Beths Grammar School Biology Curriculum Map – Year 13

Term Edexcel Spec A	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 13	**<u>Intent</u>** Topic 5- On the wild side This topic uses the context of climate change to develop understanding of a wide range of biological ideas. The topic uses the iconic example of the polar bear and the Arctic tundra as the storyline to introduce the topic and it is returned to at various points through the topic. The topic content starts with a consideration of ecosystems, the role of biotic and abiotic factors in determining the number and distribution of organisms in a habitat, and succession with the idea of niche revisited. The reliance of ecosystems on photosynthesis and the transfer of energy between trophic levels is studied before looking in detail at climate change. Throughout the topic there is a focus on the use of scientific evidence to support ideas and theories, including the evidence for climate change and the theory of evolution. The impact of climate change on organisms is considered and this provides the opportunity	***<u>Topic 5- On the wild side</u>*** ***Introduction to the topic*** ***Introductory presentation (Interactive)*** ***Ecosystems – abiotic and biotic factors*** • ***Understand the terms ecosystem, community, population and habitat.*** • ***Understand that the numbers and distribution of organisms in a habitat are controlled by biotic and abiotic factors.*** • ***Understand how the concept of niche accounts for distribution and abundance of organisms in a habitat.*** ***Activity 5.1 The brine shrimp ecosystem (Practical)*** ***<u>Studying ecosystems</u>*** ***CORE PRACTICAL 10:*** ***Carry out a study on the ecology of a habitat, such as using quadrats and transects to determine distribution and abundance of organisms, and measuring abiotic factors appropriate to the habitat.***	***Checkpoint question 5.1*** ***Core Practical 10***

	to revisit ideas about enzymes introduced in Topic 2. The topic concludes by looking at the carbon cycle and methods to reduce atmospheric carbon dioxide.	***Activity 5.2 Looking for patterns (CORE PRACTICAL)*** ***Succession*** • ***Understand the stages of succession from colonisation to a climax community.*** ***Activity 5.3 Succession (Interactive)*** ***Photosynthesis*** • ***Understand the overall reaction of photosynthesis as requiring energy from light to split apart the strong bonds in water molecules, storing the hydrogen in a fuel (glucose) by combining it with carbon dioxide and releasing oxygen into the atmosphere.*** • ***Understand how phosphorylation of ADP requires energy and that hydrolysis of ATP provides an immediate supply of energy for biological processes.*** • ***Understand the light-dependent reactions of photosynthesis including how light energy is trapped by exciting electrons in chlorophyll and the role of these electrons in generating ATP, reducing NADP in photophosphorylation and producing oxygen through photolysis of water.*** • ***Understand the light-independent reactions as reduction of carbon dioxide using the products of the light-dependent reactions (carbon fixation in the***	***Checkpoint question 5.2*** ***Checkpoint question 5.3***

		Calvin cycle, the role of GP, GALP, RuBP and RUBISCO). • ***Know that the products are simple sugars that are used by plants, animals and other organisms in respiration and the synthesis of new biological molecules (polysaccharides, amino acids, lipids and nucleic acids).*** ***CORE PRACTICAL 11:*** ***Investigate photosynthesis using isolated chloroplasts (the Hill reaction).*** • ***Understand the structure of chloroplasts in relation to their role in photosynthesis.*** ***Activity 5.5 Investigating photosynthesis (CORE PRACTICAL)*** ***Activity 5.4 Photosynthesis (Interactive)*** ***Activity 5.6 How Calvin won the Nobel Prize (Optional)*** ***<u>Energy flow in the ecosystem</u>*** • ***Be able to calculate net primary productivity.*** • ***ii) Understand the relationship between gross primary productivity, net primary productivity and plant respiration.*** • ***Know how to calculate the efficiency of biomass and energy transfers between trophic levels.***	***Core Practical 11*** ***Checkpoint question 5.4*** ***Test on Photosynthesis***

