

INTENT-

- To develop knowledge and understanding of key scientific principles within Biology, Chemistry and Physics.
- Students to apply this knowledge and explain key ideas within Science, applying them to a range of typical and frequent assessment points.
- Students will be able to analyse scientific data and will be able to evaluate scientific discoveries in order to approach enquiry questions based on

The bigger picture:

The year 11 curriculum revisits many of the core scientific concepts from earlier years, grouping them in similar fashion to how they are typically presented in exams (also reflected in the assessments) – this often include application of knowledge from the perspective of required practical's. Each terms learning culminates in students tackling pinnacle topics.

Bilton School Planning for Progress over Time Programme of Study

WS1 – Development of Scientific Thinking
 WS2 – Experimental skills and strategies
 WS3 – Analysis and evaluation
 WS4 – Scientific vocabulary, quantities, units, symbols and nomenclature

IMPLEMENTATION

	Term 1 Energy, Electricity, Atomic Structure (P1), Infection and Response, Energy Changes, Quantitative Chemistry Review, PPE 1 Revision								Term 2 PPE 1 Revision/ Review, Chemical Analysis, Homeostasis and Response, Organic Chemistry, Forces and Motion							Term 3 Inheritance, Variation and Evolution, The Rate and Extent of Chemical Change, Forces and Motion, Ecology, Chemistry of the Atmosphere and Using Resources, Waves, PPE 2 Revision						Term 4 PPE 2 Revision/ Review, Revision					Term 5 Revision					Term 6 Revision									
KS4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
Year 11 Combined	(TTD x2) Energy L1, 2	Energy L3, 4, 5, 6, Energy Review	Electricity L1,2,3,4 & 5	Electricity Review, Atomic structure L1,2,3,4	Particle Model Review, P1 Revision, P1 paper 2022	P1 paper 2022 Review and Reteach	PPE Prep - Skills Revision	PPE Prep - B1, C1 & P1 Revision Key areas	PPE Prep - B1, C1 & P1 Revision Key areas	PPEs - Biology Paper 1/ Chemistry Paper 1/ Physics Paper 1	PPEs - Biology Paper 1/ Chemistry Paper 1/ Physics Paper 1	PPEs - Biology Paper 1/ Chemistry Paper 1/ Physics Paper 1 Start Chemical Analysis RQP	L1&2 Human Nervous response L3 Reaction Time RQP L4 Homeostasis/ Diabetes/ Menstrual Cycle L5 Application Lesson	L1 Fractional Distillation L2 Alkanes and properties L3 Cracking and alkenes L4 Combustion of Fuels L5 Application Lesson	L1 Forces L2 Motion L3 Momentum / Acceleration RQP L4 Extension of a spring RQP L5 Application Lesson	L1 Variation and Adaptation and classification L2 DNA Structure L3 & 4 Inheritance and Genetic crosses/ Inherited disease L5 Application Lesson	L1 & 2 Rates of reaction and collision Theory L3 Equilibrium L4 Rates of Reaction RQP L5 Application Lesson	L1 Food chains/ webs / Biomass L2 Decay L3 Human Impact L4 Sampling RQP L5 Application lesson	L1 Types of Water/ treatment L2 Gases of the atmosphere L3 Greenhouse effect/ Carbon footprint L4 Purification of water RQP L5 Application Lesson	L1 Types of waves/ Waves RQP L2 EM spectrum / Leslie cube RQP L3 Magnetism L4 Magnetism and properties of light L5 Application Lesson	PPEs - Biology paper 2/ Chemistry Paper 2/ Physics Paper 2	PPEs - Biology paper 2/ Chemistry Paper 2/ Physics Paper 2	PPEs - Review	P2 Booklet	C2 Booklet	B2 Booklet	P1 Booklet	C1 Booklet	B1 Booklet	Revision	Revision	Revision	Revision	Revision	Revision	Revision	Revision	Revision	Revision	Revision	Revision
Progress and assessment	P1 Paper (2022) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.								PPE 1, Application Lessons FAR completed approximately every 6 lessons.							Application Lessons FAR completed approximately every 6 lessons.						PPE 2, Exam Qs FAR completed approximately every 6 lessons.					Exam Qs, Past papers FAR completed approximately every 6 lessons.														
Required Practical (RP)	<ul style="list-style-type: none"> Resistance of a Wire Current – Pd Characteristics 								<ul style="list-style-type: none"> Chromatography Reaction Time Acceleration Extension of a Spring 							<ul style="list-style-type: none"> Rates of Reaction Sampling Waves (Liquids and Solids) Purification of Water IR Radiation 						Revision of all RQP					Revision of all RQP														

