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 allow 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

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

IMPLEMENTATION

KS4	Term 1	Term 2	Term 3	Term 4	Term 5	Term 6
	Cell Biology, Atomic Structure and the Periodic Table, Particle Model	Organisation, Structure, Bonding and the Properties of Matter, Bioenergetics	Bioenergetics, Chemical Changes, Inheritance, Variation & Evolution	Forces and Motion, The Rate and Extent of Chemical Change	Homeostasis and Response, Quantitative Chemistry, Infection and Response, Energy Changes, Using Resources C&C Finite and Renewable Resources	Chemistry of the Atmosphere C&C Greenhouse Effect, Ecology Link to Geography
Year 10 Combined	1: (TTD x2) Cell Biology L1 review 2: Cell Biology L2, 3, 4, 5 RQP 3: Cell Biology L6, 7 RQP , Atomic Structure and the Periodic Table L1 review, 2. 4: Atomic Structure and the Periodic Table L3, 4, 5, 6 5: Atomic Structure and the Periodic Table L7, Revision, Cell Biology and Atomic Structure ETT 6: Particle Model L1,2RQP,3,4 7: Particle Model L5RQP,6,7 8: Organisation L1 review, 2, 3 RQP, 4	9: Organisation L5, 6 RQP, 7, 8 10: Organisation L9, Structure and the Properties of Matter L1 review 11: Structure and the Properties of Matter L2, 3, 4, 5 12: Structure and the Properties of Matter L6, 7, Revision 13: Organisation and Structures and Bonding and the Properties of Matter ETT, Review/ Reteach Bioenergetics L1 14: Bioenergetics L2,3RQP,4, 5 15: Bioenergetics L6,7 Chemical Change L1,2	16: Chemical change L3, 4 RQP Chemical Changes and Bioenergetics ETT 17: Inheritance, Variation and Evolution L1,2,3,4 18: Inheritance, Variation and Evolution L5,6,7,8 19: Inheritance, Variation and Evolution Review, Forces and Motion L1,2 20: Forces and Motion L3,4,5,6, RQP 21: Forces and Motion L7,8,9,10RQP	22: Forces and Motion L11,12, Review Inheritance, Variation and Evolution and Forces and Motion ETT 23: The Rate and Extent of Chemical Change L1,2,3,4 24: The Rate and Extent of Chemical Change L5,6,7,8 RQP 25: The Rate and Extent of Chemical Change, Homeostasis and Response L1,2 RQP, 3 26: Homeostasis and Response L4,5,6,7	27: Homeostasis and Response L8, The Rate and Extent of Chemical Change and Homeostasis and Response Review, ETT 28: Quantitative Chemistry L1,2,3,4 29: Infection and Response L1, 2, 3, 4 30: Energy Changes L1, 2 RQP, 3 , 4 31: Using Resources L1,2,3 RQP,4 32: EOY Assessment Revision	33: EOY Assessment Revision 34: EOY Assessment Revision 35: EOY Assessment Revision 36: EOY Assessment & Review 37: Chemistry of the Atmosphere L1, 2, 3,4 38: Ecology L1,2, 3, 4 39: Ecology L5, 6 Sampling RQP
Progress and assessment	End of topic test (ETT) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.	End of topic test (ETT) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.	End of topic test (ETT) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.	End of topic test (ETT) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.	End of topic test (ETT) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.	End of topic test (ETT) Retrieval starters to test previous knowledge through the Unit. FAR completed approximately every 6 lessons.
