Subject: Year 10 Biology
Year Overview

Key content – knowledge and skills	National Curriculum focus
In light of school closures during the summer term 2020, the following year 9 topics have been carried through into year 10. Work has been set via distance learning for these topics but will still need to be revisited. **<u>Biology Infections and Response:</u>** Pathogens are microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. **<u>Biology Bioenergetics:</u>** In this section we will explore how plants harness the Sun's energy in photosynthesis in order to make food. This process liberates oxygen which has built up over millions of years in the Earth's atmosphere. Both animals and plants use this oxygen to oxidise food in a process called aerobic respiration which transfers the energy that the organism needs to perform its functions. Conversely, anaerobic respiration does not require oxygen to transfer energy. During vigorous exercise the human body is unable to supply the cells with sufficient oxygen and it switches to anaerobic respiration. This process will supply energy but also causes the build-up of lactic acid in muscles which causes fatigue	Translate numeric data into graphical form. Applying knowledge of a range of techniques, apparatus and materials appropriate to the experiment. Applying scientific principles to the context of real life situations.

Additional topics include (already planned for year 10): **<u>Biology- Homeostasis and response:</u>** **<u>Biology: Inheritance, variation and evolution</u>** **<u>Biology Evolution</u>** **<u>Biology: Ecology</u>**	

Key assessment points

End of unit assessment

Christian ethos

British values

- Know that there are consequences in rules are not followed
- Scientific developments may give rise to moral dilemmas
- Understanding that science has a major effect on the quality of our lives
- Considering the environment
- Understanding that science has a major effect on the quality of our lives.
- Consider the benefits of scientific developments and the social responsibility involved

Medium-term plan

Week	Month	Learning Intentions and/or Key Questions
Aut1-1	September	**<u>Biology- Infection and Response:</u>** • I can suggest how communicable diseases are spread. • I can suggest links between lifestyle and health. • I can discuss the validity of a statement based on evidence in the form of data. • I can explain why viruses are always pathogens but not all bacteria are. • I can explain how pathogens are passed from one organism to another and use this to suggest ways of preventing the spread. • I can explain what is meant by exponential growth and analyse a graph showing it. • I can suggest how to measure the growth of bacteria and discuss uncertainty. • I can plan a detailed investigation to find out how a variable affects the growth of bacteria. • I can write a prediction using detailed scientific knowledge. • I can calculate the number of bacteria in a sample when using a counting chamber. • I can apply knowledge of sampling techniques to ensure samples are representative.
Aut1-2		
Aut1-3		
Aut1-4		
Aut1-5	October	
Aut1-6		
Aut1-7		

		• I can use scientific knowledge to explain in detail how methods reduce or prevent the spread of disease. • I can use an example to explain how the scientific method has been applied to help prevent the spread of disease. • I can explain how measles, HIV and tobacco mosaic virus affect the infected organism. • I can explain why viral infections are often more difficult to prevent and treat than bacterial infections. • I can write a persuasive letter to parents urging them to vaccinate their children against measles. • I can suggest why more people die from viral diseases compared to bacterial diseases. • I can explain in detail how methods to control the spread of salmonella and gonorrhoea work. • I can explain how rose black spot affects the growth of a plant. • I can explain why it is so expensive to stop the spread of malaria. • I can explain how a reduced or over active immune system can cause illness. • I can explain in detail how antibody production fights pathogens. • I can evaluate an analogy of the human defence systems against disease. • I can analyse data on plant growth to write conclusions using scientific knowledge. • I can suggest how plant diseases affect food security. • I can explain in detail how and why ion deficiencies affect plant growth. • I can explain in detail how plant defence responses work. • I can interpret information from a scientific article to explain how plant to plant communication can be used as a form of defence. • I can explain why, if a large proportion of the population is vaccinated, the spread of the pathogen is reduced. • I can apply ideas about specificity of antibodies. • I can suggest a reasoned explanation for a pattern in data. • I can explain in detail how antibiotic resistant bacteria arise. • I can explain why scientists are constantly developing new antibiotics. • I can suggest why mould naturally produces antibiotics. • I can discuss how effective herbal remedies are. • I can analyse data to evaluate the effectiveness of new antibiotics and make a reasoned decision which one to develop further. • I can describe in some detail how new medical drugs are tested and trialled for safety, effectiveness, toxicity, efficacy, and dose. • I can critically analyse the results from a double blind trial. • I can explain why the results of drug trials are published in journals. • I can explain why hybridoma cells are used to produce monoclonal antibodies. • I can explain in detail how pregnancy tests work. • I can describe how monoclonal antibodies are used to produce ELISA tests and outline how they are used. • I can explain in detail how the methods of using monoclonal antibodies to treat cancer work. • I can evaluate the use of monoclonal antibodies in treating cancer compared to other treatments.
		Half term holiday
Aut2-1	November	**<u>Biology- Bioenergetics:</u>**

