## Teign School Curriculum Overview





**SCIENCE KS5 Curriculum**

**A Level Bio, Phys, Chem – OCR**

**BTEC Applied Science Certificate and Extended Certificate - EDEXCEL**

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| **Year**  | **Cycle 1 -12 Weeks****(10 weeks teaching, 1 week assessment, 1 impact week)** | **Cycle 2 -12 Weeks****(10 weeks teaching, 1 week assessment, 1 impact week** | **Cycle 3 -12 Weeks****(10 weeks teaching, 1 week assessment, 1 impact week** |
| **12** |  |  |  |
| **Biology** | **Module 2 Foundations in biology****2.1.1 Cell structure** **Students study the ultrastructure and function of cells and microscopy in this unit. Cell biology is a logical place to start, as cells are the building blocks of organisms. PAG 1: Microscopy, is covered in this topic.** ***KS4 Link Topic 1: Cell biology*** **2.1.2 Biological molecules:** **Students study the structure and functions of carbohydrates, proteins, lipids and water. Another fundamental topic that students need to grasp to be able to understand many other concepts later in the course. PAG 9: Qualitative testing is covered here.** ***KS4 Link Topic 2: Organisation but it is largely new ideas.*****2.1.3 Nucleotides and nucleic acids:** **Students study the structures of DNA, RNA and ATP; 3 key molecules that link to many other concepts and need teaching near the start of the course. PAG 10: Investigation using computer modelling is covered in this topic.** ***KS4 Link Topic 6 Triple Science only: Inheritance, variation and evolution*** **2.1.4 Enzymes:** **The last molecule students will study in depth are enzymes; their structure, function, mode of actions, factors affecting the rate and coenzymes and cofactors. PAG 4: Rates of enzyme controlled reactions is studied here.** ***KS4 Link Topic 2: Organisation*** | **Module 2 Foundations in biology****2.1.5 Biological membranes:** **Students study the structure of the plasma membrane in detail and its functions before linking this learning to the methods by which substances cross the membrane. PAG 5: Colorimeter and PAG 8: Transport in and out of cells are covered here.** ***KS4 Link Topic 1: Cell biology*** ***KS5 Links Topic 2.1.1 and 2.1.2*** **2.1.6 Cell division, cell diversity and cellular organisation****Students learn in detail about the cell cycle, mitosis, meiosis, specialised cells, levels of organisation within organisms and stem cells differentiation and their potential uses in medicine.** ***KS4 Link Topic 1: Cell biology, Topic 2: Organisation and Topic 6: Inheritance, variation and evolution******KS5 Link Topic 2.1.3*** **Module 3 Exchange and Transport****3.1.1 Exchange surfaces****Students learn about the need for and features of specialised exchange surfaces. They then study ventilation and gas exchange systems in mammals, bony fish and insects as examples of the properties and functions of exchange surfaces in animals. PAG 2: Dissection is covered here.*****KS4 Links Topic 1: Cell biology and Topic 2: Organisation******KS5 Link Topic 2.1.5*** **3.1.2 Transport in animals****Students learn about the need for transport systems in animals and the different types of them before moving on to look at the structure and functions of the components of animal transport systems in more detail.** ***KS4 Link Topic 2: Organisation******KS5 Links Topic 2.1.2 and 2.1.5 and Topic 3.1.1*** **3.1.3 Transport in plants****Students learn about the need for transport systems in plants before moving on to look at the structure and function of the vascular system, the different transport methods they use and adaptations they might have.** ***KS4 Links Topic 1: Cell biology and Topic 2: Organisation******KS5 Links Topics 2.1.2 and 2.1.5 1 and Topic 3.1.1***  | **Module 4 Biodiversity, evolution and disease****4.1.1 Communicable diseases, prevention and immune system****Students study the different types of pathogens and how they are transmitted and the defences both plants and animals have against them. They build upon this to study the immune system and medical interventions used to help prevent and treat infections.*****KS4 Link Topic 3: Infection and response and Topic 6: Inheritance, variation and evolution******KS5 Link Topic 2.1.1*****4.2.1 Biodiversity (self – study topic)****Students will study the different types of biodiversity, how to sampling and statistical tests can be used to measure it and how to measure genetic diversity. They then move on to look at factors affecting biodiversity and the reasons for and methods of maintaining it. PAG 3: Sampling techniques is covered here.