Beths Grammar School KS4 (Biology) Curriculum Map – Year 11

Term **GCSE OCR BIology A Gateway Science Suite**	**INTENT** **Substantive Knowledge** This is the specific, factual content for the topic, which should be connected into a careful sequence of learning.	**IMPLEMENTATION** **Disciplinary Knowledge (Skills)** This is the action taken within a particular topic in order to gain substantive knowledge.	**IMPACT** **Assessment opportunities** What assessments will be used to measure student progress? Evidence of how well students have learned the intended content.
Autumn Term 1A Year 11	**<u>Intent</u>** Learners can relate this subtopic back to prior learning on how animals and plants are adapted to their environment. By the end of this subtopic, they should be able to explain how those adaptations have arisen. Learners need to consider how species they are familiar with have arisen and how they are similar yet distinct from other species. Learners should appreciate that changes in the environment can leave some individuals, or even some entire species, unable to compete and reproduce leading to extinction. Variation in the genome and changes in the environment drive the process of natural selection, leading to changes in the characteristics of populations. Evolution accounts for both biodiversity and how organisms are all related to varying degrees. Key individuals have played important roles in the development of our understanding of genetics.	B5.2a state that there is usually extensive genetic variation within a population of a species. B5.2b describe the impact of developments in biology on classification systems to include natural and artificial classification systems and the use of molecular phylogenetics based on DNA sequencing. ***Natural and artificial classification systems and use of molecular phylogenetics based on DNA sequencing.*** B5.2c explain how evolution occurs through the natural selection of variants that have given rise to phenotypes best suited to their environment to include the concept of mutation. ***the concept of mutation*** B5.2d describe 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 new species. B5.2e describe the evidence for evolution to include fossils and antibiotic resistance in bacteria. ***fossils and antibiotic resistance in bacteria*** B5.2f describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection and explain the impact of these ideas on modern biology to include seedbanks being used as a store of biodiversity (separate science only) ***seedbanks being used as a store of biodiversity***	***Test on topic 5.2, followed by Test on all of Topic 1***

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Autumn Term 1B Year 11	**<u>Intent</u>** Why is this taught now? Living organisms interact with each other, the environment and with humans in many different ways. If the variety of life is to be maintained, we must actively manage our interactions with the environment. We must monitor our environment, collecting and interpreting information about the natural world, to identify patterns and relate possible cause and effect. From their study in topic B4, learners should be familiar with ecosystems and the various ways organisms interact. They should understand how biotic and abiotic. This topic reminds learners how organisms interact with each other and the environment and covers in more detail how human interactions within ecosystems can affect the variety of life. Learners must learn how we collect data using a variety of sampling techniques to monitor our environment and how we interpret that data to identify patterns and relate possible cause and effect. Learners will also look at what we can do to reduce human impact on the environment to maintain local and global biodiversity and what challenges this may entail.	BM6.1i - construct and interpret frequency tables and diagrams, bar charts and histograms. B6.1a - explain how to carry out a field investigation into the distribution and abundance of organisms in a habitat and how to determine their numbers in a given area to include sampling techniques (random and transects, capture-recapture), use of quadrats, pooters, nets, keys and scaling up methods. ***sampling techniques (random and transects, capture-recapture), use of quadrats, pooters, nets, keys and scaling up methods.*** ***BM6.1ii - understand the principles of sampling as applied to scientific data.*** ***Investigation of ecological sampling methods. Using the symbols =, <>, >, ?, ~ in answers where appropriate. (PAG B1, PAG B3) Investigation of sampling using a suitable model (e.g. measuring the red sweets in a mixed selection)*** B6.1b - describe both positive and negative human interactions within ecosystems and explain their impact on biodiversity to include the conservation of individual species and selected habitats and threats from land use and hunting. ***the conservation of individual species and selected habitats and threats from land use and hunting*** ***investigation into the effectiveness of germination in different strengths of acid rain. (PAG B3, PAG B6) Investigation into the effects of lichen distribution against pollution. (PAG B3)*** B6.1c - explain some of the benefits and challenges of maintaining local and global biodiversity to include the difficulty in gaining agreements for and the monitoring of conservation schemes along with the benefits of ecotourism.	***Trial Exams*** ***PAG B1 and PAG B3*** ***PAG B3 and PAG B6*** ***Test on 6.1***

