Science – Year 10

Shirley High Curriculum Map

***Year10**: "**Proficient scientist**" = Learners are now able to take their KS3 knowledge and develop it further to become proficient in the subject*
***Challenge pupils to**: Link KS3 ideas to higher level thinking*

	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:
	10 Quantitative chemistry 11 Chemical changes 12 Energy changes	13 The rate and exchange of chemical change 14 Organic chemistry 15 Chemical analysis 16 Chemistry of the atmosphere	3 Infection and response 4 Bioenergetics	19 Electricity 20 Particle model of matter	21 Atomic structure 22 Forces	END OF YEAR EXAMS WEX Cultural Capital / Trips
Why Now?	Now moving into Yr 10 pupils will study the mathematical and quantitative chemistry needed to move on to becoming 'expert scientists' next year With knowledge of the 3 types of bonding now from the last half term, pupils will look at the energy changes in reactions and how reactions occur in terms of bonds. They will also study energy as a resource – a key topic in this current world. Pupils will learn the different types of reactions and calculate the energy changes within via bond making/breaking Lastly pupils will learn the different types of reactions and calculate the energy changes within via bond making/breaking	The pupils will explore practically the way that rates of reactions can be altered 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 and its evolution	Pupils will learn about Germ theory and how humans have natural immune systems to combat pathogens, as well as the development of medicines and vaccines. 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 build on last year to learn about the particle model of matter.	Pupils will build on last term to learn about nuclear reactions and the uses and dangers of radioactivity . Also Pupils will recap the ideas of forces from KS3 and then learn how Newton's three Laws affect our universe.	
Fundamental Concepts	10 Quantitative chemistry 7 Reactions can release energy (exothermic) or absorb it (endothermic). 11 Chemical reactions involve the making and breaking of bonds. 12 Energy changes in reactions can be measured quantitatively 14 How different organic molecules react 7 Reactions can release energy (exothermic) or absorb it (endothermic).	13 Chemical reactions are caused by successful collisions causing bonds to break and new ones to be formed 15 Quantitative and qualitative analysis of chemicals 16 The atmosphere of the Earth has changed drastically over time to now support life.	3 Diseases can be communicable or non-communicable and spread by different vectors. 10 Numerical formulas 4 Photosynthesis is the reaction that light energy is converted to a chemical energy store	20 The arrangement and movement of particles is key to the properties 19 Electricity is an efficient way to transfer energy and is linked to power.	21 Atoms can change and break down in nuclear reactions 22 How to draw forces and their effects	
Students will learn about…	Quantitative chemistry • Measurement of energy changes in chemical reactions (quantitative) • Bond breaking, bond making, activation energy and reaction profiles (quantitative) Chemical changes • determination of empirical formulae from the ratio of atoms of different kinds • balanced chemical equations, ionic equations and state symbols • identification of common gases • the chemistry of acids; reactions with some metals and carbonates • pH as a measure of hydrogen ion concentration and its numerical scale • electrolysis of molten ionic liquids and aqueous ionic solutions • reduction and oxidation in terms of loss or gain of oxygen. Energy changes • Measurement of energy changes in chemical reactions (quantitative) • Bond breaking, bond making, activation energy and reaction profiles (quantitative)	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 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 • Chemical analysis To know how to chemically identify pure and impure substances To be able to analyse chromatograms To know how to test for different gases 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,	Infection and response • the relationship between health and disease • communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) • non-communicable diseases • bacteria, viruses and fungi as pathogens in animals and plants • body defences against pathogens and the role of the immune system against disease • reducing and preventing the spread of infectious diseases in animals and plants • the process of discovery and development of new medicines the impact of lifestyle factors on the incidence of non-communicable diseases Bioenergetics • photosynthesis as the key process for food production and therefore biomass for life • the process of photosynthesis • factors affecting the rate of photosynthesis	Electricity • measuring resistance using p.d. and current measurements • exploring current, resistance and voltage relationships for different circuit elements; including their graphical representations • quantity of charge flowing as the product of current and time • drawing circuit diagrams; exploring equivalent resistance for resistors in series • the domestic a.c. supply; live, neutral and earth mains wires, safety measures • power transfer related to p.d. and current, or current and resistance Particle model of matter • relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities • melting, evaporation, and sublimation as reversible changes • calculating energy changes involved on heating, using specific heat capacity; and those involved in changes of state, using specific latent heat • links between pressure and temperature of a gas at constant volume,	Atomic structure • the nuclear model and its development in the light of changing evidence • masses and sizes of nuclei, atoms and small molecules • differences in numbers of protons, and neutrons related to masses and identities of nuclei, isotope characteristics and equations to represent changes • ionisation; absorption or emission of radiation related to changes in electron orbits • radioactive nuclei: emission of alpha or beta particles, neutrons, or gamma-rays, related to changes in the nuclear mass and/or charge • radioactive materials, half-life, irradiation, contamination and their associated hazardous effects, waste disposal nuclear fission, nuclear fusion and our sun's energy 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	