*****KS4 Link Topic 7: Ecology*****4.2.2 Classification and evolution** **Students will study the classification systems and how evidence has led to it changing over time. They will then move onto look at natural selection, variation and adaptations and how selection can lead to changes in populations over time and the implications some of these may have on humans.*****KS4 Link Topic 6: Inheritance, variation and evolution and Topic 7: Ecology******KS5 Link Topic 2.1.4*** **Module 5: Communication, homeostasis and energy****5.1.5 Plant responses only** **Student learn about the different type of plant responses, the roles of plant hormones and their commercial use. There is a focus here on using experimental evidence and practical investigations into the affect of plant hormones. PAG 11:Investgation into the measurement of plant responses may be covered here.*****KS4 Link Topic 5 Triple Science only: Homeostasis and response*****Module 6: Genetics, evolution and ecosystems****6.3.1 Ecosystems****Students will study biotic and abiotic factors within ecosystems, how biomass is transferred through ecosystems, the recycling within ecosystems, succession and how the distribution and abundance of organisms can be measured within ecosystems.*****KS4 Link Topic 7: Ecology (some Triple Science only content)******KS5 Link Topic 4.2.1***  |
| **Physics** | **TAUGHT AT TEIGN****Unit 2 Foundations of Physics****Practical and mathematical skills building on those covered throughout the KS4 course. Including vectors, units and prefixes, uncertainties and measurement.****Units 3.1 Motion and 3.2 Forces in action: KS4 links to Topic 5****We explore static and dynamic systems including density and pressure, linear motion, rotation and projectile motion.****TAUGHT AT COOMBESHEAD****Units 4.1 – 4.3 Electric circuits: KS4 links Topic 2****Building on KS4 content, students delve deeper into charge and current before tackling resistance, resistivity and power. This then cumulates in applying these concepts electric circuits using Kirchhoff’s Laws and other fundamentals.** | **TAUGHT AT TEIGN****Units 3.3 – 3.5 Energy, materials and Newton: KS4 links to Topic 1 and Topic 5****We apply the energy model taught at KS4 to more complex situations before moving on to cover the deformation of materials under tensile and compressive loads. Unit 3 in then finished by dealing with collisions between objects in both 1D and 2D applying Newton’s Laws and conservation of linear momentum.****TAUGHT AT COOMBESHEAD****Units 4.4 – 4.5 Waves and Quantum Physics: KS4 links Topic 6****Beginning with fundamental properties of waves, the unit then delves into the behaviour of light through refraction, diffraction and polarisation. Interference and stationary waves are then discussed, including the infamous Young’s Double Slit Experiment before sidestepping neatly into introductory quantum physics with the photon model of light, photoelectric effect and wave-particle duality.** | **TAUGHT AT TEIGN****Units 5.2 Circular Motion and 5.4 Gravitational Fields: KS4 links to Topic 5****The mechanics of circular motion are introduced through ideas such as angular velocity, centripetal acceleration and centripetal force. This makes the perfect starting point to move into gravitational fields and Newton’s Law of Gravitation. The two topics are then combined to tackle orbital motion of objects in space** **through concepts such as Kepler’s Laws.****TAUGHT AT COOMBESHEAD****Units 6.5 Medical Imaging: KS4 links Topic 4****Various medical imaging techniques are explained using physics principles. X-rays and their attenuation by matter, PET scans utilising previously covered ideas of radiation and finally ultrasound, explained through new ideas such as acoustic impedance.**  |
