



Science Year 11 Long Term Map biology

Subject Intent/Aims

Expose all students to a broad range of learning opportunities to deepen their knowledge and understanding of themselves and the world around them and to build a solid foundation of Science knowledge and skills. We believe in developing curiosity and understand that science is an active process with many questions to be answered and still to be asked. We provide an understanding of how knowledge was derived, discovered and came to be accepted by the scientific community. By focusing on thinking, interpreting and evaluating rather than simply memorising scientific fact we intend to enable our students to use the skills that they need to answer their own scientific questions.

Our focus on the scientific process as a way of thinking and working will allow our students to develop their own ideas, attitudes and interpretations.

Topic Ecology

National Curriculum:

- levels of organisation within an ecosystem
- some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community
- how materials cycle through abiotic and biotic components of ecosystems
- the role of microorganisms (decomposers) in the cycling of materials through an ecosystem
- organisms are interdependent and are adapted to their environment
- the importance of biodiversity
- methods of identifying species and measuring distribution, frequency and abundance of species within a habitat
- positive and negative human interactions with ecosystems.

Composition

Explore how humans are threatening biodiversity as well as the natural systems that support it.

Understand how delicate ecosystems are and the interdependence of different species.

Topic Variation and Evolution

National Curriculum:

- the genome as the entire genetic material of an organism
- how the genome, and its interaction with the environment, influence the development of the phenotype of an organism
- the potential impact of genomics on medicine
- most phenotypic features being the result of multiple, rather than single, genes
- single gene inheritance and single gene crosses with dominant and recessive phenotypes
- sex determination in humans
- genetic variation in populations of a species
- the process of natural selection leading to evolution.
- the evidence for evolution
- developments in biology affecting classification
- the importance of selective breeding of plants and animals in agriculture
- the uses of modern biotechnology including gene technology; some of the practical and ethical considerations of modern biotechnology

Composition

Know that the number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring.



	<p>Recognise the DNA codes for proteins which impact the phenotype of organisms.</p> <p>Know that genetic information is passed onto offspring, driving natural selection.</p>
Components	Components
<p>Component 1:</p> <ul style="list-style-type: none">• Know what abiotic factor is and how it would affect a given community given appropriate data or context. <p>Component 2:</p> <ul style="list-style-type: none">• Know what a biotic factor is and how it might affect a given community given appropriate data or context. <p>Component 3:</p> <ul style="list-style-type: none">• Know about different types of adaptations and explain how organisms are adapted to live in their natural environment, given appropriate information. <p>Component 4:</p> <ul style="list-style-type: none">• Know that photosynthetic organisms are the producers of biomass for life on Earth.• Know the terms mean, mode and median.• Know sampling techniques to investigate the effect of a factor on the distribution of a species. <p>Component 5:</p> <ul style="list-style-type: none">• Know that many different materials cycles through the abiotic and biotic components of an ecosystem.• Know the stages and the importance of the carbon and water cycles to living organisms.• Know the role of microorganisms in cycling materials through an ecosystem by returning carbon to the atmosphere as carbon dioxide and mineral ions to the soil. <p>Component 6:</p> <ul style="list-style-type: none">• Know how waste, deforestation and global warming have an impact on biodiversity. <p>Component 7:</p> <ul style="list-style-type: none">• Know how 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. <p>Component 8:</p> <p>Know there is a 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.</p> <p>Component 9</p> <p>Know the environmental implications of deforestation.</p> <p>Component 10:</p> <ul style="list-style-type: none">• know some of the biological consequences of global warming.• Know that the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications	<p>Component 1:</p> <ul style="list-style-type: none">• Know that meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed. <p>Component 2:</p> <ul style="list-style-type: none">• Know that meiosis halves the number of chromosomes in gametes and fertilisation restores the full number of chromosomes. <p>component 3:</p> <p>Know the structure of DNA.</p> <p>Component 4:</p> <ul style="list-style-type: none">• Know the importance of understanding the human genome. <p>Component 5:</p> <ul style="list-style-type: none">• Know the meaning of the terms: gamete, chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype.• Know that most phenotype features are the result of multiple genes rather than single gene inheritance. <p>Component 6:</p> <ul style="list-style-type: none">• Know about the economic, social and ethical issues concerning embryo screening, given appropriate information. <p>Component 7:</p> <p>Know how a genetic cross shows sex inheritance.</p> <p>Component 8:</p> <ul style="list-style-type: none">• Know how the genome and its interaction with the environment influence the development of the phenotype of an organism• Know that there is usually extensive genetic variation within a population of a species.