	Topic 6- Infection, Immunity and Forensics This topic uses forensic biology to introduce a wide range of biological ideas. It uses a storyline that concerns the discovery of two dead bodies. A series of questions is posed, such as: How are these people identified? When did they die? What caused their deaths? Could their deaths have been prevented? The topic then presents the biology that is needed to answer these questions and develop understanding of a wide range of biological ideas. The topic revisits and builds on areas covered in Year 1 and in Topic 5, for example cell structure and function, succession, protein synthesis, evolution and DNA technology.	***Activity 5.7 Constructing food webs*** ***Activity 5.8 Energy flow in an ecosystem*** ***Topic 6-Infection, Immunity and Forensics*** ***Introduction to the topic*** ***The introduction of the context could be relatively short and combined with Session 2 below if the interactive introduction is completed outside of class time*** ***Introductory presentation (Interactive)*** ***DNA profiling*** • ***Know how DNA profiling is used for identification and determining genetic relationships between organisms (plants and animals).*** • ***Know how DNA can be amplified using the polymerase chain reaction (PCR).*** ***Activity 6.1 DNA photocopying: the polymerase chain reaction (Interactive)*** ***Activity 6.2 Restriction enzymes and gel electrophoresis (Interactive)***	***Test on Ecology*** ***Checkpoint question 6.1***

		You might decide to complete part one of this activity and then complete Activity 6.1 on PCR before considering gel electrophoresis. See Guidance notes below. ***Activity 6.4 DNA profiling summary*** ***DNA profiling*** • ***Know how DNA profiling is used for identification and determining genetic relationships between organisms (plants and animals).*** ***CORE PRACTICAL 14:*** ***Use gel electrophoresis to separate DNA fragments of different length.*** ***Activity 6.3 Practical DNA gel electrophoresis (CORE PRACTICAL)*** ***Determining time of death, forensic entomology and succession*** • ***Understand how to determine the time of death of a mammal by examining the extent of decomposition, stage of succession, forensic entomology, body temperature and degree of muscle contraction.*** • ***Know the role of micro-organisms in the decomposition of organic matter and the recycling of carbon.*** ***Activity 6.5 Crime investigation (Interactive)*** ***Note that this activity needs to be introduced in advance to give students preparation time.***	***Core Practical 14*** ***Checkpoint Question 6.3*** ***Checkpoint question 6.4***

		Structure of bacteria and viruses • ***Be able to compare the structure of bacteria and viruses.*** ***Q6.23*** ***Activity 6.10 Gram staining bacteria (Optional Practical) could be done at this stage or later when considering TB in detail.*** ***Activity 6.6 Bacteria and viruses*** ***Non-specific responses of the body to infection*** • ***Understand the non-specific responses of the body to infection, including inflammation, lysozyme action, interferon, and phagocytosis.*** ***Activity 6.7 Phagocytosis (Interactive) Note that this contains detail covered in the specific immune response.*** ***The specific immune response*** • ***Understand the roles of antigens and antibodies in the body's immune response including the involvement of plasma cells, macrophages and antigen-presenting cells.*** • ***Understand the differences between the roles of B cells (B memory and B effector cells) and T cells (T helper, T killer and T memory cells) in the body's immune response.*** ***Activity 6.8 The specific immune response (Interactive)***	***Test on Forensic Science*** ***Checkpoint question 6.5***