| **Chemistry** | **Module 2 Foundations in Chemistry****Teign** **2.1.3 Amount of substance****2.1.4 Acid-base titrations****2.1.5 Redox taught with 3.1.2 Group 2 and 3.1.3 The Halogens****Coombeshead**  **2.1.2 Compounds, formulae and equations****2.1.1 Atomic structure and isotopes****2.1.4 Acids****2.2.1 Electron structure****2.2.2 Bonding and structure*****KS4 Links Topic 1 Atomic structure and*** ***the periodic table******Topic 2 Bonding structure and the*** ***properties of matter******Topic 3 Quantitative chemistry***  | **Module 3 Periodic Table and Energy****Module 4 Core Organic Chemistry****Teign** **3.1.4 Qualitative analysis****3.2.1 Enthalpy changes****3.2.2 Reaction rates** **Coombeshead** **3.1.1 Periodicity****4.1.1 Basic concepts of organic chemistry to be taught as required during this module.****4.1.2 Alkanes****4.1.3 Alkenes*****KS4 Links Topic 5 Energy changes******Topic 6 The rate and extent of chemical change******Topic 7 Organic Chemistry*** | **Module 3 Periodic Table and Energy****Module 4 Core Organic Chemistry****Module 5 Physical Chemistry and Transition Elements****Teign** **3.2.3 Equilibrium****5.2.3 Redox and redox titrations PAG12****Coombeshead** **4.2.1 Alcohols****4.2.2 Haloalkanes****4.2.3 Organic synthesis****4.2.4 Analytical techniques*****KS4 Links Topic 6 The rate and extent of chemical change******Topic 7 Organic Chemistry******Topic 8 Chemical analysis*** |
| **BTEC App Sci** | **Taught jointly at TGN and CHD****Unit 1 - Principles and Applications of Science****This unit covers three in depth curriculum areas – one related each to Chemistry, Biology and Physics. The Chemistry is based around understanding of atomic structure, bonding, the Periodic Table and quantitative chemistry. The Biology is based around cell ultrastructure, tissue organisation, muscle structure and action potential propagation and transmission. The Physics content is based on waves – their behaviour and use in communications.*****KS4 Links Bio Topics 1,2 and 5; Chemistry Topics 1 and 2; Physics Topic 6*** | **Taught jointly at TGN and CHD****Unit 2: Practical Scientific Procedures and****Techniques****This unit develops student’s practical science skills in five key areas – calorimetry, chromatography, making standard solutions, titration and colourimetry. These skills are developed through structured investigative science of increasing complexity and then assessed through the submission of 4 internally assessed assignments. As well as the four investigative assignments there is a fourth which is reflective in nature and gives the students a chance to analyse the skills they have gained, and those that they need to develop further.*****KS4 Links Bio Topic 4; Chemistry 2 and 3; Physics Topic 1 and 3*** | **Taught jointly at TGN and CHD****Unit 2: Practical Scientific Procedures and Techniques****This unit develops student’s practical science skills in five key areas – calorimetry, chromatography, making standard solutions, titration and colourimetry. These skills are developed through structured investigative science of increasing complexity and then assessed through the submission of 4 internally assessed assignments. As well as the four investigative assignments there is a fourth which is reflective in nature and gives the students a chance to analyse the skills they have gained, and those that they need to develop further.*****KS4 Links Bio Topic 4; Chemistry 2 and 3; Physics Topic 1 and 3*** |
| **13** |  |  |  |
| **Biology** | **Module 5: Communication, homeostasis and energy****5.1 Communication and homeostasis****5.1.1 Communication and homeostasis****Students will learn about the need for communication systems, the importance of cell signalling, the principles of homeostasis and the responses involved in temperature control in endo and ectotherms as a specific example.*****KS4 Link Topic 5: Homeostasis and response******KS5 Link Topic 2.1.1 and 2.1.5*** **5.1.2 Excretion as an example of homeostatic control****Students will look at the role excretion has in maintaining homeostasis, the structure and function of the liver and kidneys, the role of the kidney in osmoregulation, the effects of kidney failure and treatments and the use of excretory products in medical diagnosis. This topic provides an opportunity to carry out dissections and examine and draw sections to show their histology.*****KS4 Link Topic 4: Bioenergetics and Topic 5: Homeostasis and response (some Triple Science only content)******KS5 Link Topics 2.1.1, 2.1.2 and 2.1.5*** **5.1.3 Neuronal communication****Students study the structure and function of receptors and neurones and how nerve impulses are generated and transmitted in mammals before finally looking at the structure and roles of synpases.