		the difficulty in gaining agreements for and the monitoring of conservation schemes along with the benefits of ecotourism. *B6.1d - evaluate the evidence for the impact of environmental changes on the distribution of organisms, with reference to water and atmospheric gases	
Spring Term 2A Year 11	**Intent** Why is this taught now? Learners should be familiar with the content of a healthy human diet and the consequences of imbalances in a healthy daily diet. Their knowledge and understanding from topics 1, 4 and 5 will also be drawn together in this topic. This includes the organisation of DNA, what plants require enabling them to photosynthesise, interactions between species and the idea of variability within species and subsequent selection of characteristics. The human population is increasing rapidly and with this comes a need for more food. Biologists are seeking to tackle this increased demand, which will lead to an improvement in the lives of many people around the world. However, there are many things to consider in achieving this aim, not least the impact on ecosystems. There is much debate surrounding the use of gene technology as a potential solution to the problem of food security	6.2 a) Describe some of the biological factors affecting levels of food security to include increasing human population, changing diets in wealthier populations, new pests and pathogens, environmental change, sustainability and cost of agricultural inputs. ***increasing human population, changing diets in wealthier populations, new pests and pathogens, environmental change, sustainability, and cost of agricultural inputs*** 6.2 b) Describe and explain some of the possible agricultural solutions to the demands of the growing human population to include increased use of hydroponics, biological control, gene technology, fertilisers and pesticides. ***increased use of hydroponics, biological control, gene technology, fertilisers and pesticides*** B6.2c - explain the impact of the selective breeding of food plants and domesticated animals. ***Research into the Rothamsted Research Broadbalk experiment*** B6.2d - describe genetic engineering as a process which involves modifying the genome of an organism to introduce desirable characteristics. B6.2e - describe the main steps in the process of genetic engineering to include restriction enzymes, sticky ends, vectors e.g. plasmids, ligase, host bacteria, selection using antibiotic resistance markers ***restriction enzymes, sticky ends, ligase, host bacteria and selection using antibiotic resistance markers, vectors e.g. plasmids***	***Test on 6.2***

		Produce a storyboard of the processes for genetic engineering. B6.2f - explain some of the possible benefits and risks of using gene technology in modern agriculture - practical and ethical considerations. ***practical and ethical considerations*** B6.2g - describe and explain some possible biotechnological solutions to the demands of the growing human population to include genetic modification. ***genetic modification*** ***Research into the growth of GM crops or livestock.***	
Spring Term 2B Year 11	**<u>Intent</u>** Why is this taught now? Learners should be familiar with the effects of 'recreational' drugs (including substance misuse) on behaviour, health and life processes, the impact of exercise, asthma and smoking on the gas exchange system and the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. This topic area covers types of disease, how they are spread, how our bodies defend themselves against disease and how immunity is achieved. The topic is split into two main categories: communicable disease in plants and animals and non-communicable disease. The prevention of disease is also covered so that learners become more aware of how to reduce our risk of contracting these diseases through our life-style choices and what new technologies scientists are developing to combat disease such as monoclonal antibodies and gene technology.	B6.3a - describe the relationship between health and disease. B6.3b - describe different types of diseases to include communicable and non-communicable diseases. ***To include communicable and non-communicable diseases*** B6.3c - describe the interactions between different types of disease to include HIV and tuberculosis; HPV and cervical cancer. ***To include HIV and tuberculosis, HPV and cervical cancer*** B6.3d - explain how communicable diseases (caused by viruses, bacteria, protists and fungi) are spread in animals and plants to include scientific quantities, number of pathogens, number of infected cases, estimating number of cases. ***To include scientific quantities, number of pathogens, number of infected cases, estimating number of cases*** B6.3e - explain how the spread of communicable diseases may be reduced or prevented in animals and plants to include detection of the antigen, DNA testing, visual identification of the disease. ***To include detection of the antigen, DNA testing, visual identification of the disease*** B6.3f - describe a minimum of one common human infection, one plant disease and sexually transmitted infections in humans including HIV/AIDS to include plant diseases: virus tobacco	

