

Curriculum Map: Triple Biology Year 11 (Triple Biology only content in bold)

	Autumn	Spring
<p>Content Declarative knowledge 'I Know'</p>	<p>Topic: B6 Inheritance, variation and evolution Know the main features of sexual and asexual reproduction, that it involves the fusion of gametes, sperm and egg in animals and pollen and ovule cells in flowering plants. Know that the mixing of genetic information in gametes leads to variation in the offspring. Know that asexual reproduction only involves one parent and there is no mixing of gametes and that it leads to genetically identical offspring known as clones. Know that gametes are produced by a process known as meiosis when a cell divides twice to form four gametes, each with a single set of chromosomes. Know that gametes join at fertilisation to restore the normal number of chromosomes and the new cell divides by mitosis to form an embryo in which cells differentiate. Know the advantages of sexual reproduction and asexual reproduction. Know that some organisms reproduce by both methods depending on the circumstances e.g. malarial parasites, fungi, some plants. Know the basic structure of DNA and define the term genome. Know the importance of understanding the human genome. Know the structure of DNA as a polymer made from four different nucleotides. Know the structure of a nucleotide and the complementary base pairing. Know the relationship between DNA triplets and amino acids and an outline of protein synthesis. Know how genetic variants may influence phenotype. Know that proteins are synthesised on ribosomes, according to a template. Know that mutations occur continuously and that most do not alter the protein but some may alter the protein so that its function is affected e.g. an enzyme or structural protein and some may act on non-coding parts of DNA and switch genes on or off. Know how to use the terms allele, dominant, recessive, homozygous, and heterozygous correctly. Know that some characteristics are controlled by a single gene while most characteristics are a result of multiple genes interacting. Know that each gene may have different forms called alleles. Know the symptoms of some disorders like polydactyly and cystic fibrosis and how they are inherited. Know that the human body cells contain 23 pairs of chromosomes, 22 pairs control characteristics only and the 23rd pair carries the genes that determine sex. Know that in females the sex chromosomes are the same (XX); in males the chromosomes are different (XY).</p>	<p>Topic: B6 Inheritance, variation and evolution Know that Charles Darwin proposed the theory of evolution by natural selection which states that all species evolved from simple life forms that first developed more than three billion years ago and that this theory is now widely accepted. Know the stages of evolution by natural selection. Know that there was much controversy surrounding Darwin's revolutionary new ideas. Know that Lamarck's theory of evolution was based on the idea that changes that occur in an organism during its lifetime can be inherited. Know that Wallace independently proposed the theory of evolution by natural selection and did much pioneering work on speciation. Know that Mendel carried out breeding experiments on plants and observed that the inheritance of characteristics is determined by inherited 'units'. Know that these 'units' are genes and are located on chromosomes. Know how fossils are formed and that they are the remains of organisms from many years ago, which support Darwin's theory. Know how bacteria becomes resistant to antibiotics and how mutation is involved in the developing of resistant strains. Know that extinction may be caused by many different reasons. Know that organisms of the same species can interbreed to produce fertile offspring. Know that selective breeding (artificial breeding) is a process by which humans breed animals and plants for their desirable characteristics. Know the steps involved in selective breeding and explain the impact it can have on a phenotype. Know examples of GM organisms and state how they are useful to humans. Know the term genetic engineering and that it involves modifying the genome of an organism to introduce a desired characteristic, with examples. Know that enzymes are used to cut the gene from a chromosome; gene is inserted into a vector, e.g. bacterial</p>

