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 10 curriculum revisits key ideas from year 7,8 and 9, developing ideas further and developing them to allowing access to GCSE style questions. Topics are introduced throughout the year to allow concepts to build up and is designed to allow for the revisit of key misconceptions before moving forward.

Bilton School Planning for Progress over Time
Programme of Study 2021/22

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 Cell Biology, Atomic Structure and the Periodic Table, Particle Model								HOLIDAY: 1 WEEK	Term 2 Particle Model, Organisation, Structure and the Properties of Matter							HOLIDAY: 2 WEEKS	Term 3 Chemical Changes, Bioenergetics, Inheritance, Variation & Evolution							HOLIDAY: 1 WEEK	Term 4 Forces and Motion, The Rate and Extent of Chemical Change							HOLIDAY: 2 WEEKS	Term 5 The Rate and Extent of Chemical Change, Homeostasis and Response, Quantitative Chemistry,							HOLIDAY: 1 WEEK	Term 6 Using Resources C&C Finite and Renewable Resources, Magnets and Electromagnets, Chemistry of the Atmosphere C&C Greenhouse Effect, Ecology Link to Geography						
KS4	2/9/21	6/9/21	13/9/21	20/9/21	27/9/21	4/10/21	11/10/21	18/10/21		1/11/21	8/11/21	15/11/21	22/11/21	29/11/21	6/12/21	13/12/21		4/1/22	10/1/22	17/1/22	24/1/22	31/1/22	7/2/22	14/2/22		28/2/22	7/3/22	14/3/22	21/3/22	28/3/22	4/4/22		25/4/22	2/5/22	9/5/22	16/5/22	23/5/22		6/6/22	13/6/22	20/6/22	27/6/22	4/7/22	11/7/22	18/7/22
Year 10	(TTD x2)	Cell Biology L1/2 review, 3,4,5 RQP	Cell Biology L6,7,8,9	Cell Biology L11,12, MT, Atomic Structure and the Periodic Table L1/2 review	Atomic Structure and the Periodic Table L3,4,5,6	Atomic Structure and the Periodic Table L7,8,9,10	Cell Biology and Atomic Structure ETT 1	Particle Model L1,2RQP,3,4		Particle Model L5RQP,6,7, MT	Organisation L1,2,3RQP,4	Organisation L5/6RQP,7,8	Organisation L9,10,11,12	Organisation L13,14, ETT 2	Review/Reteach Structure and the Properties of Matter L1/2,3,4,5	Structure and the Properties of Matter L6,7,8,9		Chemical Changes L1,2,3,4	Chemical Changes L5,6,7RQP,8	Bioenergetics L1,2,3RQP,4	Bioenergetics L5,6,7,8	Chemical Changes and Bioenergetics ETT	Inheritance, Variation and Evolution L1,2,3,4	Inheritance, Variation and Evolution L5,6,7,8		Inheritance, Variation and Evolution Review, MT Forces and Motion L1,2	Forces and Motion L3,4,5,6, RQP	Forces and Motion L7,8,9,10 RQP	Forces and Motion L11,12, Review Inheritance, Variation and Evolution and Forces and Motion ETT	The Rate and Extent of Chemical Change L1,2,3,4	The Rate and Extent of Chemical Change L5,6,7,8 RQP		The Rate and Extent of Chemical Change MT, Homeostasis and Response L1,2,3 RQP	Homeostasis and Response L4,5,6,7	Homeostasis and Response L8, The Rate and Extent of Chemical Change and Homeostasis and Response Review, ETT	Quantitative Chemistry L1,2,3,4	Quantitative Chemistry L5,6,7,8		Using Resources L1,2,3,4	Using Resources L5 RQP,6,7,8	Using Resources MT, Magnets and Electromagnets L1,2, 3	EOY Assessment Revision	Magnets and Electromagnets L4, Review, ETT Chemistry of the Atmosphere L1	Chemistry of the Atmosphere L2,3,4	Ecology Trip to Brandon Marsh to cover Sampling RQP
Progress and assessment	**Mini Test (MT), End of topic test (ETT)** **Follow on questions to test previous knowledge through the Unit.** **13/9/21 – FAR 1** **27/9/21 – FAR 2** **11/10/21 – FAR 3**									**Mini Test (MT), End of topic test (ETT)** **Follow on questions to test previous knowledge through the Unit.** **1/11/21 – FAR 1** **15/11/21 – FAR 2** **29/11/21 – FAR 3** **13/12/21 – FAR 4**								**Mini Test (MT), End of topic test (ETT)** **Follow on questions to test previous knowledge through the Unit.** **10/1/22 - FAR 1** **24/1/22 – FAR 2** **7/2/22 – FAR 3**								**Mini Test (MT), End of topic test (ETT)** **Follow on questions to test previous knowledge through the Unit.** **28/2/22 – FAR 1** **14/3/22 – FAR 2** **28/3/22 – FAR 3**								**Mini Test (MT), End of topic test (ETT)** **Follow on questions to test previous knowledge through the Unit.** **25/4/22 – FAR 1** **9/5/22 – FAR 2** **23/5/22 – FAR 3**								**Mini Test (MT), End of Year Assessment (EOY)** **Follow on questions to test previous knowledge through the Unit.** **13/6/22 – FAR 1** **27/6/22 – FAR 2** **11/7/22 – FAR 3**						
Required Practical (RP)	• **Microscopy – Focus on conversion of units and calculations** • **Osmosis – Focus on hypothesis** • **Density – Focus on method for both regular and irregular shaped objects**									• **Food Tests – Focus on methods and positive results** • **Enzymes – Focus on variables**								• **Making Salts – Focus on methods/ equipment for measuring** • **Photosynthesis – Focus on hypothesis and how to link conclusion back to the rate of photosynthesis**								• **Rates of Reaction.** • **Extension of a Spring** • **Acceleration**								• **Reaction Time**								• **Water Purification** • **Sampling**						
