









Combined Science CURRICULUM MAP YEAR 11



<p>HALF TERM 1:</p> <p>Ecology</p> <ol style="list-style-type: none"> 1. Describe the relationship between communities and ecosystems. 2. An ecosystem is the interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment. 3. To survive and reproduce, organisms require a supply of materials from their surroundings and from the other living organisms there. A stable community is one where all the species and environmental factors are in balance so that population sizes remain fairly constant. 4. Organisms have features (adaptations) that enable them to survive in the conditions in which they normally live. These adaptations may be structural, behavioural or functional. 5. understand that photosynthetic organisms are the producers of biomass for life on Earth. 6. Feeding relationships within a community can be represented by food chains. All food chains begin with a producer which synthesises molecules. 7. A range of experimental methods using transects and quadrats are used by ecologists to determine the distribution and abundance of species in an ecosystem. 8. Describe the carbon cycle and water cycle in how materials are cycled for the building blocks of life. 9. Biodiversity is the variety of all the different species of organisms on earth, or within an ecosystem. 10. Rapid growth in the human population and an increase in the standard of living mean that increasingly more resources are used and more waste is produced. 11. Humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste. 12. What is deforestation and its effects. 13. describe some of the biological consequences of global warming. <p>Rates</p> <ol style="list-style-type: none"> 1. Describe how the rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed over time. 2. Draw and interpret, graphs showing the quantity of product formed or quantity of reactant used up against time. 3. Draw tangents to the curves on these graphs and calculate the gradient of a tangent as a measure of the rate of reaction. (HT) 4. Describe how the rate of a reaction is affected by temperature, concentration, temperature, surface area and catalyst. 5. Describe reversible reactions and how the direction can be changed by changing the conditions. 6. If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change. (HT). Use Le Chatelier's Principle to predict the effects of changing conditions on a system at equilibrium. (HT) 		<p>Supporting texts or wider reading</p> <p>The importance of understanding rates of reaction in industry</p>
		<p>Opportunities for extended writing</p> <p>Extended Response 6 mark exam style question practise.</p> <p>Required Practical 7: Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.</p> <p>Required practical activity 11: Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity.</p> <p>Required practical activity 18: investigate the relationship between force and extension for a spring.</p> <p>Required practical activity 19: investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force.</p>
		<p>Speak like an expert</p> <p>Outdoor practical activities and discussion around distribution and abundance of organisms in Ecology.</p> <p>Discuss methods used by the police/council to determine whether motorists are speeding.</p> <p>How can police investigators determine the speed of vehicles before a crash?</p> <p>Discuss the conditions needed by reactions in industry to get a good yield of product with low overhead costs.</p>
		<p>Links to careers, personal development and other subject areas.</p> <p>Maths –Recall and apply equation. Recognise and be able to use the symbol for proportionality \propto. Parallelogram of force- Use angular measures in degrees. Interpret data from an investigation of the relationship between force. Gradients and tangents.</p>



<p>Forces</p> <ol style="list-style-type: none"> 1. Define and give examples of scalar and vector quantities. 2. Weight is the force acting on an object due to gravity. The force of gravity close to the Earth is due to the gravitational field around the Earth. $W=mg$. 3. 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. 4. A single force can be resolved into two components acting at right angles to each other. Use vector diagrams to illustrate resolution of forces (HT) 5. The work done by a force on an object can be calculated using the equation: work done = force x distance. Describe the energy transfer involved when work is done. 6. Explain why, to change the shape of an object (by stretching, bending or compressing), more than one force must be applied – limited to stationary objects only. Calculate force = spring constant x extension and elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$ 7. Draw distance–time and velocity–time graphs from measurements and extract and interpret lines and slopes of graphs, translating information between graphical and numerical form. 8. Describe the forces affecting a falling object. 9. Explain Newtons’ Laws. 10. Describe factors that affect thinking distance, braking distance and stopping distance. 11. Estimate the forces involved in the deceleration of road vehicles. (HT) 12. Use the concept of momentum as a model to describe and explain examples of momentum in an event, such as a collision. (HT) 		
<p>HALF TERM 2: Inheritance, Variation & Evolution</p> <ol style="list-style-type: none"> 1. Compare sexual and asexual reproduction. 2. Describe the composition of the genetic material in the nucleus. The genome of an organism is the entire genetic material of that organism. 3. Most characteristics are a result of multiple genes interacting, rather than a single gene. Complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees. 4. Some disorders are inherited. Polydactyly (having extra fingers or toes) is caused by a dominant allele. Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele. 5. 22 chromosome pairs control characteristics only, but one of the pairs carries the genes that determine sex. In females the sex chromosomes are the same (XX). In males the chromosomes are different (XY). 6. Describe how variation generated by mutations/ sexual reproduction is the basis for natural selection and how species evolve. Describe Darwin’s theory. 7. Explain the impact of selective breeding of food plants and domesticated animals. 8. Describe the main steps in the process of genetic engineering. Explain the potential benefits and risks of genetic engineering (HT). 		<p>Supporting texts or wider reading</p> <p>Read articles about crimes scenes using chromatography as an analytical technique.</p> <p>Reading and extracting key information on the selective breeding, genetic engineering, designer babies, extinction and evolution.</p>
		<p>Opportunities for extended writing</p> <p>Extended Response 6 mark exam style question practise.</p> <p>Required practical activity 12: Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate R_f values.</p> <p>Required Practical 20: make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.</p>