Aut2-2 Aut2-3 Aut2-4 Aut2-5 Aut2-6 Aut2-7	December	• I can explain how adaptations of the leaf make photosynthesis efficient. • I can explain how adaptations of the leaf make photosynthesis efficient. • I can explain why chlorophyll is needed for photosynthesis. • I can apply knowledge of enzymes to explain why a high temperature affects the rate of photosynthesis. • I can predict how the rate of photosynthesis will be affected with more than one limiting factor. • I understand and can use the inverse square law and light intensity in the context of photosynthesis. • I can explain how carnivorous plants are adapted to their environment. • I can explain how and why plants convert glucose to starch for storage. • I can explain in detail how using greenhouses can help control limiting factors and increase the rate of photosynthesis. • I can use data to comment on the cost-effectiveness of greenhouses. • I can evaluate the use of greenhouses and hydroponics in terms of economics. • I can apply understanding of respiration in new contexts. • I can explain why respiration is an exothermic reaction. • I can explain why a control is necessary in some scientific investigations. • I can explain why stores of glycogen change with exercise. • I can justify he choice of chart/graph used to display data. • I can compare and contrast anaerobic respiration in animals, plants, and microorganisms. • I can explain in detail why heart and breathing rate continue to be high for a period of time after exercise. • I can write a prediction based on scientific knowledge. • I can explain the link between protein consumption and concentration of urea • in urine. • I can evaluate information to assess credibility.
		Christmas holiday
Spr1-1 Spr1-2 Spr1-3 Spr1-4 Spr1-5 Spr1-6	January February	<u>Biology Homeostasis and response</u> • I can apply knowledge of enzymes and osmosis to explain in detail why internal conditions need to be maintained. • I can explain how drugs affect homeostasis. • I can explain how nervous and chemical responses differ. • I can explain in detail how the nervous system coordinates a response. • I can evaluate results in detail in order to discuss precision and accuracy. • I can explain in detail how impulses travel across a synapse. • I can apply knowledge of synapses to explain the effects of drugs. • I can evaluate in detail the benefits and risks of investigating and treating brain disorders. • I can consider ethical dilemmas surrounding brain research. • I can independently plan a method to test a hypothesis. • I can draw an accurate ray diagram to show how to eye focuses light.