Homework *(ensure that this is NOT stand alone, but clearly advances or embeds knowledge and understanding)*	**Use of SENECA – Activity and Exam Question based** **Cells – 1** **1.1, 1.2, 1.3** **Atomic Structure and the Periodic Table – 1** **1.1** **Particle Model – 3** **3.1, 3.2, 3.3**									**Use of SENECA – Activity and Exam Question based** **Organisation - 2** **2.1, 2.2, 2.3, 2.4, 2.5** **Chemical Bonding – 2** **2.1, 2.2, 2.3**									**Use of SENECA – Activity and Exam Question based** **Chemical Change – 4** **4.1, 4.2, 4.3, 4.4** **Bioenergetics - 4** **4.1, 4.2** **Inheritance, Variation & Evolution – 6** **6.1, 6.2, 6.3**									**Use of SENECA – Activity and Exam Question based** **Forces – 5** **5.1, 5.2, 5.3** **The Rate & Extent of Chemical Change – 6** **6.1, 6.2**									**Use of SENECA – Activity and Exam Question based** **Homeostasis & Response - 5** **5.1, 5.2, 5.3** **Quantitative Chemistry – 3** **3.1**									**Use of SENECA – Activity and Exam Question based** **Using Resources – 10** **10.1, 10.2** **Chemistry of the Atmosphere – 9** **9.1**						
Key Vocabulary/literacy opportunities	**Cell Biology** **Osmosis, Diffusion, Active transport, Mitosis, Differentiation** **Atomic Structure and the Periodic Table** **Atomic number, Atomic Mass** **Particle Model** **Density, Specific Heat Capacity, Specific Latent Heat**									**Organisation** **Enzymes, Biological catalyst, communicable, Non-communicable, Tissue, Organ** **Bonding, Structure and the Properties of Matter** **Ionic Bonding, Covalent Bonding, Metallic Bonding, Ions, Polymers, Molecule, Intermolecular forces, alloy**								**Chemical Changes** **Reactant, Products, Neutralisation, Electrolysis, Cathode, Anode, Half-Equation (HT)** **Bioenergetics** **Photosynthesis, Limiting factor, Aerobic respiration, Anaerobic Respiration** **Inheritance, Variation and Evolution** **Asexual Reproduction, Selective Breeding, Meiosis, Genome, Alleles, DNA, Chromosomes, Gene, Phenotype, Genotype**								**Forces and Motion** **Scalar, Vector, Mass, Weight, Elastic Deformation, Inelastic Deformation, Limit of Proportionality** **The Rate and Extent of Chemical Change** **Activation Energy, Collision Theory, Catalyst, Closed System, Dynamic Equilibrium**								**Homeostasis and Response** **Homeostasis, Reflex, Endocrine System, Hormone, Gland, Receptor, Neurone, Negative Feedback Loop (HT)** **Quantitative Chemistry** **Relative Atomic Mass, Relative Formula Mass, Moles, Concentration, Empirical Formula, Conservation of mass**								**Using Resources** **Finite Resource, Renewable Resource, Sustainable Development, Life Cycle Assessment, Potable Water, Desalination** **Chemistry of the Atmosphere** **Greenhouse Gas, Peer-Revied, Global Warming, Carbon Footprint, Carbon Neutral** **Ecology** **Abiotic, Biotic, Trophic level, Biodiversity, Adaptation**						

Working Scientifically Skills	**Cells:** WS1: Understand how microscopy techniques have changed overtime by comparing light and electron microscopes and explain how electron microscopy has increased understanding of sub-cellular structures by showing an understanding of the detail seen. Use models and analogies to explain how cells divide Evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments. Recognise, draw and interpret diagrams that model diffusion and osmosis. Evaluate the risks associated with isotonic and high energy drinks. WS4: carry out calculations involving magnification, real size and image size using the formula: magnification = size of image/ size of real object and express answers in standard form if appropriate. **Atomic Structure and the Periodic Table:** WS1: Give examples of how the model of the atom has changed overtime and recognise the importance of peer review when new ideas are put forward. Link the evidence of the scattering experiment to the changes in the atomic model and be able to compare the plum pudding model and the atomic model. Represent the electronic structures of atoms using the accepted model 2,8,8 rule. Explain how the position of an element in the periodic table is related to the arrangement of electrons in its atoms and hence to its atomic number and predict possible reactions and probable reactivity of elements from their positions in the periodic table (Group 1,7 & 0). Understand how the periodic table has changed overtime and explain how testing a prediction can support or refute a new scientific idea. WS2: describe, explain and give examples of the specified processes of separation and suggest suitable separation and purification techniques for mixtures when given appropriate information. WS4: Use SI units and the prefix nano when discussing the size of atoms. **Particle Model:** WS1: recognise/draw simple diagrams to model the difference between solids, liquids and gases and explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules. Explain how the motion of the molecules in a gas is related to both its temperature and its pressure and explain qualitatively the relation between the temperature of a gas and its pressure at constant volume.	