*****KS4 Link Topic 5: Homeostasis and response******KS5 Link Topics 2.1.1, 2.1.2, 2.1.4 and 2.1.5*****5.1.4 Hormonal communication****Students will study the principles of endocrine communication, the structure and function of adrenal glands and the pancreas before looking at how blood glucose levels are regulated in detail. Diabetes and its potential treatments complete this topic. Another opportunity in this topic to examine and draw sections to show histology of the endocrine tissues.*****KS4 Link Topic 5: Homeostasis and response******KS5 Link Topics 2.1.1, 2.1.2 and 2.1.5*****5.1.5 Animal responses only****Students will study the structure of the nervous system, the brain, how the neuronal and hormonal systems coordinate responses and their effects on heart rate. They move on to look at muscles and muscle contraction in depth. PAG 11: Investigation into the measurement of plant or animal responses is covered here.*****KS4 Link Topic 5 Triple Science only: Homeostasis and response*** ***KS5 Link Topics 2.1.1, 2.1.2, 2.1.5, 5.1.3 and 5.1.4*****5.2 Energy for biological processes****5.2.1 Photosynthesis****Students will study the structure of chloroplasts and the importance of photosynthetic pigments. They then link this to the main stages of photosynthesis before studying theoretically and practically, the factors that affect its rate. PAG 6: Chromatography is covered here.*****KS4 Link Topic 4: Bioenergetics******KS5 Link Topics 2.1.1, 2.1.2, and 2.1.4*****5.2.2 Respiration****Students will learn about the need for cellular respiration, the structure of the mitochondrion, the main stages in respiration, the process of anaerobic respiration, practical investigations of both types of respiration in yeast, respiratory substrates, RQ and practically investigating the factors affecting the rate of respiration. PAG 12: Research skills will be covered here.*****KS4 Link Topic 4: Bioenergetics******KS5 Link Topics 2.1.1, 2.1.2, and 2.1.4*** | **Module 6: Genetics, evolution and ecosystems****6.1 Genetics and evolution****6.1.1 Cellular control****Students will study the types of mutations and their effects, regulatory mechanisms for gene expression, the genetic control of body plan development and the importance of mitosis and apoptosis in the development of body form.** ***KS4 Link Topic 6 Triple Science only: Inheritance, variation and evolution******KS5 Link Topic 2.1.3 and 2.1.4*****6.1.2 Patterns of inheritance****Students will study sexual reproduction and meiosis, genetic diagrams to show patterns of inheritance and phenotypic ratios, statistical tests relating to genetics, variation, evolution and artificial selection.*****KS4 Link Topic 6: Inheritance, variation and evolution******KS5 Link Topic 2.1.3 and 4.2.2*****6.1.3 Manipulating genomes****Students will study the principles of DNA sequencing and its uses, DNA profiling and its uses, PCR and its application in DNA analysis, electrophoresis and its uses, genetic engineering and the ethics related to this and gene therapy.*****KS4 Link Topic 6: Inheritance, variation and evolution******KS5 Link Topic 2.1.3, 2.1.4 and 6.1.1*****6.2 Cloning and biotechnology****6.2.1 Cloning and biotechnology****Students will learn about the different methods of cloning plants and animals, the uses of such techniques and the arguments for and against them. They will then move on to look at the uses of microorganisms in biotechnological processes, how to culture them using aseptic techniques, their growth and how we can manipulate their growth conditions to maximise yield. Finally, they will study the uses of immobilised enzymes in biotechnology. PAG 7: Microbiological techniques will be covered here.*****KS4 Link Topic 1 Triple Science: Cell biology and Topic 6 Triple Science: Inheritance, variation and evolution******KS5 Link Topic 2.1.3, 2.1.4 and 2.1.6*****6.3 Ecosystems****6.3.2 Populations and sustainability****Students will study the factors that determine the size of a population and the interactions between populations. They will then learn about the economic, social and ethical reasons why ecosystems may need to be carefully managed and the need to use biological resources in a sustainable way.*****KS4 Link Topic 7: Ecology******KS5 Link Topic 4.2.1*** |  |