Required Practical (RP)	• Microscopy – Focus on conversion of units and calculations • Osmosis – Focus on hypothesis and reading and interpreting the results from the graph. • Density – Focus on method for both regular and irregular shaped objects	• Food Tests – Focus on methods and positive results • Enzymes – Focus on variables • Photosynthesis – Focus on hypothesis and how to link conclusion back to the rate of photosynthesis	• Making Salts – Focus on methods/ equipment for measuring • Extension of a Spring – Focus on measurements and errors • Acceleration – Focus on Equipment (use of dataloggers)	• Rates of Reaction – Focus on equipment for measuring, graph shape (curve line of best fit)	• Water Purification – focus on observations	• Sampling – focus on equipment and key calculations
Homework *(ensure that this is NOT stand alone, but clearly advances or embeds knowledge and understanding)*	Use of Educake.	Use of Educake.	Use of Educake.	Use of Educake.	Use of Educake.	Use of Educake.

Numeracy Opportunities	• Using equations – Calculating magnification, number of neutrons from the mass number and atomic number, calculating isotopic masses, using mathematical formulae to calculate the volume of a regular shaped object to then be used to calculate density, calculating specific heat capacity, calculating specific latent heat. • Conversion of units – Magnification calculations. • Using standard form. • Interpreting and analysing data in exam questions. • Using and reading scales on equipment during practical work. • Analysing data from practicals. <u>Cell Biology</u> MS 1b, 2a, 2h, Students should be able to demonstrate an understanding of the scale and size of cells and be able to make order of magnitude calculations, including the use of standard form. MS 1d, 3a Students should be able to use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures. MS 1a, 1b, 2h, 3b Students should be able to carry out calculations involving magnification, real size and image size using the formula: $\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$ Students should be able to express answers in standard form if appropriate. MS 1c, 5c Students should be able to calculate and compare surface area to volume ratios. MS 1a, 1c Students should be able to: • use simple compound measures of rate of water uptake • use percentages • calculate percentage gain and loss of mass of plant tissue. MS 4a, 4b, 4c, 4d Students should be able to plot, draw and interpret appropriate graphs. <u>Atomic Structure and the Periodic Table</u> MS 1b Recognise expressions in standard form. MS 1d Students should be able to relate size and scale of atoms to objects in the physical world. MS 5b Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. <u>Particle Model</u> MS 1a, b, c, 3b, c Students should be able to recall and apply this equation to changes where mass is conserved. MS 1a, 3b, c, d Students should be able to apply this equation, which is given on the Physics equation sheet, to calculate the energy change involved when the temperature of a material changes. MS 1a, 3b, c, d Students should be able to apply this equation, which is given on the Physics equation sheet, to calculate the energy change involved in a change of state. MS 4a		• Using and reading scales on equipment during practical work. • Analysing data from practicals. • Plotting and interpreting graphs. <u>Organisation</u> MS 1c Students should be able to develop an understanding of size and scale in relation to cells, tissues, organs and systems. MS 1a, 1c Students should be able to carry out rate calculations for chemical reactions. MS 1a, 1c Students should be able to use simple compound measures such as rate and carry out rate calculations for blood flow. MS 2c, 2g, 4a Students should be able to translate disease incidence information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables. MS 2d Students should understand the principles of sampling as applied to scientific data, including epidemiological data. MS 2d Students should be able to understand the principles of sampling as applied to scientific data in terms of risk factors. MS 2c, 4a Students should be able to translate information between graphical and numerical forms; and extract and interpret information from charts, graphs and tables in terms of risk factors. MS 2g Students should be able to use a scatter diagram to identify a correlation between two variables in terms of risk factors. MS 2a, 2d, 5c Process data from investigations involving stomata and transpiration rates to find arithmetic means, understand the principles of sampling and calculate surface areas and volumes. MS 1a, 1c Students should be able to understand and use simple compound measures such as the rate of transpiration. MS 2c, 4a, 4c Students should be able to: • translate information between graphical and numerical form • plot and draw appropriate graphs,		• Using and reading scales on equipment during practical work. • Analysing data from practicals. • Using equations – Carrying out and rearranging a range