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<p>9. Describe the evidence for evolution including fossils and antibiotic resistance in bacteria. Explain how mutations of bacterial pathogens produce new strains.</p> <p>Organic Chemistry</p> <ol style="list-style-type: none"> Describe what crude oil is and how it forms. Explain how fractional distillation works in terms of evaporation and condensation. Explain how the properties of hydrocarbons depend on the size of their molecules, including boiling point, viscosity and flammability. These properties influence how hydrocarbons are used as fuels. Describe the complete and incomplete combustion of hydrocarbon fuels. Hydrocarbons can be broken down (cracked) to produce smaller, more useful molecules. Cracking can be done by various methods including catalytic cracking and steam cracking. Alkenes are more reactive than alkanes and react with bromine water, which is used as a test for alkenes. Alkenes are used to produce polymers and as starting materials for the production of many other chemicals. <p>Chemical analysis</p> <ol style="list-style-type: none"> Describe how melting point and boiling point data can be used to distinguish pure substances from mixtures. Describe purpose of a formulation and give examples. Explain how chromatography can be used to separate mixtures and calculate the R_f value. Describe the test for hydrogen, oxygen, carbon dioxide and chlorine. <p>Waves</p> <ol style="list-style-type: none"> Waves may be either transverse or longitudinal- describe how they travel. Define amplitude, wavelength and frequency. Describe methods to measure the speed of sound waves in air, and the speed of ripples on a water surface. Electromagnetic (transverse) waves form a continuous spectrum and all electromagnetic wave travel at the same velocity through a vacuum or air. Describe how waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. Construct ray diagrams to illustrate the refraction of a wave. Different wavelengths of electromagnetic waves are reflected, refracted, absorbed or transmitted differently by different substances and types of surface. (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. (HT) Ultra-violet waves, X-rays and gamma rays can have hazardous effects on human body tissue. The effects depend on the type of radiation and the size of the dose. Radiation dose (in Sieverts) is a measure of the damage caused by the radiation in the body. Describe the applications of electromagnetic waves have many practical applications. Explain why each type of 		<p>Speak like an expert</p> <p>Research the process of peer review in reporting results/data.</p> <p>Evaluate the use of models for predicting climate change.</p> <p>Evaluate the reliability of the data available on the internet</p>
		<p>Links to careers, personal development and other subject areas.</p> <p>Cultural and environmental impact of the oil industry around the world.</p> <p>Geography- how waste, deforestation and global warming have an impact on biodiversity. Deforestation. Global warming.</p> <p>History- Research the work of Le Chatelier or the life of Fritz Haber. Highlight the moral ambiguity of Haber's work.</p>



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electromagnetic wave is suitable for the practical application. (HT)		
HALF TERM 3: Homeostasis 1. explain that homeostasis is the regulation of the internal conditions of a cell or organism to maintain optimum conditions for function in response to internal and external changes. 2. In the human body, these include control of blood glucose concentration, body temperature and water levels. 3. explain how the structure of the nervous system is adapted to its functions. The nervous system enables humans to react to their surroundings and to coordinate their behaviour. 4. The CNS is the brain and spinal cord. The CNS coordinates the response of effectors which may be muscles contracting or glands secreting hormones. 5. explain how the various structures in a reflex arc – including the sensory neurone, synapse relay neurone and motor neurone – relate to their function. Reflex actions are automatic and rapid; they do not involve the conscious part of the brain. 6. describe the principles of hormonal coordination and control by the human endocrine system 7. Blood glucose concentration is monitored and controlled by the pancreas. 8. explain how insulin controls blood glucose (sugar) levels in the body. 9. compare Type 1 and Type 2 diabetes and explain how they can be treated. 10. describe the roles of hormones in human reproduction, including the menstrual cycle. 11. evaluate the different hormonal and non-hormonal methods of contraception. 12. explain the use of hormones in modern reproductive technologies to treat infertility Chemistry of atmosphere 1. Describe the Earth's early atmosphere - how the atmosphere was formed, changed and developed over time. 2. Describe the greenhouse effect and the interactions of short and long wavelength radiation with matter. 3. Describe the scale, risk and environmental implications of global climate change and population. Develop solutions that help to reduce the impact of human activity. The Earth's resources 1. Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, need to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. 2. Describe the process to make water potable.		Supporting texts or wider reading History of the Earth's atmosphere
		Opportunities for extended writing Extended Response 6 mark exam style question practise. Required Practical 6: plan and carry out an investigation into the effect of a factor on human reaction time. Required practical activity 13: analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.
		Speak like an expert Research the process of peer review in reporting results/data. Evaluate the use of models for predicting climate change. Evaluate the reliability of the data available on the internet.
		Links to careers, personal development and other subject areas. Geography- evolution of atmosphere, global warming, climate change, air pollution. Sustainable resources. RRR. Maths - Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Appropriate number of significant figures. Extract and interpret information about resources from charts, graphs and tables. Use orders of magnitude to evaluate the significance of data.



