Long Term Plan – Combined Science (2024-25)

Vision: Our vision is to ignite a passion for science in every student. We strive to create a dynamic, hands-on learning environment where curiosity thrives and students are empowered to explore the wonders of science. Our aim is to develop critical thinkers and problem solvers equipped with the skills and knowledge to address real-world challenges. By integrating sustainable practices and collaborative projects, we prepare students to lead in a rapidly evolving scientific landscape. We are committed to fostering a culture of scientific curiosity and inspiring students to make meaningful contributions to society and the global community.							**Year End Points**
	HT1	**HT2**	**HT3**	**HT4**	**HT5**	**HT6**	
Year 10 Biology	B4 Organising animals and plants, blood, gas exchange and transport systems in plants.	B6 Preventing and treating disease.	B7 Non communicable disease.	B8 Photosynthesis. **Required practical Photosynthesis.** B9 Respiration.	**Retrieval of paper 1 with extended writing and calculation and required practical skills revisited.** **Full paper 1 assessment including detailed feedback and re-teaching.**	B16 Adaptation, interdependence and competition. **Required practical sampling.**	By the end of year 10 students will know: The need for transport systems in multicellular organisms, including plants, the relationship between the structure and functions of the human circulatory system and the function of the gas exchange system in animals. The relationship between health and disease, communicable diseases including sexually transmitted infections in humans (including HIV/AIDs), non-communicable diseases , the role of bacteria, viruses and fungi as pathogens in animals and plants, the body's defences against pathogens and the role of the immune system against disease, how to reduce and prevent the spread of infectious diseases in animals and plants, the process of the discovery and development of new medicines and the impact of lifestyle factors on the incidence of non-communicable diseases. The process of photosynthesis and the factors affecting the rate of photosynthesis. The importance of cellular respiration and the processes of aerobic and anaerobic respiration. Some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community, methods of identifying species and measuring distribution, frequency and abundance of species within a habitat, organisms are interdependent and are adapted to their environment.
Year 10 Chemistry	C5 Chemical changes (Lesson on g/dm^3.) **Required practical Making salts.**	C6 Electrolysis. **Required practical Electrolysis.**	C4 – Chemical calculations.	C7 Energy changes **Required practical Temperature changes.**	**Retrieval of paper 1 with extended writing and calculation and required practical skills revisited.** **Full paper 1 assessment including detailed**	C8 Rates and equilibrium. **Required practical Rates of reaction.**	By the end of year 10 students will know: The different chemical changes that can take place and these chemical changes can be classified in different ways. Students will be able to predict exactly which new substances will be formed. That the extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart' using the principles of electrolysis. How to represent chemical reactions and given information, students will be able to use quantitative methods to determine the purity of chemical samples.

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					feedback and re-teaching.		That energy changes are an important part of chemical reactions and the interaction of particles often involves the transfer of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. Students will know that these interactions between particles can produce heating or cooling effects that are used in a range of everyday applications and that some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity. Students will also know that electricity can also be used to decompose ionic substances and is a useful means of producing elements that are too expensive to extract any other way. That chemical reactions can occur at vastly different rates. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are many variables that can be manipulated in order to speed them up or slow them down. Chemical reactions may also be reversible and therefore the effect of different variables needs to be established in order to identify how to maximise the yield of desired product. Students will know that in industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product and whilst there may be compromises to be made, they carry out optimisation processes to ensure that enough product is produced within a sufficient time, and in an energy-efficient way.
Year 10 Physics	P3 Energy resources	P6 Molecules and matter P2.2, P2.3 **Required practical Thermal insulation** **Required practicals Specific heat capacity and density**	P7 Radioactivity. P9 Motion.	P8 Forces in balance. P10 Force and motion including forces and braking. **Required practicals Acceleration and Force and extension.**	**Retrieval of paper 1 with extended writing and calculation and required practical skills revisited.** **Full paper 1 assessment including detailed feedback and re-teaching.**	P10 Force and motion including forces and braking. **Required practicals Acceleration and Force and extension.**	By the end of year 10 students will know: The different types of renewable and non-renewable energy resources used on Earth and why they are considered either renewable or non-renewable. That power is the rate of transfer of energy, how to calculate energy efficiency for any energy transfer and that the domestic a.c. supply is 50Hz and on average 230V. Students will know how to identify live, neutral and earth mains wires, safety measures to take when wring a plug and the power transfer related to p.d. and current, or current and resistance. How to relate the models of the molecules in solid, liquid and gas phases to their densities. Students will know that changes of state are reversible. Students will also know how to calculate the energy changes involved in heating, how to calculate specific heat capacity and specific latent heat. Students will be able to make links between the pressure and temperature of a gas at a constant volume. The current nuclear model and its development in the light of changing evidence. Students will also know how to work out the number of protons and neutrons using the atomic number and the mass number and the identities of nuclei, isotope characteristics and how to use the equations to represent changes. Students will know the difference between ionisation; absorption or emission of radiation related to changes in electron orbits. Students will be able to identify radioactive nuclei: emission of alpha or beta particles, neutrons, or gamma rays using changes in the nuclear mass and/or charge.