of forces and motion calculations. • Using standard form. • Interpreting and analysing data in exam questions. • Plotting and interpreting graphs. • Calculating the gradient from a graph. • HT – using tangents on graphs. <u>Bioenergetics</u> MS 3d Solve simple algebraic equations. MS 1a, 1c, 2c, 4a, 4c Students should be able to: • measure and calculate rates of photosynthesis • extract and interpret graphs of photosynthesis rate involving one limiting factor • plot and draw appropriate graphs selecting appropriate scale for axes • translate information between graphical and numeric form. MS 3a, 3d (HT only) Students should understand and use inverse proportion – the inverse square law and light intensity in the context of photosynthesis. <u>Inheritance, Variation and Evolution</u> MS 2e Students should be able to understand the concept of probability in predicting the results of a single gene cross, but recall that most phenotype features are the result of multiple genes rather than single gene inheritance. MS 1c, 3a Students should be able to use direct proportion and simple ratios to express the outcome of a genetic cross. MS 2c, 4a Students should be able to complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees. MS 2e (HT only) Students should be able to construct a genetic cross by Punnett square diagram and use it to make predictions using the theory of probability. MS 1c, 3a Students should understand and use direct proportion and simple ratios in genetic crosses. MS 2c, 4a Extract and interpret information from charts, graphs and tables. MS 2c, 4a		• Using and reading scales on equipment during practical work. • Analysing data from practicals. • Using equations – Carrying out and rearranging a range of forces and motion calculations. • Using standard form. • Interpreting and analysing data in exam questions. • Plotting and interpreting graphs. • Calculating the gradient from a graph. • HT – using tangents on graphs. <u>Forces and Motion</u> MS 3b, c Students should be able to recall and apply W = mg. MS 3a Students should recognise and be able to use the symbol for proportionality, ∝ MS 4a, 5a, b (HT only) Students should be able to use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces, to include both magnitude and direction (scale drawings only). MS 3b, c Students should be able to recall and apply W =Fs. MS 1c Students should be able to convert between newton-metres and joules. MS 3b, c, 4a Students should be able to recall and apply F = ke. MS 3b, c, 4a Students should be able to: • describe the difference between a linear and non-linear relationship between force and extension • calculate a spring constant in linear cases. MS 3c Students should be able to apply this equation which is given on the Physics equation sheet. $[E_e = \frac{1}{2} k e^2]$ MS 3c Students should be able to calculate relevant values of stored energy and energy transfers. Motion – MS 1, 3c Throughout this section (Forces and motion), students should be able to use ratios and proportional reasoning to convert units and to compute rates. MS 1a, c, 2f Students should be able to make measurements of distance and		• Conversion of units. • Using equations – Carrying out and rearranging a range of quantitative chemistry calculations. • Using standard form. • Interpreting and analysing data in exam questions. <u>Homeostasis and Response</u> MS 2c Students should be able to extract and interpret data from graphs, charts and tables, about the functioning of the nervous system MS 4a Students should be able to translate information about reaction times between numerical and graphical forms. MS 2c Students should be able to extract information and interpret data from graphs that show the effect of insulin in blood glucose levels in both people with diabetes and people without diabetes. MS 2c (HT only) Students should be able to extract and interpret data from graphs showing hormone levels during the menstrual cycle. MS 2c (HT only) Interpret and explain simple diagrams of negative feedback control. <u>Quantitative Chemistry</u> (HT Only) MS 1a Recognise and use expressions in decimal form. MS 1b Recognise and use expressions in standard form. MS 2a Use an appropriate number of significant figures. MS 3a Understand and use the symbols: =, <>, >, ∝, ~ MS 3b Change the subject of an equation. MS 1c Students should be able to use the relative formula mass of a substance to calculate the number of moles in a given mass of that substance and vice versa. MS 1a Recognise and use expressions in decimal form. MS 1c Use ratios, fractions and percentages. MS 3b Change the subject of an equation. MS 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities. Students should be able to: • calculate the masses of substances shown in a balanced symbol equation • calculate the masses of reactants and products from the balanced symbol equations		• Using equations – Carrying out and rearranging a range of sampling calculations. • Using standard form. • Interpreting and analysing data in exam questions. • Plotting and