	<ul style="list-style-type: none">• Know that all variants arise from mutations and that: most have no effect on the phenotype <p>Component 9:</p> <ul style="list-style-type: none">• Know evolution as a change in the inherited characteristics of a population over time through a process of natural selection which may result in the formation of a new species. <p>Component 10:</p> <ul style="list-style-type: none">• Know the impact of selective breeding of food plants and domesticated animals. <p>Component 11:</p> <ul style="list-style-type: none">• Know that genetic engineering is a process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.
Composites	Composites
<p>extract and interpret information from charts, graphs and tables relating to the effect of abiotic and biotic factors on organisms within a community.</p> <p>Plot and draw appropriate graphs selecting appropriate scales for the axes</p> <p>undertake a practical looking at species distribution in a given area and link this to biotic and abiotic factors.</p> <p>use knowledge from lesson as well as wider knowledge to inform valid opinions on global topic.</p>	<p>link new knowledge to prior learning.</p> <p>analyse information.</p> <p>apply the concept of probability in predicting the results of a single gene cross.</p> <p>use direct proportion and simple ratios to express the outcome of a genetic cross.</p> <p>complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees.</p> <p>construct a genetic cross by Punnett square diagram and use it. to make predictions using the theory of probability.</p> <p>explain how evolution occurs through natural selection of variants that give rise to phenotypes best suited to their environment.</p> <p>Explain the benefits and risks of selective breeding given appropriate information and consider related ethical issues.</p> <p>explain the potential benefits and risks of genetic engineering compared to selective breeding.</p> <p>use direct proportion and simple ratios in genetic crosses.</p>



	<p>use correct scientific terminology</p> <p>analyse new information to form valid informed opinions.</p> <p>analyse scientific evidence to prove or disprove theories.</p>
Higher Order Knowledge	Higher Order Knowledge
<p>Component 12</p> <ul style="list-style-type: none">•Know that decay is caused by decomposers and the factors that alter the rate of decay.•Know how these decomposers can be utilised for energy. <p>Component 13</p> <ul style="list-style-type: none">•Know the methods and reasons behind intensive farming.•Know there is a conflict between sustainable farming and cost.•Know the methods on offer for the future of farming including biotechnology.•Know the method and enzymes used in biotechnology.	<p>Component 12:</p> <ul style="list-style-type: none">•Know the basic steps behind protein synthesis including translation and transcription.•Know the impact of genetic mutations in relation to the order of codons and amino acids in genes. <p>Component 13:</p> <ul style="list-style-type: none">•Know how evolution through natural selection can lead to the creation of new species. <p>Component 14:</p> <ul style="list-style-type: none">•Know the basic steps in clone production in both animals and plants.•Be able to compare the positives and negatives of each type of cloning including ethical issues.
Key terms	Key terms
<p>Community</p> <p>Population</p> <p>Biotic</p> <p>Abiotic</p> <p>Interdependence</p> <p>Adaptation</p> <p>Deforestation</p> <p>Biodiversity</p> <p>Ecosystem</p> <p>Habitat</p> <p>Intraspecific competition</p> <p>Inter specific competition</p>	<p>Variation</p> <p>Evolution</p> <p>Natural Selection</p> <p>Genetic Engineering</p> <p>Fossils</p> <p>Extinction</p> <p>Binomial System</p> <p>Sexual Reproduction</p> <p>Asexual Reproduction</p> <p>Meiosis</p> <p>Gene</p> <p>Phenotype</p> <p>Genotype</p> <p>Allele</p> <p>Homozygous</p> <p>Heterozygous</p>