<p>Numeracy Skills</p> <ul style="list-style-type: none"> Using and rearranging equations. Conversion of units. Using standard form. Interpreting and analysing data in exam questions. Analysing data from practicals. <p><u>Energy</u></p> <p>MS 1a, c, 3b, c Throughout this section on Energy students should be able to calculate the changes in energy involved when a system is changed by: • heating • work done by forces • work done when a current flows.</p> <p>MS 1a, c, 3b, c use calculations to show on a common scale how the overall energy in a system is redistributed when the system is changed.</p> <p>MS 1a, c, 3b, c Students should be able to calculate the amount of energy associated with a moving object, a stretched spring and an object raised above ground level.</p> <p>MS 3b, c Students should be able to recall and apply $[E_k = \frac{1}{2} m v^2]$</p> <p>$[E_e = \frac{1}{2} k e^2]$</p> <p>$[E_p = m g h]$</p> <p>$[\Delta E = m c \Delta \theta]$</p> <p>$[P = \frac{E}{t}]$</p> <p>$[P = \frac{W}{t}]$</p> <p>$efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$</p> <p>MS 1a, c, 3b, c Students may be required to calculate or use efficiency values as a decimal or as a percentage.</p> <p><u>Electricity</u></p> <p>MS 3b, c Students should be able to recall and apply</p> <p>$[Q = I t]$</p> <p>$[V = I R]$</p> <p>MS 4c, d, e Students should be able to use graphs to explore whether circuit elements are linear or non-linear and relate the curves produced to their function and properties.</p> <p>MS 1c, 3b, 3c, 3d</p> <p>$R_{total} = R_1 + R_2$</p> <p>MS 1c, 3b, c, d</p>		<ul style="list-style-type: none"> Using and rearranging equations. Conversion of units. Using standard form. Interpreting and analysing data in exam questions. Analysing data from practicals. <p><u>Chemical Analysis</u></p> <p>MS 1a Recognise and use expressions in decimal form.</p> <p>MS 1c Use ratios, fractions and percentages.</p> <p>MS 1d Make estimates of the results of simple calculations.</p> <p>Students should be able to interpret chromatograms and determine Rf values from chromatograms</p> <p>$R_f = \frac{distance\ moved\ by\ substance}{distance\ moved\ by\ solvent}$</p> <p>MS 2a Students should be able to provide answers to an appropriate number of significant figures.</p> <p><u>Organic Chemistry</u></p> <ul style="list-style-type: none"> MS 5b Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. 	<ul style="list-style-type: none"> Using and rearranging equations. Conversion of units. Using standard form. Interpreting and analysing data in exam questions. Analysing data from practicals. <p><u>Magnetism and Electromagnetism</u></p> <p>MS 3b, c Students should be able to apply this equation $[F = B I l]$</p> <p>(HT Only) MS 3b, c Students should be able to apply this equation $[\frac{V_p}{V_s} = \frac{n_p}{n_s}]$</p> <p>$V_s \times I_s = V_p \times I_p$</p> <p>calculate the current drawn from the input supply to provide a particular power output</p> <p>MS 1c, 3b, c apply the equation linking the p.d.s and number of turns in the two coils of a transformer to the currents and the power transfer involved, and relate these to the advantages of power transmission at high potential differences.</p> <p><u>Waves</u></p> <p>MS 1c, 3b, c Students should be able to apply this equation $period = \frac{1}{frequency}$</p> <p>$[T = \frac{1}{f}]$</p> <p>MS 1c, 3b, 3c Students should be able to recall and apply $[v = f \lambda]$</p>	<ul style="list-style-type: none"> Using and rearranging equations. Conversion of units. Using standard form. Interpreting and analysing data in exam questions. Analysing data from practicals. 	<ul style="list-style-type: none"> Using and rearranging equations. Conversion of units. Using standard form. Interpreting and analysing data in exam questions. Analysing data from practicals. 	
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<p>calculate the currents, potential differences and resistances in dc series circuits.</p> <p>MS 3b, c Students should be able to recall and apply</p> $[P = VI]$ $[P = I^2 R]$ $[E = Pt]$ $[E = QV]$ <p>Atomic Structure (P1)</p> <p>MS 1b Students should be able to recognise expressions given in standard form. Atoms are very small, having a radius of about 1×10^{-10} metres. The radius of a nucleus is less than 1/10 000 of the radius of an atom.</p> <p>MS 1b, c, 3c Use nuclear equations to represent radioactive decay.</p> <p>MS 4a Students should be able to determine the half-life of a radioactive isotope from given information.</p> <p>(HT only) MS 1c, 3d Students should be able to calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives.</p> <p>MS 1b Students should be able to use data presented in standard form.</p> <p style="text-align: center;">•</p>						
<p>Homework (ensure that this is NOT stand alone, but clearly advances or embeds knowledge and understanding)</p>	<p>Use of Educake and BBC Bitesize Revision</p>	<p>Use of Educake and BBC Bitesize Revision</p>	<p>Use of Educake and BBC Bitesize Revision</p>	<p>Use of Educake and BBC Bitesize Revision</p>	<p>Use of Educake and BBC Bitesize Revision</p>	<p>Use of Educake and BBC Bitesize Revision</p>