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<p>3. Phytomining uses plants to absorb metal compounds. The plants are harvested and then burned to produce ash that contains metal compounds. Bioleaching uses bacteria to produce leachate solutions that contain metal compounds. (HT)</p> <p>4. Develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment.</p> <p>5. Life cycle assessments (LCAs) are carried out to assess the environmental impact of products in each of these stages</p> <p>6. Study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.</p>		
<p>HALF TERM 4:</p> <p>Revision Cycles – Preparation for GCSE Examinations</p> <p>Biology – Paper 1</p> <ol style="list-style-type: none"> 1. Cell biology 2. Organisation 3. Infection and response 4. Bioenergetics <p>Chemistry – paper 1</p> <ol style="list-style-type: none"> 1. Atomic structure and the periodic table 2. Bonding, structure, and the properties of matter 3. Quantitative chemistry 4. Chemical changes 5. Energy changes <p>Physics – Paper 1</p> <ol style="list-style-type: none"> 1. Energy 2. Electricity 3. Particle model of matter 4. Atomic structure <p>Biology – Paper 2</p> <ol style="list-style-type: none"> 1. Homeostasis and response 2. Inheritance, variation and evolution 3. Ecology <p>Chemistry – paper 2</p> <ol style="list-style-type: none"> 1. The rate and extent of chemical change 2. Organic chemistry 3. Chemical analysis 4. Chemistry of the atmosphere 5. Using resources <p>Physics – Paper 2</p> <ol style="list-style-type: none"> 1. Forces 2. Waves 3. Magnetism and electromagnetism <p>Science Skills</p> <ol style="list-style-type: none"> 1. Recognise and use expressions in decimal form and standard form 	<div data-bbox="831 779 922 864"></div> <div data-bbox="831 969 911 1055"></div> <div data-bbox="818 1122 925 1234"></div> <div data-bbox="820 1323 920 1424"></div>	<p>Supporting texts or wider reading</p> <p>Revision Guides, Science on a Page revision sheets, Past Paper exam questions to practise, Science Department Exam Strategy sheet.</p> <p>Opportunities for extended writing</p> <p>Extended Response 6 mark exam style question practise.</p> <p>Speak like an expert</p> <p>Skills Workshops – SEE Lessons. Revision of key topics and common mathematical calculations in a skills focused lesson.</p> <p>Links to careers, personal development and other subject areas.</p> <p>Mathematics: calculations for mean, mode, median, percentage change.</p>





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<ol style="list-style-type: none"> 2. Use ratios, fractions and percentages 3. Make estimates of the results of simple calculations 4. Use an appropriate number of significant figures 5. Find arithmetic means 6. Construct and interpret frequency tables and diagrams, bar charts and histograms 7. Understand simple probability 8. Understand the terms mean, mode and median 9. Make order of magnitude calculations 10. Understand and use the symbols: =, <, <<, >>, >, α, ~ 11. Change the subject of an equation 12. Translate information between graphical and numeric form 13. Plot two variables from experimental or other data 14. Use angular measures in degrees (physics questions only) 15. Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects (chemistry and physics questions only) 16. Calculate areas of triangles and rectangles, surface areas and volumes of cubes 		
<p>HALF TERM 5:</p> <p>Revision Cycles – Preparation for GCSE Examinations focusing on Paper 1 Content</p> <p>Science Skills SEE Lessons</p> <p>Biology, Chemistry and Physics Paper 1 examinations will take place this half term. Each paper will be:</p> <ul style="list-style-type: none"> • Written exam: 1 hour 15 minutes • Foundation and Higher Tier • 70 marks • 16.7% of GCSE 		<p>Supporting texts or wider reading</p> <p>Revision Guides, Science on a Page revision sheets, Past Paper exam questions to practise, Science Department Exam Strategy sheet.</p>
		<p>Opportunities for extended writing</p> <p>Extended Response 6 mark exam style question practise.</p>
		<p>Speak like an expert</p> <p>Keyword Definitions</p>
		<p>Links to careers, personal development and other subject areas.</p>
<p>HALF TERM 6:</p> <p>Revision Cycles – Preparation for GCSE Examinations focusing on Paper 2 Content</p> <p>Science Skills SEE Lessons</p> <p>Biology, Chemistry and Physics Paper 2 examinations will take place this half term. Each paper will be:</p>		<p>Supporting texts or wider reading</p> <p>Revision Guides, Science on a Page revision sheets, Past Paper exam questions to practise, Science Department Exam Strategy sheet.</p>
		<p>Opportunities for extended writing</p> <p>Extended Response 6 mark exam style question practise.</p>



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<ul style="list-style-type: none">• Written exam: 1 hour 15 minutes• Foundation and Higher Tier• 70 marks• 16.7% of GCSE		<p>Speak like an expert</p> <p>Keyword Definitions</p>
		<p>Links to careers, personal development and other subject areas.</p>