

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 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 Cells, Bioenergetics, Chemical Changes, Energy Changes, Energy | | | | | | | | | Term 2 PPE 1- Revision of Key topics Homeostasis and Response, Organic Chemistry, Forces and Motion | | | | | | | Term 3 Inheritance, Variation and Evolution, The Rate and Extent of Chemical Reactions, Forces and Motion, Ecology Chemistry of the atmosphere and Using Resources, Waves | | | | | | | Term 4 PPE 2, Revision | | | | | | | Term 5 Revision | | | | | | | Term 6 | | | | | | | | | | |
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| 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 11 | (TTD x2) Content Cells, Skills Magnification, RQP Microscopy, 6 Mark Q, Demo Model Gut/ Digestion Content Bioenergetics, Skills Graphs, RQP Photosynthesis, 6 Mark Q, Assessment 1 Content Chemical Reactions, Skills Methods, Practical Reactions of Metals, 6 Mark Q, RQP Making a Salt Content Energy changes, Content Electrolysis, RQP Energy Changes, 6 Mark Q, RQP Electrolysis Content Specific Heat Capacity, Skills Variables, RQP SHC, 6 Mark Q, Assessment 2 Content Cell Transport, Skills conclusions, RQP Osmosis, 6 Mark Q, PPE Prep - B1, C1 & P1 Revision Key areas | | | | | | | | HOLIDAY: 1 week PPE Prep - B1, C1 & P1 Revision Key areas PPEs – Biology Paper 1/ Chemistry Paper 1/ Physics Paper 1 PPEs Feedback and Review of key topic areas of concern PPE Feedback and Review of Key topic areas of concern 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 Speed/ Distance-time graphs L2 Velocity-time graphs / Acceleration L3 Momentum / Acceleration RQP L4 Stopping Distances L5 Application Lesson | | | | | | | | HOLIDAY: 2 weeks 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 Scalars and vectors/ Weight equation/ work done L2 Terminal velocity L3 Resultant Force and Free body diagrams L4 Extension of a spring RQP L5 Application Lesson EOT 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 | | | | | | | | HOLIDAY: 1 WEEK PPEs – Biology paper 2/ Chemistry Paper 2/ Physics Paper 2 PPE lessons based around areas for improvement Waves Content P2 Revision Booklet C2 Revision Booklet B2 Revision Booklet | | | | | | | | HOLIDAY: 2 WEEKS P1 Revision Booklet C1 Revision Booklet B1 Revision Booklet | | | | | | | | HOLIDAY: 1 WEEK | | | | | | | |
| Progress and assessment | Mini Test (MT), End of topic test (ETT) 13/9/21 – FAR 1 27/9/21 – FAR 2 11/10/21 – FAR 3 | | | | | | | | PPE 1, Application Lessons 1/11/21 – FAR 1 15/11/21 – FAR 2 29/11/21 – FAR 3 13/12/21 – FAR 4 | | | | | | | | Application Lessons 10/1/22 - FAR 1 24/1/22 – FAR 2 7/2/22 – FAR 3 | | | | | | | | PPE 2, Exam Qs 28/2/22 – FAR 1 14/3/22 – FAR 2 28/3/22 – FAR 3 | | | | | | | | | | | | | | | | | | | | | | | |
| Required Practical (RP) | <ul style="list-style-type: none">MicroscopyPhotosynthesisMaking a SaltElectrolysisSpecific Heat CapacityOsmosis | | | | | | | | <ul style="list-style-type: none">Reaction TimeAcceleration | | | | | | | | <ul style="list-style-type: none">Rates of ReactionExtension of a SpringSamplingWavesRadiation – Leslie Cube | | | | | | | | <ul style="list-style-type: none">Revision of all RQP | | | | | | | | | | | | | | | | | | | | | | | |
| Homework <small>(ensure that this is NOT stand alone, but clearly advances or embeds knowledge and understanding)</small> | Use of SENECA and BBC Bitesize Revision Cells – 1 1.1, 1.2, 1.3 Bioenergetics – 4 4.1, 4.2 Chemical Changes – 4 4.1, 4.2, 4.3, 4.4 Energy Changes – 5 5.1 Energy – 1 1.1, 1.2, 1.3 | | | | | | | | Use of SENECA and BBC Bitesize Revision Homeostasis & Response - 5 5.1, 5.2, 5.3 Organic Chemistry – 7 7.1 Forces – 5 5.1, 5.2, 5.3 | | | | | | | | Use of SENECA and BBC Bitesize Revision Inheritance, Variation & Evolution – 6 6.1, 6.2, 6.3 The Rate & Extent of Chemical Change – 6 6.1, 6.2 Ecology – 7 7.1, 7.2, 7.3 Chemistry of the Atmosphere – 9 9.1 Using Resources – 10 10.1, 10.2 Waves – 6 6.1, 6.2 | | | | | | | | Use of SENECA and BBC Bitesize Revision PPE 2, Exam Qs 28/2/22 – FAR 1 14/3/22 – FAR 2 28/3/22 – FAR 3 | | | | | | | | Use of SENECA and BBC Bitesize Revision PPE 2, Exam Qs 28/2/22 – FAR 1 14/3/22 – FAR 2 28/3/22 – FAR 3 | | | | | | | | | | | | | | | |