**Organisation:** WS1: Use 'lock and key theory' as a simplified method to explain enzyme action. evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs, mechanical devices or transplant and appreciate the limitations of Science and consider ethical issues linked with this. Evaluate the personal and economic implications. Interpret data about risk factors linked to associated diseases. WS3: recognise different types of blood cells in a photograph or diagram, and explain how they are adapted to their functions. **Bonding, Structure and the Properties of Matter:** **WS1:** Use dot and cross diagrams as a method to represent Ionic and covalent bonding and deduce the type of bonding when shown dot and cross diagrams. Appreciate the limitations of dot and cross diagrams. Work out the empirical formula of an ionic compound from a given model or diagram. Recognise small molecules, polymers or giant structures, metallic bonding from diagrams showing their bonding/ structures. Use data to predict and discuss and explain the state of matter of a particular substance. Recognise that atoms do not share the properties of the overall substance. HT - Explain the limitations of the particle theory in relation to changes of state when particles are represented by solid inelastic spheres which have no forces between them. Link the properties of matter to the type of bonding that they exhibit when given data about melting and boiling point, electrical conductivity, solubility etc.	**Chemical Changes:** **WS1:** Predict the products of the electrolysis of aqueous solutions containing a single ionic compound. Bioenergetics: **WS1:** Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses. **Inheritance, Evolution and Evolution:** **WS1:** Modelling behaviour of chromosomes during meiosis. Discuss the importance of understanding the human genome. This is limited to the: • search for genes linked to different types of disease • understanding and treatment of inherited disorders • use in tracing human migration patterns from the past. Appreciate that embryo screening and gene therapy may alleviate suffering but consider the ethical issues which arise. Use the theory of evolution by natural selection in an explanation to show how horses have evolved over time. Explain the benefits and risks of selective breeding given appropriate information and consider related ethical issues. Explain the potential benefits and risks of genetic engineering in agriculture and in medicine and that some people have objections. HT - Interpret information about genetic engineering techniques and to make informed judgements about issues concerning cloning and genetic ngineering, including GM crops. Describe the evidence (data) for evolution including fossils and antibiotic resistance in bacteria. Describe and explain how theories have changed overtime and describe and explain why the fossil record is incomplete. Describe and explain how classification has changed overtime. Interpret evolutionary trees	**Forces and Motion:** **WS1:** HT - use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero. Know whenever two objects interact, the forces they exert on each other are equal and opposite. Evaluate the effect of various factors on thinking distance based on given data. Explain the dangers caused by large accelerations. Recall and apply the momentum calculation. **WS2:** Investigate factors that can affect thinking distance (reaction time). **WS3:** Interpret data collected from an investigation of the relationship between force and extension. draw distance–time graphs from measurements and extract and interpret lines and slopes of distance–time graphs, translating information between graphical and numerical form. Determine speed from a distance–time graph. Draw velocity–time graphs from measurements and interpret lines and slopes to determine acceleration HT - interpret enclosed areas in velocity–time graphs to determine distance travelled (or displacement HT- measure, when appropriate, the area under a velocity–time graph by counting squares. WS4: Interconvert units when looking at work done and energy transfer calculations. **The Rate and Extent of Chemical Change:** **WS1:** predict and explain using collision theory the effects of changing conditions of concentration, pressure and temperature on the rate of a reaction. State and identify that when a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur at exactly the same rate.	