's atmosphere. • I can explain, using word equations, how gases were formed in the atmosphere and oceans were formed. • I can describe how the proportion of carbon dioxide in the early atmosphere was reduced. • I can state the composition of dry air. • I can use word equations to show how carbon dioxide can form sedimentary rocks. • I can explain the greenhouse effect. • I can explain how greenhouse gases increase the temperature of the atmosphere. • I can explain how human activity can change the proportion of greenhouse gases in the atmosphere. • I can explain the possible effects of global climate change and why they are difficult to predict. • I can explain possible methods to reduce greenhouse gas emissions. • I can explain some of the problems in trying to reduce greenhouse gas emissions. • I can explain how sulphur dioxide and nitrogen oxides are made when fossil fuels are combusted. • I can describe the health impacts of atmospheric pollutants.
		Half term holiday
Spr2-1		<u>Chemistry: Using resources</u> • Recycling • Potable water • Waste management. <u>REVISION IN PREPARATION FOR GCSE EXAMINATIONS</u>
Spr2-2		
Spr2-3	March	
Spr2-4		
Spr2-5		
Spr2-6		
	April	**Easter holiday**
Sum1-1		
Sum1-2		
Sum1-3	May	
Sum1-4		
Sum1-5		

Sum1-6		
	June	**Half term holiday**
Sum2-1		
Sum2-2		
Sum2-3		
Sum2-4		
Sum2-5	July	
Sum2-6		
Sum2-7		