Beths Grammar School Biology Curriculum Map – Year 13

Autumn Term 1B Year 13	Intent Why is this taught now? Topic 5- On the wild side This topic uses the context of climate change to develop understanding of a wide range of biological ideas. The topic uses the iconic example of the polar bear and the Arctic tundra as the storyline to introduce the topic and it is returned to at various points through the topic. The topic content starts with a consideration of ecosystems, the role of biotic and abiotic factors in determining the number and distribution of organisms in a habitat, and succession with the idea of niche revisited. The reliance of ecosystems on photosynthesis and the transfer of energy between trophic levels is studied before looking in detail at climate change. Throughout the topic there is a focus on the use of scientific evidence to support ideas and theories, including the evidence for climate change and the theory of evolution. The impact of climate change on organisms is considered and this provides the opportunity to revisit ideas about enzymes introduced in Topic 2. The topic concludes by looking at the carbon cycle and methods to reduce atmospheric carbon dioxide.	**Topic 5- On the wild side** **<u>Evidence for climate change – temperature records</u>** • Understand the different types of evidence for climate change and its causes (including records of carbon dioxide levels, temperature records, pollen in peat bogs and dendrochronology), recognising correlations and causal relationships. *Activity 5.9 Long data sets: the importance of being trendy* **<u>Evidence for climate change – pollen in peat bogs</u>** • Understand the different types of evidence for climate change and its causes (including records of carbon dioxide levels, temperature records, pollen in peat bogs and dendrochronology), recognising correlations and causal relationships. *Activity 5.10 Pollen analysis (Interactive)* **<u>Evidence for climate change – dendrochronology</u>** • Understand the different types of evidence for climate change and its causes (including records of carbon dioxide	

		levels, temperature records, pollen in peat bogs and dendrochronology), recognising correlations and causal relationships. *Activity 5.11 Tree ring studies (Interactive)* **<u>The link between carbon dioxide and warming</u>** • Understand the causes of anthropogenic climate change, including the role of greenhouse gases (carbon dioxide and methane) in the greenhouse effect. *Activity 5.12 Do higher carbon dioxide levels lead to warmer conditions? (Practical)* *Activity 5.13 Carbon dioxide levels and global temperatures* **<u>Controversy surrounding the issue of climate change</u>** • Understand the way in which scientific conclusions about controversial issues, such as what actions should be taken to reduce climate change or the degree to which humans are affecting climate change, can sometimes depend on who is reaching the conclusions. *Activity 5.15 Who is right? (Optional)* *Activity 5.14 Global warming – fact or fiction?* *Climate modelling*	

		• Understand that data can be extrapolated to make predictions and that these are used in models of future climate change. • ii) Understand that models for climate change have limitations. *Activity 5.16 Global warming model (Interactive)* **<u>Effect of climate change on flora and fauna – distribution</u>** • Understand the effects of climate change (changing rainfall patterns and changes in seasonal cycles) on plants and animals (distribution of species, development and life cycles). • Student research on changing distribution of species using Student Book and Internet *Activity 5.17 Coral bleaching (Optional)* **<u>Temperature and enzyme activity</u>** *CORE PRACTICAL 12:* *Investigate the effect of temperature on the initial rate of an enzyme-catalysed reaction, to include Q10.* *Activity 5.18 Investigating the effect of temperature on enzyme activity (CORE PRACTICAL)* **<u>Effect of climate change on flora and fauna – development</u>** *CORE PRACTICAL 13:* *Investigate the effects of temperature on the development of organisms (such as seedling growth rate, brine shrimp hatch rates).*	Checkpoint Question 5.5 CORE PRACTICAL 12 CORE PRACTICAL 13:

		Activity 5.20 The effect of temperature on the hatching success of brine shrimps (CORE PRACTICAL) *Activity 5.19 Effect of climate manipulations on a grassland community (CORE PRACTICAL)* **<u>Effect of climate change on flora and fauna – life cycles</u>** • Understand the effects of climate change (changing rainfall patterns and changes in seasonal cycles) on plants and animals (distribution of species, development and life cycles). *Activity 5.21 Are insects emerging earlier? (Interactive)* **<u>Evolution by natural selection – molecular evidence</u>** • Understand how evolution (a change in the allele frequency) can come about through gene mutation and natural selection. • Understand the role of the scientific community (scientific journals, the peer review process, scientific conferences) in validating new evidence, including proteomics and genomics, that supports the accepted scientific theory of evolution. *Activity 5.23 Grasshopper natural selection* *Activity 5.24 Evolution revealed* *Activity 5.22 Debunking the myth of polar bear hair*	***Global Warming Test***