**The Rate and Extent of Chemical Change:** **WS1:** predict and explain using collision theory the effects of changing conditions of concentration, pressure and temperature on the rate of a reaction. State and identify that when a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur at exactly the same rate. **Homeostasis and Response:** **WS1:** Evaluate information around the relationship between obesity and diabetes, and make recommendations taking into account social and ethical issues. Evaluate the use of different contraception methods when given data about each and understand that Science alone can not answer the issues around contraception. HT - State that developments in microscopy techniques have enabled the developments in IVF treatment. Describe and explain the ethical issues linked with IVF treatment and give the pros and the cons. Evaluate the methods of treating infertility. HT – Interpret and explain negative feedback loops for control. **Quantitative Chemistry:** **WS1:** State the law of conservation of mass states that no atoms are lost or made during a chemical reaction so the mass of the products equals the mass of the reactants and use balanced symbol equations to prove this. **WS3:** Identify that whenever a measurement is made there is always some uncertainty about the result obtained and represent the distribution of results and make estimations of uncertainty using calculations and use the range of a set of measurements about the mean as a measure of uncertainty. WS4: HT – Define what a mole is and be able to recognise its importance of it for calculations. Carry out calculations to work out the number of moles using the correct units. State Avogadro's constant and be able to relate this to moles. Use the correct number of significant figures. Define limiting reactant and know its effects on the amount of product.	**Using Resources:** **WS3:** Extract and interpret information about resources from charts, graphs and tables. carry out simple comparative LCAs for shopping bags made from plastic and paper understanding the limitations and comparing the impact on the environment and quantified when linked to energy, water resources and waste. **Magnetism and Electromagnetism:** **WS2:** Plan investigations to observe the magnetic field around a magnet Describe how the magnetic effect of a current can be demonstrated Draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field Explain how a solenoid arrangement can increase the magnetic effect ofthe current. **Chemistry of the Atmosphere:** **WS1:** Describe and explain the theories for how the atmosphere has changed overtime and state the evidence for the changes, appreciating that the evidence is limited. Test the production of oxygen by aquatic plants using the pondweed investigation. Describe and explain the formation of deposits of limestone, coal, crude oil and natural gas. Describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter. Evaluate the quality of evidence in a report about global climate change given appropriate information and describe uncertainties in the evidence base and recognise the importance of peer review of results and of communicating results to a wide range of audiences. Describe briefly four potential effects of global climate change and discuss the scale, risk and environmental implications of global climate change. Describe and explain the carbon footprint and actions that can be taken to reduce it. Predict the products of combustion of a fuel given appropriate information about the composition of the fuel and the conditions in which it is used. Describe and explain the problems caused by increased amounts of these pollutants in the air. **WS3:** Interpret data linked to the evolution of the atmosphere and present reasoned explanations. WS4: Use scientific terminology when discussing the atmosphere and how it has changed overtime. **Ecology:** **WS1:** Explain how a change in an abiotic factor would affect a given community given appropriate data or context. Explain how a change in a biotic factor might affect a given community given appropriate data or context. Interpret graphs used to represent predator-prey cycles. Interpret and explain the processes in diagrams of the carbon cycle, the water cycle. Explain how waste, deforestation and global warming have an impact on biodiversity. Evaluate the conflict between the need for cheap available compost to increase food production and the need to conserve peat bogs and peatlands as habitats for biodiversity and to reduce carbon dioxide emissions. Evaluate the environmental implications of deforestation. Recognise that the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications and explain why evidence is uncertain or incomplete in a complex context. Evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment and explain and evaluate the conflicting pressures on maintaining biodiversity given appropriate information. **WS2:** Record first hand observation on organisms using sampling techniques.
Connected knowledge							

	IMPACT: Students will be able to measure progress using tracking sheets in exercise books. As all assessments will use generic criteria, will be moderated through dept meetings it will be possible to measure progress over time within and across year groups.