| **Physics** | **TAUGHT AT TEIGN****Unit 5.5 Astrophysics and Cosmology, and Unit 5.3 Oscillations: KS4 links Topic 4 (and Topic 8 triple)****Star formation leads to investigating the lifecycle of stars, explored through their spectra before leading to cover current theories on the beginning and subsequent evolution of the universe such as the big bang, cosmic microwave background radiation and Hubble’s Law. The second topic of oscillations deals with simple harmonic motion including damping and resonance effects.****TAUGHT AT COOMBESHEAD****Units 6.1 Capacitors and 6.2 Electric Fields: KS4 links Topic 2****Capacitors are used as an introduction to electric field theory. Including the exponential nature of charging and discharging, Coulomb’s Law and electric potential. The motion of charged particles in uniform electric fields is the final topic in this unit.** | **TAUGHT AT TEIGN****Unit 5.1 Thermal physics: KS4 links Topic 1****Fundamental concepts of internal energy, states of matter and absolute zero are explored before covering macroscopic properties of matter such as specific latent heat. We then progress to cover ideal gas laws and explain observable properties using ideas of motion of gas molecules.****TAUGHT AT COOMBESHEAD****Units 6.3 Electromagnetism and 6.4 Particle physics: KS4 links Topic 4 & 7** **Previous ideas of fields are now applied to magnetism before exploring the link between electricity and magnetism** **through charged particles in magnetic fields and EM induction including Faraday’s Law. The second unit explores the world of elementary particles, nuclear decay and interactions through the strong and weak nuclear force.** |  |
| **Chemistry** | **Module 5 Physical Chemistry and Transition Elements****5.1.1 How fast?****5.1.2 How far?****5.1.3 Acids, bases and buffers****5.2.1 Lattice enthalpy****5.2.2 Enthalpy and entropy****5.2.3 Redox and electrode potentials****5.3.1 Transition elements****5.3.2 Qualitative analysis****KS4 Links Topic 4 Chemical changes****Topic 5 Energy changes****Topic 6 The rate and extent of chemical change** | **Module 6 Organic Chemistry and Analysis****6.1.1 Aromatic compounds****6.1.2 Carbonyl compounds****6.1.3 Carboxylic acids and esters****6.2.1 Amines****6.2.2 Amino acids, amides and chirality****6.2.3 Polyesters and polyamides****6.2.4 Carbon-carbon bond formation****6.2.5 Organic synthesis****6.3.1 Chromatography and qualitative analysis****6.3.2 Spectroscopy****KS4 Links Topic 7 Organic Chemistry****Topic 8 Chemical analysis** |  |
| **BTEC App Sci** | **Taught jointly at TGN and CHD****Unit 3- Science Investigation Skills****Learners will cover the stages involved and the skills needed in planning a scientific investigation: how to record, interpret, draw scientific conclusions and evaluate.** **Students develop their understanding and skills based within 5 broad themes – ecology, enzymes, diffusion, fuels and circuits.****Within each theme students gain knowledge of how to plan and carry out an investigation as well as gathering, analysing and interpreting data and drawing conclusions.*****KS4 Links – Required practicals across all three sciences*****Taught at TGN****Unit 15: Electrical circuits and their applications A&B: KS4 links Physics Topic 2****Foundational concepts of charge, current and voltage are explored for a wide range of circuit types. More detailed ideas such as resistance, resistivity and power are then covered before cumulating in applying these concepts electric circuits using Kirchhoff’s Laws and other fundamentals.** | **Taught jointly at TGN and CHD****Unit 3- Science Investigation Skills****Learners will cover the stages involved and the skills needed in planning a scientific investigation: how to record, interpret, draw scientific conclusions and evaluate.** **Students develop their understanding and skills based within 5 broad themes – ecology, enzymes, diffusion, fuels and circuits.****Within each theme students gain knowledge of how to plan and carry out an investigation as well as gathering, analysing and interpreting data and drawing conclusions.****This unit is assessed through an external exam.*****KS4 Links – Required practicals across all three sciences*****Taught at TGN****Unit 15: Electrical circuits and their applications C&D: K4S links Physics Topic 2****Differences between AC and DC circuits are covered including detailing safety concerts and practices. The final learning aim looks at measurement devices and transducers. Applying the circuits knowledge we have gained to explore how circuits can be used to make measurements, including thermistors, LDR’s and thermocouples.** |  |