<p>Key Vocabulary/literacy opportunities</p>	<p><u>Energy</u> Specific heat capacity, gravitational potential energy, kinetic energy</p> <p><u>Electricity</u> Current, Potential Difference, Resistance, Ohmic conductor, Non-ohmic conductor, AC, DC</p> <p><u>Atomic Structure (P1)</u> Isotope, Alpha, Beta, Gamma, Contamination, Irradiation, Half-life</p> <p><u>Infection and Response</u> Pathogen, Antigen, Antibody, Vaccination</p> <p><u>Energy Changes</u> Exothermic, Endothermic, Bond energies</p> <p><u>Quantitative Chemistry</u> Relative Atomic Mass, Relative Formula Mass, Moles, Concentration, Empirical Formula, Conservation of mass</p>	<p><u>Chemical Analysis</u> Pure, Mixture, Formulation, Chromatography, Stationary phase, Mobile phase, Rf value</p> <p><u>Homeostasis and Response</u> Homeostasis, Reflex, Endocrine System, Hormone, Gland, Receptor, Neurone, Negative Feedback Loop (HT)</p> <p><u>Organic Chemistry</u> Crude Oil, Fractional Distillation, Cracking, Alkane, Alkene, Hydrocarbon, Combustion</p> <p><u>Forces and Motion</u> Speed, Velocity, Acceleration, Terminal Velocity, Momentum, Conservation of Momentum</p>	<p><u>Inheritance, Variation and Evolution</u> Asexual Reproduction, Selective Breeding, Meiosis, Genome, Alleles, DNA, Chromosomes, Gene, Phenotype, Genotype</p> <p><u>The Rate and Extent of Chemical Change</u> Activation Energy, Collision Theory, Catalyst, Closed System, Dynamic Equilibrium</p> <p><u>Forces and Motion</u> Scalar, Vector, Mass, Weight, Elastic Deformation, Inelastic Deformation, Limit of Proportionality</p> <p><u>Ecology</u> Abiotic, Biotic, Trophic level, Biodiversity, Adaptation</p> <p><u>Chemistry of the Atmosphere</u> Greenhouse Gas, Peer-Reviewed, Global Warming, Carbon Footprint, Carbon Neutral</p> <p><u>Using Resources</u> Finite Resource, Renewable Resource, Sustainable Development, Life Cycle Assessment, Potable Water, Desalination</p> <p><u>Waves</u> Transverse, Longitudinal, Electromagnetic Spectrum, Amplitude, Frequency, Wavelength</p> <p><u>Magnetism and Electromagnetism</u> North pole, South pole, Magnetic field, Solenoid, Electromagnet, Motor Effect, Fleming's Left-hand rule</p>			
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<p>Connected knowledge</p>	<p><u>Energy –</u> KS3 – Energy.</p> <p>KS4 – Forces and Motion. Energy.</p> <p>Maths – Apply knowledge of substituting numbers into calculations and how to rearrange equations.</p> <p><u>Electricity -</u> KS3 – Electricity.</p> <p>KS4 – Energy</p> <p>KS5 – Electricity</p> <p>Maths – Apply knowledge of substituting numbers into calculations and how to rearrange equations.</p> <p><u>Atomic Structure –</u> KS3 – Particles, Atoms and Elements.</p> <p>KS4 – Atomic structure and the periodic table, Waves.</p> <p>KS5 – Particles and radiation,</p> <p>Maths – Apply knowledge of substituting numbers into calculations and how to rearrange equations. Apply graph skills to be able to plot energy changes graph for a neutralisation reaction.</p> <p><u>Infection and Response –</u> KS3 – Cells, Unicellular Organisms.</p> <p>KS4 – Cell Biology.</p> <p>KS5 – Cells</p> <p>Maths – Apply knowledge of graphs from maths to be able to interpret data on infection and vaccination graphs.</p> <p><u>Energy Changes –</u> KS3 – Types of Reactions.</p> <p>KS4 – Chemical Changes, The Rate and Extent of Chemical Change.</p> <p>KS5 – Energetics, Thermodynamics</p> <p>Maths – Apply basic math skills to calculate the energy changes within a reaction. Apply graph skills to be able to plot energy changes graph for a neutralisation reaction.</p>	<p><u>Chemical Analysis –</u> KS3 – Atoms and Elements, Compounds and Mixtures</p> <p>KS4 – Structure, bonding and the properties of matter.</p> <p>KS5 – Organic Chemistry, Organic Synthesis, Chromatography</p> <p><u>Homeostasis and Response -</u> KS3 – Cells, Reproduction, Movement.</p> <p>KS4 – Cells, Organisation.</p> <p>KS5 – Organisms respond to changes in their internal and external environments.</p> <p>Maths – See links with handling data in Maths and interpreting graphs.</p> <p><u>Organic Chemistry -</u> KS3 – Atoms and Elements, Compounds and Mixtures, Combustion, Energy Resources, Earth and Atmosphere.</p> <p>KS4 – Structure, bonding and the properties of matter, Chemistry of the Atmosphere, Using Resources.</p> <p>KS5 – Organic Chemistry, Organic Synthesis</p> <p><u>Forces and Motion –</u> KS3 – Forces, Motion, Acceleration Project.</p> <p>KS4 – Energy, Magnetism and Electromagnetism.</p> <p>KS5 – Mechanics and materials, Further mechanics and thermal physics.</p> <p>Maths – See links to equations and graphs in maths.</p>	<p><u>Inheritance, Variation and Evolution –</u> KS3 – Cells, Reproduction, Genetics and Variation.