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							Students will know the dangers of radioactive materials, the importance of half-life and irradiation, contamination and their associated hazardous effects including waste disposal. How to calculate the speed of sound, how to estimate speeds and accelerations in everyday contexts, and how to interpret quantitatively graphs of distance, time, and speed. How to identify contact and non-contact forces and that forces are vectors. Students will know how to calculate work done as force x distance and the difference between elastic and inelastic stretching. That acceleration is caused by forces; how to apply Newton's First Law and how to calculate weight and gravitational field strength and the importance of decelerations and braking distances in relation to road safety.
Year 11 Biology	B10 The Human Nervous system. **Required practical Reaction time.** B11 Hormonal control.	B13 Reproduction.	B14 Variation and evolution.	B15 Genetics and evolution.	B17 Organising an ecosystem. B18 Biodiversity and ecosystems.		By the end of year 11 students will know: The principles of homeostasis and how nervous coordination and control in humans maintains optimum conditions. The relationship between the structure and function of the human nervous system, the relationship between structure and function in a reflex arc. The principles of hormonal coordination in humans including the hormones involve in human reproduction and the use of hormonal and non-hormonal methods of contraception. The genome as the entire genetic material of an organism and how the genome and its interaction with the environment influence the phenotype of an organism. How sex is determined in humans. How single gene inheritance and single gene crosses involving dominant and recessive phenotypes can occur. The idea that most phenotypes result from the interaction of many genes and how genomics can impact medicine through ideas such as embryo screening and the ethics involved. That there is genetic variety within populations of a species and natural selection leads to evolution. The evidence that scientists use for evolution and how the study of classification has developed. The importance of selective breeding of both plants and animals in agriculture and the use of modern biotechnology in farming along with the practical and ethical challenges.

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Year 11 Chemistry	C12 – Chemical analysis, gas tests, chromatography. **Required practical Chromatography.**	Complete C8 Rates. C9 – Crude oil distillation and uses.	C13 – The Earth's atmosphere.	C14 – Use, reuse and recycling of water, metals and other products. **Required practical Water purification.**			By the end of year 11 students will know: How to distinguish between pure and impure substances and how to carry out separation techniques for mixtures of substances: filtration, crystallisation, chromatography, simple and fractional distillation. That different factors that can influence the rate of reaction including varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst and the factors affecting reversible reactions. That carbon compounds are used both as fuels and feedstock, and the competing demands for limited resources. How fractional distillation of crude oil and cracking are used to make more useful materials. How to apply life cycle assessment and recycling to assess environmental impacts associated with all the stages of a product's life. The evidence for the composition and the evolution of the Earth's atmosphere since its formation. The evidence, and the uncertainties in evidence, for climate change. The potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate. Other common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources. The Earth's water resources through the detailed study of the water cycle and how we obtain potable water and the treatment of waste water to allow safe discharge into the water courses.
Year 11 physics	P12 Wave properties. **Required practical Waves.**	P13 Electromagnetic waves. **Required practical Radiation and absorption.**	P15 Electromagnetism. Interleave with electricity retrieval				By the end of year 11 students will know: Amplitude, wavelength, frequency, relating velocity to frequency and wavelength, transverse and longitudinal waves, velocities differing between media: absorption, reflection, refraction effects. Electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays, production and detection, by electrical circuits, or by changes in atoms and nuclei, uses in the radio, microwave, infra-red, visible, ultra-violet, X-ray and gamma ray regions, hazardous effects on bodily tissues. 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.