		• I can explain in detail the changes to the eye in response to changes in light intensity. • I can draw accurate ray diagrams to explain what happens during accommodation and what causes long and short sightedness. • I can evaluate the risks and benefits of surgery to treat long and short sightedness. • I can compare and contrast nervous and hormonal action. • I can apply knowledge to suggest and explain how changes in hormone production could affect the body. • I can explain how glucagon interacts with insulin to control blood glucose levels. • I can explain why it is important to control the level of glucose in the blood. • I can evaluate different treatments for Type 1 diabetes. • I can explain in detail how lifestyle choices affect the risk of developing Type 2 diabetes. • I can summarise how scientists are working to find a cure for diabetes. • I can explain how adrenaline prepares the body for 'fight or flight'. • I can design labelled flow diagrams of negative feedback control. • I can explain why fertility changes with age in men and women. • I can explain the role of each hormone in the menstrual cycle. • I can explain the interactions of hormones in the control of the menstrual cycle. • I can interpret in detail a graph showing how the levels of hormones change. • I can apply knowledge of hormones in the menstrual cycle to suggest how hormonal contraceptives work. • I can evaluate different methods of contraception in detail. • I can describe FSH and IVF can be used to help treat infertility. • I can evaluate the advantages and disadvantages of IVF. • I can use different viewpoints to make an informed decision on unused IVF embryos. • I can explain in detail how the production and diffusion of auxin affects the growth of shoots and roots. • I can independently plan and carry out an investigation into the effect of light on plant growth. • I can predict the results of an investigation of tropisms, with detailed scientific reasons. • I can explain how the effects of plant hormones are useful in agriculture, horticulture and the food industry. • I can evaluate the use of synthetic plant hormones.
		Half term holiday
Spr2-1		<u>Biology: Inheritance and variation</u> • I can contrast sexual and asexual reproduction. • I can explain in detail why meiosis is important for sexual reproduction. • I can evaluate a model to show that variation is produced in offspring from sexual reproduction but not in asexual reproduction. • I can compare and contrast mitosis and meiosis. • I can explain in detail why gametes are all genetically different to each other. • I can solve a complex calculation to determine the number of possible gametes formed during meiosis.
Spr2-2		
Spr2-3	March	
Spr2-4		
Spr2-5		
Spr2-6		

		• I can suggest and explain the advantages and disadvantages of using both methods of reproduction. • I can explain in detail how plants reproduce sexually. • I can describe DNA as a polymer made up of repeating nucleotide units each consisting of a sugar, a phosphate and a base. • I can explain how the order of bases determines the type of protein made. • I can evaluate a model of DNA • I can compare and • I can explain why knowledge of the genomes of other species is useful. • I can discuss possible issues surrounding genome sequencing. • I can explain why the cost of genome sequencing has reduced since it was started. • I can explain how the human body can make so many different proteins with so few genes. • I can outline the reasons why most mutations are harmless. • I can explain in detail how a mutation can affect the function of a protein. • I can use the terms homozygous and heterozygous correctly. • I can explain how the genotype affects the phenotype at a molecular level. • I can explain why Punnett squares cannot be used to work out possible genotypes in offspring for the majority of human traits. • I can explain why we only get the expected ratios in a genetic cross if there are large numbers of offspring. • tree to work out where an individual is likely to be homozygous or heterozygous for particular alleles. • I can evaluate in to detail the use of using genetic engineering to cure inherited disorders. • I can use a genetic cross to predict the probability of a child inheriting an genetic disorder. • I can explain how screening shows if the embryo has a genetic disorder. • I can make an informed judgement about embryo screening by evaluating in detail the economic, social and ethical issues. • I can explain why some traits are only due to genetic causes. • I can explain why it is so hard to get valid results form identical-twin studies. • I can discuss some of the issues scientists face when conducting twin studies.
	April	**Easter holiday**
Sum1-1		<u>Biology Evolution</u> • I can use a family tree • I can explain why it is rare that a mutation leads to a new phenotype. • I can apply the theory of evolution by natural selection to suggest how a specific organism evolved. • I can explain how a change in a model can make it useful for explaining something else. • I can compare and contrast natural and artificial selection. • I can explain in detail how the variation of alleles in a population is reduced through selective breeding. • I can explain in detail why the reduction of variation is a problem.
Sum1-2		
Sum1-3	May	
Sum1-4		
Sum1-5		
Sum1-6		