Final Composition/Deliberate Practice		Final Composition/Deliberate Practice	
End of unit test covering adaptation, biodiversity and sustainability In class assessments Required Practical- Looking at the distribution of species.		Planning, carrying out and analysing an investigation into adaptation	
Summative/Formative assessment		Summative/Formative assessment	
RRR, quick quizzes and Century nuggets. End of unit test on adaptations, Competition and Interdependence. Organisation of an Ecosystem Biodiversity and the impacts of Global Warming		RRR, quick quizzes and Century nuggets. End of unit assessment genetics, variation and evolution end of term assessment	
Numeracy and literacy		Numeracy and literacy	
Maths skills – graphs, calculations English – literacy skills – focusing onkeywords, tier 3 vocabulary, connectives, SPAG, synonyms,		Maths skills – graphs, calculations English – literacy skills – focusing onkeywords, tier 3 vocabulary, connectives, SPAG, synonyms,	
Cross curricular links		Cross curricular links	
Maths- Area of shapes and working out averages. Geography- Ecosystems and the impact of global warming. Food prep- Impacts on food production. RE sustainability		Maths- Ratios and probability R.E- Ethics of cloning humans Health and Social care- Treatment of genetic disease	
SMSC		British Value	
		RSHE	



<p><i>There will be multiple opportunities for students develop spiritually; being creative in their learning and a range of activities</i></p> <p><i>The high expectations placed on the student from the school and department mean that pupils will regularly be made aware of the right and wrong morally</i></p> <p><i>Pupils are expected to share the views morally on the different topics but also show respect and appreciate others in the classroom.</i></p> <p><i>The majority of topics will give the students opportunity to develop their social skills, from giving presentations to working in group tasks.</i></p>	<p><i>Students will be taught the legal implications of using the internet</i></p> <p><i>Students will be taught to fully appreciate other students viewpoints and the importance of being respectful</i></p> <p><i>Students will be taught the importance of selecting valid information from reliable sources for any presentation tasks that they do.</i></p> <p><i>Students are taught how to contribute to life in modern Britain by learning about the history of scientific discovery</i></p> <p><i>Students will learn how to display British Values when discussing sensitive issues</i></p>	<p><i>The students will be taught about how to be safe online and the dangers.</i></p> <p><i>The students will be made aware of online relationships and the sexual issues that may arise.</i></p> <p><i>The students will be regularly conversed on their physical and mental health when issues arise within topics</i></p> <p><i>They will be taught about the need for tolerance of other people's viewpoints</i></p> <p><i>Ethics of cloning and genetic modification</i></p>
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<p><u>Adapted Curriculum Content</u></p> <p>RP decomposition</p> <p>Decomposition</p> <p>Impacts of environmental change</p> <p>Trophic levels</p> <p>Factors affecting food security</p> <p>Intensive farming</p> <p>Sustainable fishing</p> <p>Role of biotechnology</p> <p>ALL TRIPLE ONLY</p>	<p><u>Adapted Curriculum Content:</u></p> <p>Advantages and disadvantages of sexual and asexual reproduction</p> <p>DNA structure and nucleotides</p> <p>Transcription and translation.</p> <p>effects of mutations on non coding DNA</p> <p>Biotechnology main steps</p> <p>Cloning</p> <p>The history of theory of evolution</p> <p>Speciation</p> <p>Mendel</p> <p>ALL TRIPLE ONLY</p>
<p><u>Adaptive Implementation Practices:</u></p> <p>Coloured paper/pens</p> <p>Differentiated worksheets</p> <p>Differentiated tasks</p> <p>Seating plans to maximise concentration allowing for visual/hearing impairments etc</p> <p>Appropriate use of IWB</p> <p>Dual coding</p> <p>Spare equipment</p> <p>Modelling experimental detail</p> <p>Pre drawn tables/graphs/diagrams to be labelled</p>	<p><u>Adaptive Implementation Practices:</u></p> <p>Coloured paper/pens</p> <p>Differentiated worksheets</p> <p>Differentiated tasks</p> <p>Seating plans to maximise concentration allowing for visual/hearing impairments etc</p> <p>Appropriate use of IWB</p> <p>Dual coding</p> <p>Spare equipment</p> <p>Modelling experimental detail</p> <p>Pre drawn tables/graphs/diagrams to be labelled</p>



St Philip Howard Catholic Voluntary Academy



Department Planning 2024



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