</p> <p>KS4 – Cell Biology.</p> <p>KS5 – Cells, Biological Molecules, Genetic information, variation and relationships between organisms, Genetics, populations, evolution and ecosystems, The control of gene expression.</p> <p><u>The Rate and Extent of Chemical Change -</u> KS3 – Acids and Alkalis, Types of Reaction, Metals and Reactivity.</p> <p>KS4 – Atomic Structure and the Periodic Table, Chemical Change, Energy Changes.</p> <p>KS5 – Kinetics, Chemical equilibria, Le Chatelier’s principle and Kc, Rate equations, Equilibrium constant Kp for homogeneous systems.</p> <p>Maths – See links to interpreting and plotting graphs in Maths.</p> <p><u>Forces and Motion –</u> KS3 – Forces, Motion, Acceleration Project.</p> <p>KS4 – Energy, Magnetism and Electromagnetism.</p> <p>KS5 – Mechanics and materials, Further mechanics and thermal physics.</p> <p>Maths – See links to equations and graphs in maths.</p> <p><u>Ecology –</u> KS3 – Photosynthesis and Respiration, Ecosystems and Ecosystem Project.</p> <p>KS4 – Organisation, Bioenergetics.</p> <p>KS5 – Organisms exchange substances with their environment, Energy transfers in and between organisms, Genetics, populations, evolution and ecosystems.</p> <p>Maths- See links to interpreting and plotting graphs in Maths.</p> <p>Geography – See links to climate change and human impact in Geography.</p> <p><u>Using Resources –</u> KS3 – Energy Resources, Earth and Atmosphere, Combustion.</p> <p>KS4 – Chemical Changes, Chemistry of the Atmosphere.</p> <p>Geography – See links to climate change in Geography.</p> <p><u>Chemistry of the Atmosphere –</u> KS3 – Energy Resources, Earth and Atmosphere, Combustion.</p> <p>KS4 –</p>					
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				<p>Chemical Changes, Using Resources.</p> <p>Maths- See links to interpreting and plotting graphs in Maths.</p> <p>Geography – See links to climate change in Geography.</p> <p><u>Magnetism and Electromagnetism –</u> KS3 – Magnetism and Electromagnetism.</p> <p>KS4 – Forces and Motion.</p> <p>KS5 – Fields and their consequences.</p> <p>Maths- See links to interpreting and plotting graphs in Maths.</p> <p><u>Waves –</u> KS3 – Light, Sound</p> <p>KS4 – Atomic Structure (P1)</p> <p>KS5 – Particles and Radiation, Waves, Nuclear Physics</p>				
Spiritual, Moral, Social and cultural.	<p>Understand the collaboration between scientists when Drug trials are carried out.</p> <p>Understand the ethical and moral issues that arise from the process of trialling drugs before they go into circulation.</p> <p>Appreciate the influences of scientists in the development of vaccinations in the treatment of different types of infection.</p> <p>Understanding the collaboration between countries in the development of structure of the atom.</p> <p>Understand what Radiation is and the issues surrounding it.</p>	<p>Understand the impact that humans are having on the Earth’s resources through the extraction and processing of crude oil.</p> <p>Understand Diabetes and Contraception methods and be able to link this to the choices that they make.</p> <p>Understanding the different methods of Contraception and the ethical and moral issues surrounding these.</p> <p>Building self-knowledge and self- confidence to be able to make choices in everyday life linked to lifestyle choices.</p>	<p>Appreciating the influence of famous scientists and the impact they have had on life, society and culture e.g Variation and Evolution - Darwin/ Lamark, Selective breeding and work of farmers and gardeners.</p> <p>Understanding the moral and ethical issues that can arise when considering variation and evolution and its potential impact on everyday life.</p> <p>Understand the impact that humans are having on the Earth’s resources and the impact of the pollution that we create.</p> <p>Understand the importance of the different parts of the EM Spectrum in everyday life along with the ethical and moral issues of the Ionising nature of some of the parts.</p>					
British Values	<p>Respect and tolerance, collaboration during experiments and group work.</p> <p>Following the laboratory rules when conducting practical work.</p>	<p>Respect and tolerance, collaboration during experiments and group work.</p> <p>Following the laboratory rules when conducting practical work.</p>	<p>Respect and tolerance, collaboration during experiments and group work.</p> <p>Following the laboratory rules when conducting practical work.</p> <p>Appreciate individual liberty of own views, tolerance and mutual respect of others views throughout the variation and evolution topic.</p> <p>Recognise how their actions can have an impact on others and the wider world.</p>					