	<p>Know that the genes present, or genotype, operate at a molecular level to develop characteristics that are expressed as a phenotype.</p> <p>Know that the differences in the characteristics of individuals may be due to genes they have inherited, environmental causes or a combination of both.</p> <p>Know that mutations are changes in the DNA code that may lead to more rapid evolution, although mutations that result in a new phenotype are rare.</p>	<p>plasmid or virus; vector is used to insert gene into cell; cell then makes a new protein to produce the desired characteristic.</p> <p>Know the cloning techniques of tissue culture, cuttings, embryo transplants and adult cell cloning.</p> <p>Know the basic principles of classification and the system developed by Linnaeus.</p> <p>Topic: B1 Cell Biology</p> <p>Know that bacteria multiply by simple cell division as often as once every 20 minutes if they have enough nutrients and a suitable temperature.</p> <p>Know that bacteria can be grown in a nutrient broth solution or as colonies on an agar gel plate.</p> <p>Topic: B3 Infection and Response</p> <p>Know that monoclonal antibodies are produced from a single clone of cells and are specific to one binding site on one protein antigen.</p> <p>Know the signs of plant disease and how identification of the disease can be made.</p> <p>Know that plants can be infected by a range of viral, bacterial and fungal pathogens as well as by insects.</p> <p>Know that plants can be damaged by a range of ion deficiency conditions.</p>
<p>Skills</p> <p>Procedural Knowledge</p> <p>'I know how to'</p>	<p>Know how to make models to show what happens during fertilisation in plants and animals</p> <p>Know how to use a model to show why variation is produced in offspring from sexual reproduction than asexual reproduction.</p> <p>Know how to model the behaviour of chromosomes during meiosis.</p> <p>Know how to explain the advantages and disadvantages of asexual and sexual reproduction for any organism if given appropriate information.</p> <p>Know how to interpret a diagram of DNA structure.</p> <p>Be able to identify the number of pairs of chromosomes and each pair of sex chromosomes from male and female karyotypes</p> <p>Be able to complete Punnett squares and genetic crosses, interpret the results and describe the offspring.</p> <p>Be able to reorder by size: cell, nucleus, DNA, chromosome, and gene and extract DNA from Kiwi fruit.</p> <p>Be able to complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees.</p>	<p>Know how to describe the steps which give rise to new species.</p> <p>Know how to describe how to prepare an uncontaminated culture using aseptic technique.</p> <p>Know how to calculate cross-sectional areas of colonies or clear areas around colonies using πr^2</p> <p>Know how to calculate the number of bacteria in a population after a certain time if given the mean division time.</p> <p>Know how to express the answer in standard form.</p> <p>Required practical: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.</p> <p>Know how monoclonal antibodies are produced.</p> <p>Know how monoclonal antibodies can be used.</p> <p>Know how to describe physical and chemical plant defence responses.</p>

		Know how to describe mechanical adaptations as plant defence responses.
Strategies Conditional Knowledge 'I know when to'	Make informed judgements about the economic, social, and ethical issues concerning embryo screening, given appropriate information. Discuss the importance of understanding the human genome. Understand the historical developments of our understanding of the causes and prevention of malaria.	Explain the potential benefits and risks of cloning in agriculture and in medicine and that some people have ethical objections. Appreciate that the theory of evolution by natural selection developed over time and from information gathered by many scientists. Understand that there was much controversy surrounding the ideas in On the Origin of Species. Know how to describe the work of Darwin and Wallace and explain the impact of these ideas on Biology. Understand the work of Mendel and why the importance of Mendel's discovery was not recognised until after his death. Appreciate that our current understanding of genetics has developed over time. Understand how scientific methods and theories develop over time. Understand that monoclonal antibodies create more side effects than expected and are not as widely used as everyone had hoped when they were first developed. Appreciate the power of monoclonal antibodies and consider any ethical issues. Evaluate the advantages and disadvantages of monoclonal antibodies. The everyday application of scientific knowledge to detect and identify plant disease. The understanding of ion deficiencies allows horticulturalists to provide optimum conditions for plants.
Key Questions	What are the main features of sexual and asexual reproduction? How do cells divide by meiosis to form gametes? What are the advantages and disadvantages of sexual and asexual reproduction? Explain how sexual reproduction give rise to variation. Why is understanding the human genome important? What is the structure of DNA and how is this code used to make proteins? What evidence led to the discovery of the role of DNA?	How can plants and animals be cloned? What is the theory of evolution by natural selection and how did this theory evolve? What are the principles of aseptic technique? What are monoclonal antibodies and what are their possible applications? How do plants protect themselves against disease?
Assessment topics	B6 Mid topic test (18 minutes) after 9 lessons. PPE Paper 2: Topics B5, B6, B7 (1 hour 45 minutes)	B6 End of topic test (58 minutes) PPE Paper 1: Topics B1, B2, B3, B4 (1 hour and 45 minutes)
Cross curricular links/Character Education	Maths – concept of probability in predicting the results of a single gene cross. - using direct proportion and simple ratios to express the outcome of a genetic cross	Maths - calculate cross-sectional areas of colonies or clear areas around colonies using πr^2 - calculate the number of bacteria in a population after a certain time if given the mean division time.

	SMSC – appreciate that embryo screening and gene therapy may alleviate suffering but consider the ethical issues which may arise.	- express the answer in standard form. SMSC – ethical issues surrounding the use of monoclonal antibodies
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In the Spring and Summer terms students focus on revision of all Biology content in preparation for the summer examination series.

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