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| Key Vocabulary/literacy opportunities | Cell Biology Osmosis, Diffusion, Active transport, Mitosis, Differentiation | | Organisation Enzymes, Biological catalyst, communicable, Non-communicable, Tissue, Organ | | Inheritance, Variation and Evolution Asexual Reproduction, Selective Breeding, Meiosis, Genome, Alleles, DNA, Chromosomes, Gene, Phenotype, Genotype | | | | | |
| | Bioenergetics Photosynthesis, Limiting factor, Aerobic respiration, Anaerobic Respiration | | Bonding, Structure and the Properties of Matter Ionic Bonding, Covalent Bonding, Metallic Bonding, Ions, Polymers, Molecule, Intermolecular forces, alloy | | The Rate and Extent of Chemical Change Activation Energy, Collision Theory, Catalyst, Closed System, Dynamic Equilibrium | | | | | |
| | Chemical Changes Reactants, Products, Electrolysis, Cathode, Anode, Electrolyte, Oxidation, Reduction | | Electricity Current, Potential Difference, Resistance, Ohmic conductor, Non-ohmic conductor, AC, DC | | Forces and Motion Scalar, Vector, Mass, Weight, Elastic Deformation, Inelastic Deformation, Limit of Proportionality | | | | | |
| | Energy Changes Endothermic, Exothermic, Activation energy, Bond energies | | Homeostasis and Response Homeostasis, Reflex, Endocrine System, Hormone, Gland, Receptor, Neurone, Negative Feedback Loop (HT) | | Ecology Abiotic, Biotic, Trophic level, Biodiversity, Adaptation | | | | | |
| | Energy Specific heat capacity, gravitational potential energy, kinetic energy | | Organic Chemistry Crude Oil, Fractional Distillation, Cracking, Alkane, Alkene, Hydrocarbon, Combustion Forces and Motion Speed, Velocity, Acceleration, Terminal Velocity, Momentum, Conservation of Momentum | | Chemistry of the Atmosphere Greenhouse Gas, Peer-Reviewed, Global Warming, Carbon Footprint, Carbon Neutral Using Resources Finite Resource, Renewable Resource, Sustainable Development, Life Cycle Assessment, Potable Water, Desalination Waves Transverse, Longitudinal, Electromagnetic Spectrum, Amplitude, Frequency, Wavelength | | | | | |

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| <p>Working Scientifically Skills</p> | <p>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: $\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$ and express answers in standard form if appropriate.</p> <p>Bioenergetics:</p> <p>WS1: Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses.</p> <p>Chemical Changes:</p> <p>WS1: Predict the products of the electrolysis of aqueous solutions containing a single ionic compound.</p> <p>Energy: WS1: Use energy transfer diagrams to model energy stores and changes within systems. use calculations to show on a common scale how the overall energy in a system is redistributed when the system changed. explain ways of reducing unwanted energy transfers, for example through lubrication and the use of thermal insulation in everyday applications of science. HT Describe ways to increase the efficiency of intended energy transfers in everyday applications of science. Consider the environmental impact of the use of different energy resources in everyday life and show that science has the ability to identify environmental issues arising from the use of energy resources but not always the power to deal with the issues because of political, social, ethical or economic considerations. WS4: calculate the changes in energy involved when a system is changed by:</p> <ul style="list-style-type: none"> • heating • work done by forces • work done when a current flows • Kinetic energy <p>using SI units, interconverting units and use of appropriate number of significant figures Use the correct prefixes and powers of 10 for orders of magnitude when looking and national and global energy resources.</p> | <p>Homeostasis and Response:</p> <p>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.</p> <p>Organic Chemistry:</p> <p>WS1: Use model kits to represent alkanes. Describe and explain how fractional distillation works based on evaporation and condensation of the hydrocarbons in the mixture of crude oil. Recall how boiling point, viscosity and flammability changes with increasing molecular size. Describe and explain how cracking can be sued to break down large chain hydrocarbons into short chain hydrocarbons giving the conditions necessary. WS4: Write balanced equations for the complete combustion of hydrocarbons given formula;</p> <p>Forces and Motion:</p> <p>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</p> | <p>Inheritance, Evolution and Evolution:</p> <p>WS1: Modelling behaviour of chromosomes during meiosis. Discuss the importance of understanding the human genome. This is limited to the:</p> <ul style="list-style-type: none"> • search for genes linked to different types of disease • understanding and treatment of inherited disorders • use in tracing human migration patterns from the past. <p>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 engineering, 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.</p> <p>The Rate and Extent of Chemical Change:</p> <p>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.</p> <p>Forces and Motion:</p> <p>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</p> <p>Ecology:</p> <p>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.</p> <p>WS2: Record first hand observation on organisms using sampling techniques.</p> <p>Chemistry of the Atmosphere:</p> <p>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.</p> | | | | | | | | | | | | | | | | | | | |
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| | | | | <p>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.</p> <p><u>Using Resources:</u></p> <p>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.</p> <p><u>Waves:</u></p> <p>WS1: Describe the difference between longitudinal and transverse waves. Describe evidence that, for both ripples on a water surface and sound waves in air, it is the wave and not the water or air itself that travels. HT - use wave front diagrams to explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium. Evaluate Ultraviolet waves, X-rays and gamma rays and the hazardous effects on human body tissue. Convert between 1000 millisieverts (mSv) = 1 sievert (Sv) HT - Give brief explanations why each type of electromagnetic wave is suitable for the practical application. WS2: Describe and explain how a ripple tank can be used to measure the properties of waves and identify control variables. Describe a method to measure the speed of sound waves in air and make and record observations evaluating the data collected. describe a method to measure the speed of ripples on a water surface and make and record observations evaluating the data collected. WS3: Present and interpret the data drawing conclusions from experiments to measure the speed of sound waves in air. Present and interpret the data drawing conclusions from the experiment to measure the speed of ripples on a water surface.</p> | | | | | |
| Connected knowledge | | | | | | | | | |
| <p>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.</p> | | | | | | | | | |