interpreting graphs. <u>Chemistry of the Atmosphere</u> MS 1c To use ratios, fractions and percentages. <u>Ecology</u> MS 2c, 4a Students should be able to extract and interpret information from charts, graphs and tables relating to the interaction of organisms within a community. MS 2c, 4a Students should be able to extract and interpret information from charts, graphs and tables relating to the effect of abiotic factors on organisms within a community. MS 2c, 4a Students should be able to extract and interpret information from charts, graphs and tables relating to the effect of biotic factors on organisms within a community. MS 2b, 2f, 4a, 4c In relation to abundance of organisms students should be able to: • understand the terms mean, mode and median • calculate arithmetic means • plot and draw appropriate graphs selecting appropriate scales for the axes. MS 4a Students should be able to interpret graphs used to model these cycles. MS 1c Calculate the efficiency of biomass transfer between trophic levels. MS 1c Students should be able to calculate the efficiency of biomass transfers between trophic levels by percentages or fractions of mass. Students should be able to explain how this affects the number of organisms at each trophic level.

			selecting appropriate scales for axes • extract and interpret information from graphs, charts and tables. <u>Structures and Bonding and the Properties of Matter</u> MS 5b Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. MS 4a, 1a, 1c Students should be able to: • deduce that a compound is ionic from a diagram of its structure in one of the specified forms • describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent a giant ionic structure • work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure.		Students should be able to extract and interpret information from charts, graphs and tables such as evolutionary trees.		time and then calculate speeds of objects. MS 3b, 3c Students should be able to recall and apply s=vt. Students should be able to calculate average speed for non-uniform motion. MS 4a, b, c, d, f Students should be able to draw distance–time graphs from measurements and extract and interpret lines and slopes of distance–time graphs, translating information between graphical and numerical form. Students should be able to determine speed from a distance–time graph. MS 1d, 3b, 3c Students should be able to recall and apply $\left[a = \frac{\Delta v}{t} \right]$ Students should be able to estimate the magnitude of everyday accelerations. MS 4a, b, c, d, f Students should be able to • draw velocity–time graphs from measurements and interpret lines and slopes to determine acceleration • (HT only) interpret enclosed areas in velocity–time graphs to determine distance travelled (or displacement). Students should be able to apply $\left[v^2 - u^2 = 2 a s \right]$ MS 3a Students should recognise and be able to use the symbol for proportionality, ∝. MS 3b, c Students should be able to recall and apply F = ma. MS 1d Students should be able to estimate the speed, accelerations and forces involved in large accelerations for everyday road transport. Students should recognise and be able to use the symbol that indicates an approximate value or approximate answer,~. MS 1a, 1c Students should be able to evaluate the effect of various factors on thinking distance based on given data. MS 1c, 1d, 2c, 2d, 2f, 2h, 3b, 3c Students should be able to estimate how the distance required for road vehicles to stop in an emergency varies over a range of typical speeds. (HT only) MS 1d Students should be able to HT only) estimate the forces involved in the deceleration of road vehicles		and the mass of a given reactant or product. MS 3b Change the subject of an equation. MS 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities. Students should be able to balance an equation given the masses of reactants and products. Students should be able to change the subject of a mathematical equation. <u>Energy Changes</u> MS 1a (HT Only) Students should be able to calculate the energy transferred in chemical reactions using bond energies supplied. <u>Using Resources</u> MS 2c, 4a Students should be able to extract and interpret information about resources from charts, graphs and tables MS 2h Translate information between graphical and numeric form. Students should be able to use orders of magnitude to evaluate the significance of data. MS 1a Recognise and use expressions in decimal form. MS 1c Use ratios, fractions and percentages. MS 1d Make estimates of the results of simple calculations. MS 2a Use an appropriate number of significant figures. MS 4a Translate information between graphical and numeric form. Students should be able to carry out simple comparative LCAs for shopping bags made from plastic and paper. MS 1a Recognise and use expressions in decimal form. MS 1c Use ratios, fractions and percentages. Students should be able to interpret and evaluate the composition and uses of alloys other than those specified given appropriate information.		