		• I can explain the process of genetic engineering using technical vocabulary, e.g. plasmid, vector, restriction enzymes, marker genes, recombinant DNA. • I can explain how genetic engineering could be used to cure people with inherited disorders and discuss the limitations. • I can explain the benefits of embryo transplants over sexual reproduction for farmers. • I can compare and contrast tissue culture in plants and embryo transplantation in animals. • I can use advanced terminology to explain the process of adult cell cloning. • I can compare and contrast the process of adult and embryo cloning. • I can evaluate the possible uses of adult cell cloning. • I can evaluate the potential benefits and risks of genetic engineering. • I can explain in detail the significance of events in the field of genetics. • I can use a Punnett square to draw conclusions from the results of Mendel's experiments. • I can suggest why Mendel's work was not recognised during his lifetime but the work of Watson and Crick was. • I can explain why we no longer accept Lamarck's theory in the vast majority of cases. • I can describe an example of where Lamarck's theory could be correct. • I can explain how and why theories, such as how evolution takes place, change over time. • I can explain how the finch species on the different Galapagos islands is evidence for evolution by natural selection. • I can discuss why Darwin was conflicted over publishing his theory. • I can explain why scientists eventually accepted his theory. • I can explain the relationship between the length of isolation and number of unique species that evolve., • I can suggest how new species of organisms evolved. • I can explain why Wallace's work prompted Darwin to publish The Origin of Species. • I can evaluate the use of fossils as evidence for evolution by natural selection and how life first formed. • I can use standard form to discuss the large time scales that we use when considering the evolution of life. • I can create a geological timeline to scale. • I can suggest alternative hypotheses for why an organism became extinct. • I can evaluate in detail the need to conserve endangered plants. • I can apply knowledge of speciation to explain why dodos were only found on one island. • I can link ideas to give a scientific explanation why an asteroid could have caused the dinosaurs to become extinct. • I can suggest why mass extinctions are important for the evolution of life on Earth. • I can evaluate two theories to come to a conclusion about which is more believable and explain why scientists are not sure what caused the extinction of dinosaurs or mammoths. • I can explain how a fast reproduction rate is linked to the development of antibiotic resistance strains. • I can explain how antibiotic resistant bacteria are evidence for evolution.

		• I can summarise the reasons why the development of new antibiotics is unlikely to keep up with the emergence of new strains of antibiotic resistant bacteria. • I can use the Linnaean system to name the groups that given organisms belong to. • I can suggest why hybrids are not assigned scientific names using the binomial system.
	June	**Half term holiday**
Sum2-1		<u>Biology: Ecology</u> • I can link keywords to explain why a community is stable and important. • I can use evidence to write hypotheses about why populations have changed in a community. • I can explain why interdependence is important in maintaining a stable community. • I can describe in detail how to measure the pH and water content of soil. • I can analyse data in detail and draw appropriate conclusions. • I can discuss what factors determine the size of the quadrat used. • I can design independently an investigation based around a question or hypothesis. • I can evaluate in detail the use of sampling to estimate • population size. • I can evaluate a model of competition between organisms. • I can use the terms inter-specific and intra-specific competition and give examples of each. • I can suggest and explain how animals are adapted to compete for resources. • I can plan a method to investigate competition between cress seeds. • I can analyse data to explain the effects of overcrowding. • I can suggest the problems caused by plants that can easily outcompete others. • I can explain how an unfamiliar plant is adapted and give reasons for its adaptations. • I can link and explain rate of transpiration to leaf surface. • I can suggest and explain why a cactus would not survive in a cold climate. • I can explain in detail why all living things depend on producers. • I can evaluate in detail food chains/webs as models to show feeding relationships. • I can make predictions based on data of a predator prey relationship. • I can explain how detritivores increase the rate if decay using ideas about surface area. <u>REVISION AND PREPARATION FOR END OF YEAR ASSESSMENT</u>
Sum2-2		
Sum2-3		
Sum2-4		
Sum2-5	July	
Sum2-6		
Sum2-7		