


Science Department – Year 11

 Shirley High Curriculum Map	Year 11: "Expert scientist" = Learners are now able to complete their GCSE studies and progress to their exams. Challenge pupils to: Apply their knowledge in an intuitive way to unfamiliar situations.					
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:
	4 Bioenergetics 13 The rate and extent of chemical change 5 Homeostasis and response	PPE 1s 14 Organic chemistry 22 Forces	23 Waves 24 Magnetism and electromagnetism 15 Chemical analysis 16 Chemistry of the atmosphere	6 Inheritance, variation and evolution 7 Ecology PPE 2s	17 Using resources GCSE revision	GCSE exams
Why Now?	Pupils will learn about the key reactions of photosynthesis and respiration – the very way all organisms gain and use energy. Pupils will also build on last half terms learning on energy to see electricity as an efficient energy transfer process. Pupils will learn how bodies self-regulate and sense their world around them.	They will delve into the ideas of fuel and how we gain our important metal resources from ores, which links back to Spring 2 in year 10. Pupils will learn how humans have developed techniques and machines based on our understanding of forces.	Pupils will learn how humans have developed techniques and machines based on our understanding of waves. We all rely on electricity – but how is it produced? This half term pupils will find out. With many pupils looking at careers and next courses the chemistry of analysis will be key to now understand. Pupils will also link the changing climate to the chemistry of our atmosphere.	They will also delve into the ideas that Darwin introduced over 200 years ago, and see the modern uses of this understanding. With the spring weather pupils can get out into the school grounds and explore the diverse life there – they will learn field techniques to sample it.	Finally pupils will become good global citizens by looking at the importance of recycling and reusing resources. Students will revise and recap learning for their GCSE exams this term.	
Fundamental Concepts	4 Photosynthesis is the reaction that light energy is converted to a chemical energy store 13 Chemical reactions are caused by successful collisions causing bonds to break and new ones to be formed 5 How an organism senses and controls	14 How different organic molecules react 22 How to draw forces and their effects	23 Waves transfer energy and the EM spectrum has many uses 24 How magnetism and electricity are linked 15 Quantitative and qualitative analysis of chemicals 16 The atmosphere of the Earth has changed drastically over time to now support life.	6 To know how change in organisms over time has led to species evolution The link between organisms in an ecosystem and the energy flow	17 How resources on Earth can be used, reused and recycled.	
Students will...	Bioenergetics - photosynthesis as the key process for food production and therefore biomass for life - the process of photosynthesis - factors affecting the rate of photosynthesis The rate and extent of chemical change - factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst - factors affecting reversible reactions Homeostasis and control - principles of nervous coordination and control in humans - the relationship between the structure and function of the human nervous system - the relationship between structure and function in a reflex arc - principles of hormonal coordination and control in humans - hormones in human reproduction, hormonal and non-hormonal methods of contraception - homeostasis	Organic Chemistry - carbon compounds, both as fuels and feedstock, and the competing demands for limited resources - fractional distillation of crude oil and cracking to make more useful materials - extraction and purification of metals related to the position of carbon in a reactivity series Forces - forces and fields: electrostatic, magnetic, gravity forces as vectors - calculating work done as force x distance; elastic and inelastic stretching - pressure in fluids acts in all directions: variation in Earth's atmosphere with height, with depth for liquids, up-thrust force (qualitative)	Waves - amplitude, wavelength, frequency, relating velocity to frequency and wavelength - transverse and longitudinal waves - electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays - velocities differing between media: absorption, reflection, refraction effects - 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 Magnetism and electromagnetism - 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 Chemistry of the atmosphere - evidence for composition and evolution of the Earth's atmosphere since its formation - evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change - potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate - common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources - the Earth's water resources and obtaining potable water	Evolution, inheritance and variation - the genome as the entire genetic material of an organism - how the genome, and its interaction with the environment, influence the development of the phenotype of an organism - the potential impact of genomics on medicine - most phenotypic features being the result of multiple, rather than single, genes - single gene inheritance and single gene crosses with dominant and recessive phenotypes - sex determination in humans - genetic variation in populations of a species - the process of natural selection leading to evolution - the evidence for evolution - developments in biology affecting classification - the importance of selective breeding of plants and animals in agriculture - the uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology Ecology - Levels of organisation within an ecosystem - some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community - how materials cycle through abiotic and biotic components of ecosystems - the role of microorganisms (decomposers) in the cycling of materials through an ecosystem - organisms are interdependent and are adapted to their environment - the importance of biodiversity - methods of identifying species and measuring distribution, frequency and abundance of species within a habitat - positive and negative human interactions with ecosystems	Using resources - life cycle assessment and recycling to assess environmental impacts associated with all the stages of a product's life - the viability of recycling of certain materials - carbon compounds, both as fuels and feedstock, and the competing demands for limited resources	
Language for Life (Key terms/Vocabulary)	Photosynthesis, Temperature, rate of reaction, pressure, concentration, catalyst reversible Homeostasis, communication, nerves, neurones, hormones, reproduction, endocrine, reflex, fuel, fractional distillation, feedstock, alkane,	Alkane, Alkene, fractional distillation, separation, cracking. Force, field, electrostatic, magnetism, vector, up-thrust, amplitude, wavelength,	Transverse, longitudinal, ultraviolet, infrared, gamma ray, velocity, absorption, reflection, refraction, microwave Magnet, solenoids, transformers, National grid, Pure, impure, distillation, filtration, chromatography, solvent, solution, solute,	Selective breeding, genetic engineering, agriculture, biotechnology, evolution, genotype, phenotype Ecology, biotic, abiotic, trophic, resources, microorganism, cycling, decomposers, ecosystem,	Recycling, Life cycle assessment, potable, finite, renewable, non-renewable	

	alkene, homologous, cracking, extraction, smelting, electrolysis		atmosphere, pollutant, sulphur dioxide, particulates, potable	interdependent, biodiversity, habitat		
Extended writing Opportunities	Photosynthesis Extended Writing, Homeostasis and response Extended Writing, Rates of reaction Extended Writing,	Forces Extended Writing,	Waves Extended Writing Chemical analysis, Inheritance Extended Writing,	Ecology Extended Writing,	Using resources Extended Writing,	
Maths Across the Curriculum	Transformation of seconds to milliseconds BP and MP Calculating rates of reaction, tangents	Transposing formulas Standard form	Percentages and ratios, Fractions	Sampling techniques		
Links to careers/ aspirations	Chemical engineer Chemical analyst	Fuel technician Sound engineer, fluid technician, Aeronautical engineer	Energy scientist, farmer, Biotechnician, Gene scientist, Atmospheric Scientist, Weather presenter, Chemist, Climate scientist	Ecologist, Zoo keeper	Resource manager	
Cultural Capital	Is diabetes the next big killer?	How can we get better WIFI signal in school?	Should we be able to design our babies?	What are the effects of the seabirds in the SHS playgrounds on other species?		
Practical Application of Skills	Investigating rates of reaction Investigating reaction rates	Energy in different fuels	Investigating waves Investigating absorption, making motors,	Investigating ecology – field techniques	Antibiotics and plating techniques, potable water	