						in typical situations on a public road. (HT Only) MS 3b, c Students should be able to recall and apply p =mv. <u>The Rate and Extent of Chemical Change</u> MS 1a Recognise and use expressions in decimal form. MS 1c Use ratios, fractions and percentages. MS 1d Make estimates of the results of simple calculations. MS 4a Translate information between graphical and numeric form. MS 4b Drawing and interpreting appropriate graphs from data to determine rate of reaction. MS 4c Plot two variables from experimental or other data. MS 4d Determine the slope and intercept of a linear graph. MS 4e Draw and use the slope of a tangent to a curve as a measure of rate of change. Students should be able to: • calculate the mean rate of a reaction from given information about the quantity of a reactant used or the quantity of a product formed and the time taken • draw, and interpret, graphs showing the quantity of product formed or quantity of reactant used up against time • draw tangents to the curves on these graphs and use the slope of the tangent as a measure of the rate of reaction • (HT only) calculate the gradient of a tangent to the curve on these graphs as a measure of rate of reaction at a specific time. MS 5c predict and explain the effects of changes in the size of pieces of a reacting solid in terms of surface area to volume ratio. MS 1c use simple ideas about proportionality when using collision theory to explain the effect of a factor on the rate of a reaction.			

Key Vocabulary/literacy opportunities	Cell Biology Osmosis, Diffusion, Active transport, Mitosis, Differentiation Atomic Structure and the Periodic Table Atomic number, Atomic Mass, Proton, Neutron, Electron, Nucleus 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 Bioenergetics Photosynthesis, Limiting factor, Aerobic respiration, Anaerobic Respiration		Chemical Changes Reactant, Products, Neutralisation, Electrolysis, Cathode, Anode, Half-Equation (HT) 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 Infection and Response Pathogen, Antigen, Antibody, Vaccination Energy Changes Exothermic, Endothermic, Bond energies 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

National Curriculum Links	**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. Bioenergetics: **WS1:** Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses.	**Chemical Changes:** **WS1:** Predict the products of the electrolysis of aqueous solutions containing a single ionic compound. **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.	**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. **Infection and Response:** **WS1:** Describe and explain how the spread of diseases in animals and plants can be reduced or prevented. Evaluate the global use of vaccinations in the prevention of diseases. Explain the use of antibiotics and other medicines in the treatment of diseases in everyday life. Understand that the results of testing and trials are published only after scrutiny by peer review. **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.	**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	Cell Biology - KS3 – Cells, Reproduction, Unicellular Organisms, Genetics and Variation. KS4 – Organisation, Bioenergetics, Inheritance, Variation and Evolution. KS5 – Cells, Biological molecules, Organisms exchange substances with their environment. Maths – Apply knowledge of substituting numbers into calculations and how to rearrange equations when calculating magnification. Atomic Structure and the Periodic Table – KS3 – Particles, Solubility, Atoms and Elements, Compounds and Mixtures KS4 – Structure and Bonding and the Properties of Matter, Chemical Change, Energy Change, The Rate and Extent of Chemical Change. KS5 – Atomic Structure, Periodicity, Group 2, the alkaline earth metals, Group 7, the halogens, Properties of period 3 elements and their oxides. Maths – See links with the symbols on the periodic table and algebra in Maths and look at patterns and trends when looking at electronic structures and the periodic table. Particle Model – KS3 – Particles, Pressure KS4 – Atomic Structure and the Periodic Table. KS5 – Particles and Radiation. I Media – Evaluate your work and experiments in both science and I Media.		