	Diseases affect the health of populations of both humans and plants. Scientists are constantly on the lookout for ways of preventing and combating disease. The prevention of disease in plants is important so that we are able to grow healthy plants enabling us to feed ourselves and enhance our environment. The understanding of how disease is spread, how our bodies defend themselves against disease and how immunity is achieved is essential to enable us to combat potentially fatal diseases spreading throughout whole populations. Non-communicable diseases also have an impact on the health of the population. The prevention of these diseases is frequently discussed in the media, with advice being given to us on how to reduce our risk of contracting these diseases through our life-style choices and discussion of new technologies.	mosaic virus TMV, fungal Erysiphe graminis barley powdery mildew, bacterial Agrobacterium tumafaciens crown gall disease. ***To include human infections: one example of each viral, fungal, bacterial plant diseases: viral tobacco mosaic virus TMV, fungal Erysiphe graminis barley powdery mildew, bacterial Agrobacterium tumefaciens crown gall disease*** B6.3g - describe physical plant defence responses to disease to include leaf cuticle, cell wall. ***leaf cuticle, cell wall*** B6.3h - describe chemical plant defence responses to include antimicrobial substances. ***to include antimicrobial substances*** B6.3i - describe different ways plant diseases can be detected and identified, in the lab and in the field to include the laboratory detection of the DNA or antigen from the disease causing organism. The field diagnosis by observation and microscopy ***the laboratory detection of the DNA or antigen from the disease causing organism. The field diagnosis by observation and microscopy***	
Summer Term 3A Year 11	**Intent** Why is this taught now? Learners should be familiar with the effects of 'recreational' drugs (including substance misuse) on behaviour, health and life processes, the impact of exercise, asthma and smoking on the gas exchange system and the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. This topic area covers types of disease, how they are spread, how our bodies defend themselves against disease and how immunity	B6.3j - explain how white blood cells and platelets are adapted to their defence functions in the blood. B6.3k - describe the non-specific defence systems of the human body against pathogens. B6.3l - explain the role of the immune system of the human body in defence against disease. B6.3m - describe how monoclonal antibodies are produced. B6.3n - describe some of the ways in which monoclonal antibodies can be used to include their role in detecting antigens in pregnancy testing, detection of diseases (prostate cancer) and potentially treating disease (targeting cancer cells) ***their role in detecting antigens in pregnancy testing, detection of diseases (prostate cancer) and potentially treating disease (targeting cancer cells)***	

	is achieved. The topic is split into two main categories: communicable disease in plants and animals and non-communicable disease. The prevention of disease is also covered so that learners become more aware of how to reduce our risk of contracting these diseases through our life-style choices and what new technologies scientists are developing to combat disease such as monoclonal antibodies and gene technology. Diseases affect the health of populations of both humans and plants. Scientists are constantly on the lookout for ways of preventing and combating disease. The prevention of disease in plants is important so that we are able to grow healthy plants enabling us to feed ourselves and enhance our environment. The understanding of how disease is spread, how our bodies defend themselves against disease and how immunity is achieved is essential to enable us to combat potentially fatal diseases spreading throughout whole populations. Non-communicable diseases also have an impact on the health of the population. The prevention of these diseases is frequently discussed in the media, with advice being given to us on how to reduce our risk of contracting these diseases through our life-style choices and discussion of new technologies.	B6.3o - explain the use of vaccines and medicines in the prevention and treatment of disease to include antibiotics, antivirals and antiseptics. ***antibiotics, antivirals and antiseptics*** ***Research into whether children should be routinely vaccinated?*** B6.3p - explain the aseptic techniques used in culturing organisms to include use of alcohol, flaming, autoclaving of glassware and growth media, and measures used to stop contaminants falling onto/into the growth media (e.g. working around a Bunsen burner) ***use of alcohol, flaming, autoclaving of glassware and growth media, and measures used to stop contaminants falling onto/into the growth media (e.g. working around a Bunsen burner)*** ***Investigation into growth bacterial cultures using aseptic techniques. (PAG B1, PAG B7)*** B6.3q - describe the processes of discovery and development of potential new medicines to include preclinical and clinical testing. ***preclinical and clinical testing*** ***Investigation into growth bacterial cultures using aseptic techniques. (PAG B1, PAG B7)*** B6.3r - recall that many non-communicable human diseases are caused by the interaction of a number of factors to include cardiovascular diseases, many forms of cancer, some lung (bronchitis) and liver (cirrhosis) diseases and diseases influenced by nutrition, including type 2 diabetes. ***cardiovascular diseases, many forms of cancer, some lung (bronchitis) and liver (cirrhosis) diseases and diseases influenced by nutrition, including type 2 diabetes.*** B6.3s - evaluate some different treatments for cardiovascular disease to include lifestyle, medical and surgical. ***lifestyle, medical and surgical*** B6.3t - analyse the effect of lifestyle factors on the incidence of non-communicable diseases at local, national and global levels to include lifestyle factors to include exercise, diet, alcohol and smoking.	***PAG B1 and PAG B7*** ***PAG B1, PAG B7***

		lifestyle factors to include exercise, diet, alcohol and smoking. B6.3u - describe cancer as the result of changes in cells that lead to uncontrolled growth and division. B6.3v - discuss potential benefits and risks associated with the use of stem cells in medicine to include tissue transplantation and rejection. ***tissue transplantation and rejection*** B6.3w - explain some of the possible benefits and risks of using gene technology in medicine to include practical and ethical considerations. ***practical and ethical considerations*** B6.3x - discuss the potential importance for medicine of our increasing understanding of the human genome to include the ideas of predicting the likelihood of diseases occurring and their treatment by drugs which are targeted to genomes. the ideas of predicting the likelihood of diseases occurring and their treatment by drugs which are targeted to genomes	Test on 6.3, then all of Topic 6
Summer Term 3B Year 11			