<p>Cultural Capital</p>	<p>Science - Careers display on W side corridor.</p> <p>Understanding how Scientists work to develop ideas and how they have contributed to the development of the structure of the atom throughout history.</p> <p>Appreciate the influences of scientists in the development of vaccinations in the treatment of different types of infection.</p>	<p>Science - Careers display on W side corridor.</p> <p>Understand the use of techniques to analyse substance by scientists in everyday life e.g airports</p> <p>Understand the impact that we are having on our planet through the extraction and use of crude of oil in everyday life.</p>	<p>Science - Careers display on W side corridor.</p> <p>Understand the impact that we are having on our planet.</p> <p>Appreciate the work of Darwin/ Lamark in the theory of evolution and appreciate the different viewpoints in everyday life.</p> <p>Understand the importance of Selective breeding and work of farmers and gardeners whilst also appreciating the impact this has in the world around us.</p> <p>Understand how scientists are involved in everyday processes such as how water is treated, extraction of metals, choice of materials to produce products.</p> <p>Understand the importance of the different parts of the EM Spectrum in everyday life along with the ethical and moral issues of the Ionising nature of some of the parts.</p>	<p>Science - Careers display on W side corridor.</p> <p>Careers posters in all Science rooms</p>	<p>Science - Careers display on W side corridor.</p> <p>Careers posters in all Science rooms</p>	<p>Science - Careers display on W side corridor.</p> <p>Careers posters in all Science rooms</p>
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