Organisation - KS3 – Cells, Food and Digestion, Photosynthesis and Respiration, Movement and Exercise Investigation, Enzyme Project. KS4 – Cell Biology, Bioenergetics. KS5 – Cells, Biological molecules, Organisms exchange substances with their environment. DNA. PE – Links to the respiratory and circulatory systems covered in GCSE PE. Structure, Bonding and the Properties of Matter – KS3 – Particles, Atoms and Elements, Compounds and Mixtures. KS4 – Atomic Structure and the Periodic Table, Atomic Structure (P1). KS5 – Bonding, Properties of period 3 elements and their oxides, Polymers, amino acids, proteins and DNA. Maths – Apply knowledge of graphs from maths to be able to interpret data relating to the properties of matter. See links with Handling data in Maths and Science. Bioenergetics – KS3 – Photosynthesis and Respiration. KS4 – Cells, Organisation. KS5 – Cells, Biological molecules, Organisms exchange substances with their environment. PE – Look at how the process of aerobic and anaerobic respiration links to the respiratory system in Term 2 of PE. Food Tech - See the links with food made using Yeast and the fermentation process. Maths – See links with Handling data in Maths and Science.		Bioenergetics – KS3 – Photosynthesis and Respiration. KS4 – Cells, Organisation. KS5 – Cells, Biological molecules, Organisms exchange substances with their environment. PE – Look at how the process of aerobic and anaerobic respiration links to the respiratory system in Term 2 of PE. Food Tech - See the links with food made using Yeast and the fermentation process. Maths – See links with Handling data in Maths and Science. Chemical Changes – KS3 – Acids and Alkalis, Metals and Reactivity, Types of Reaction, Electrolysis Project. KS4 – Atomic Structure and the Periodic Table, Structure and Bonding and the Properties of Matter, The Rate and Extent of Chemical Change. KS5 – Acids and bases, Oxidation, reduction and redox equations. Maths - See the links between algebra in Maths and symbol equations. I Media- Evaluate your work and experiments in both Science and IMedia. English – An Inspector Calls – See how the Inspector is a catalyst for showing how all the characters are linked in a plot. Inheritance, Variation and Evolution – KS3 – Cells, Reproduction, Genetics and Variation. KS4 – Cell Biology. KS5 – Cells, Biological Molecules, Genetic information, variation and relationships between organisms, Genetics, populations, evolution and ecosystems, The control of gene expression.		Forces and Motion – KS3 – Forces, Motion, Acceleration Project. KS4 – Energy, Magnetism and Electromagnetism. KS5 – Mechanics and materials, Further mechanics and thermal physics. Maths – See links to equations and graphs in maths. The Rate and Extent of Chemical Change - KS3 – Acids and Alkalis, Types of Reaction, Metals and Reactivity. KS4 – Atomic Structure and the Periodic Table, Chemical Change, Energy Changes. KS5 – Kinetics, Chemical equilibria, Le Chatelier's principle and Kc, Rate equations, Equilibrium constant Kp for homogeneous systems. Maths – See links to interpreting and plotting graphs in Maths.		Homeostasis and Response - KS3 – Cells, Reproduction, Movement. KS4 – Cells, Organisation. KS5 – Organisms respond to changes in their internal and external environments. Maths – See links with handling data in Maths and interpreting graphs. Quantitative Chemistry – KS3 – Atoms and Elements, Compounds and Mixtures. KS4 – Atomic Structure and the Periodic Table. KS5 – Amount of Substance. Maths - See the links between algebra in Maths and symbol equations. Infection and Response – KS3 – Cells, Unicellular Organisms. KS4 – Cell Biology. KS5 – Cells Maths – Apply knowledge of graphs from maths to be able to interpret data on infection and vaccination graphs. Energy Changes – KS3 – Types of Reactions. KS4 – Chemical Changes, The Rate and Extent of Chemical Change. KS5 – Energetics, Thermodynamics 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. Using Resources – KS3 – Energy Resources, Earth and Atmosphere, Combustion. KS4 – Chemical Changes, Chemistry of the Atmosphere. Geography – See links to climate change in Geography.		Chemistry of the Atmosphere – KS3 – Energy Resources, Earth and Atmosphere, Combustion. KS4 – Chemical Changes, Using Resources. Maths- See links to interpreting and plotting graphs in Maths. Geography – See links to climate change in Geography. Ecology – KS3 – Photosynthesis and Respiration, Ecosystems and Ecosystem Project. KS4 – Organisation, Bioenergetics. KS5 – Organisms exchange substances with their environment, Energy transfers in and between organisms, Genetics, populations, evolution and ecosystems. Maths- See links to interpreting and plotting graphs in Maths. Geography – See links to climate change and human impact in Geography.