	Endo and Exothermic • To describe exothermic and endothermic reactions • To know the uses of energy transfers from reactions • To explain energy changes in terms of bonds breaking and making • To calculate energy changes for reactions	oxides of nitrogen, particulates and their sources the Earth's water resources and obtaining potable water		related to the motion of its particles (qualitative)	atmosphere with height, with depth for liquids, up-thrust force (qualitative)	
Language for Life (Key terms / Vocabulary)	Empirical, formulae, ionic, carbonates, reduction, oxidation, electrolysis, reaction profiles, reflex, fuel, fractional distillation, feedstock, alkane, alkene, homologous, cracking, extraction, smelting, electrolysis energy, exothermic, endothermic, bonds, joules	Temperature, rate of reaction, pressure, concentration, catalyst reversible, pure, impure, distillation, filtration, chromatography, solvent, solution, solute, atmosphere, pollutant, sulphur dioxide, particulates, potable, global warming	Health, disease, transmitted, communicable, lifestyle, medicine, quantitative,	resistance, potential difference, voltage, current, circuit, series, parallel, power Density, pressure, temperature, latent, heat capacity, sublimation Nuclei, radioactive, alpha, beta, gamma, ionisation, fission, fusion,	Nuclei, radioactive, alpha, beta, gamma, ionisation, fission, fusion, transport, circulatory,	
Extended writing Opportunities	Quantitative Extended Writing, Chemical changes Extended Writing, Energy Extended Writing, Organic chemistry Extended Writing, Energy changes extended writing	Rates of reaction Extended Writing, Organic Chemistry extended writing Chemical analysis extended writing	Infection Extended Writing, Photosynthesis Extended Writing, Respiration Extended Writing,	Electricity Extended writing Particle model Extended Writing,	Radioactivity Extended Writing, Motion Extended Writing	
Maths Across the Curriculum	Quantitative energy calculations – moles, concentrations Interpreting graphs Ratios, powers of 10, rearrangement of subject in formulas, percentages Rearrangement of formulation and conversion	Calculating rates of reaction, tangents Percentages and ratios, Fractions	Interpreting graphs	Rearrangement of formulas Boyle's Law, Bond energy calculations, negative numbers, half-life	Boyle's Law, Bond energy calculations, negative numbers, half-life	
Links to careers / aspirations	chemical analyst, forensic chemist Metallurgist, material scientist Chemical engineer, Fuel technician Chemical engineers, and cosmetic scientists	Atmospheric Scientist, Weather presenter, Chemist, Climate scientist	Healthcare professional, pharmacist, drugs researcher,	Electrician, electrical engineer, Material scientist, nuclear physicist, engineer, product designer	Material scientist, nuclear physicist, engineer, product designer	
Cultural Capital	Is the use of renewable resources really better for us?	How can we stop the effects of climate change?	Can we stop another pandemic from happening?	How non-metals and knowledge of bonding developed computer chips?	How non-metals and knowledge of bonding developed computer chips?	
Practical Application of Skills	Investigating electrolysis Energy in different fuels	Investigating rates of reaction Measuring and testing for gases	Investigating bacterial growth	Investigating resistance Series and parallel circuits Investigating Specific Latent heat	Investigating Acceleration	