Spiritual, Moral, Social and cultural.	Understanding the collaboration between countries in the development of the periodic table and the structure of the atom.		Understanding how health, diet and fitness have an effect on them throughout the Organisation topic e.g. Cancer/ CHD. Building self-knowledge and self-confidence to be able to make choices in everyday life linked to lifestyle choices.		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. Understanding the moral and ethical issues that can arise when considering variation and evolution and its potential impact on everyday life.		Linking their understanding to the chemicals around them in everyday life. Understand the impact that humans are having on the Earth's resources through the extraction of metals and the process of electrolysis and its large energy usage.		Understand Diabetes and Contraception methods and be able to link this to the choices that they make. Understanding the different methods of Contraception and the ethical and moral issues surrounding these. Building self-knowledge and self-confidence to be able to make choices in everyday life linked to life style choices. Understand the impact that humans are having on the Earth's resources and the impact of the pollution that we create.		Understand the impact that humans are having on the Earth's resources and the impact of the pollution that we create.
British Values	Respect and tolerance, collaboration during experiments and group work. Following the laboratory rules when conducting practical work.		Respect and tolerance, collaboration during experiments and group work. Following the laboratory rules when conducting practical work.		Respect and tolerance, collaboration during experiments and group work. Following the laboratory rules when conducting practical work. Recognise how their actions can have an impact on others and the wider world. Appreciate individual liberty of own views, tolerance and mutual respect of others views throughout the variation and evolution topic.		Respect and tolerance, collaboration during experiments and group work. Following the laboratory rules when conducting practical work.		Respect and tolerance, collaboration during experiments and group work. Following the laboratory rules when conducting practical work. Recognise how their actions can have an impact on others and the wider world.		Respect and tolerance, collaboration during experiments and group work. Following the laboratory rules when conducting practical work. Recognise how their actions can have an impact on others and the wider world.
Cultural Captial	Science - Careers display on W side corridor. Understanding how Scientists work to develop ideas and how they have contributed to the development of the periodic table and ideas of the structure of the atom throughout history.		Science - Careers display on W side corridor. Understand how scientific advancements lead to the development of new materials/ technologies.		Science - Careers display on W side corridor. Understand the impact that we are having on our planet. Appreciate the work of Darwin/ Lamark in the theory of evolution and appreciate the different viewpoints in everyday life. Understand the importance of Selective breeding and work of farmers and gardeners whilst also appreciating the impact this has in the world around us.		Science - Careers display on W side corridor. Link rates of reaction to how scientists choose the best reaction and careers that these ideas links to. Understand the impact that we are having on our planet through the extraction of metals.		Science - Careers display on W side corridor. Link rates of reaction to how scientists choose the best reaction and careers that these ideas links to. Understand how scientists are involved in everyday processes such as how water is treated, extraction of metals, choice of materials to produce products.		Science - Careers display on W side corridor. Understand the impact that we are having on our planet. Understand how scientists are involved in everyday processes such as how water is treated, extraction of metals, choice of materials to produce products.