		<u>Speciation</u> • Understand how isolation reduces gene flow between populations, leading to allopatric or sympatric speciation. *Activity 5.25 Speciation* *(Interactive)* <u>The carbon cycle</u> • Understand how knowledge of the carbon cycle can be applied to methods to reduce atmospheric levels of carbon dioxide. • Understand how reforestation and the use of sustainable resources, including biofuels, are examples of the effective management of the conflict between human needs and conservation. *Activity 5.26 The carbon cycle*	
	Topic 6- Infection, Immunity and forensics This topic uses forensic biology to introduce a wide range of biological ideas. It uses a storyline that concerns the discovery of two dead bodies. A series of questions is posed, such as: How are these people identified? When did they die? What caused their deaths? Could their deaths have been prevented? The topic then presents the biology that is needed to	Topic 6- Infection, Immunity and Infection **Tuberculosis – symptoms** • Understand how Mycobacterium tuberculosis (TB) and Human Immunodeficiency Virus (HIV) infect human cells, causing a sequence of symptoms that may result in death.	

	answer these questions and develop understanding of a wide range of biological ideas. The topic revisits and builds on areas covered in Year 1 and in Topic 5, for example cell structure and function, succession, protein synthesis, evolution and DNA technology.	• Gram staining bacteria (Optional Practical) could be done at this stage or earlier when considering the basic structure of bacteria *Activity 6.9 Tuberculosis* **HIV/AIDS – symptoms** • Understand how Mycobacterium tuberculosis (TB) and Human Immunodeficiency Virus (HIV) infect human cells, causing a sequence of symptoms that may result in death. *Activity 6.11 HIV worksheet* Checkpoint question 6.5 **<u>Protein synthesis</u>** • Understand how one gene can give rise to more than one protein through posttranscriptional changes to messenger RNA (mRNA). *Activity 6.13 DIY protein synthesis kit* *Activity 6.12 Protein synthesis (Interactive* **<u>Preventing pathogen entry to the body</u>** • Know the major routes pathogens may take when entering the body.	Disease Test

		• Understand the role of barriers in protecting the body from infection, including skin, stomach acid, and gut and skin flora. *Activity 6.14 Preventing infection* **<u>Immunity</u>** • Understand how individuals may develop immunity (natural, artificial, active, passive). Checkpoint question 6.7 and Q6.46 **<u>The effect of antibiotics on bacterial growth</u>** *CORE PRACTICAL 15:* *Investigate the effect of different antibiotics on bacteria.* *Activity 6.15 Which antibiotic is most effective? (CORE PRACTICAL)* **<u>How antibiotics work and evolution of antibiotic resistance by bacteria</u>** • Understand how the theory of an 'evolutionary race' between pathogens and • their hosts is supported by the evasion mechanisms shown by pathogens. • Understand the difference between bacteriostatic and bactericidal antibiotics. • Know how an understanding of the contributory causes of hospital acquired	Natural Selection and Speciation Test

		• infections have led to codes of practice regarding antibiotic prescription and hospital practice that relate to infection prevention and control. *Activity 6.16 Classifying antibiotics* *Activity 6.17 TB and macrophage*	Checkpoint question 5.6 Global warming Test Checkpoint question 5.7 Speciation Test End of Topic 6 Test
Spring Term 2A Year 13	**Intent** Why is this taught now? Topic 7- Run for your life This topic uses the context of movement and, in particular, speed of running to develop understanding of a range of biological ideas. The context introduced and revisited at points throughout compares the fast-moving cheetah and the slower but long-distance travels of wildebeest, and also human sprinters and long-distance athletes. The action of muscles is considered, from the use of antagonistic pairs to the detail of the sliding filament theory. After studying the different types of respiration that are required for sprint and endurance activities, the topic looks at how cardiac output and ventilation are controlled to ensure that there is a continuous supply of ATP for muscle contraction. It then returns to apply some of the ideas to the different types of muscle fibres. The topic also examines thermoregulation as an example of homeostasis. Negative and positive	Topic 7- Run for your life **Introduction to the topic** Introductory presentation (Interactive) **Joints and movement** • Know the way in which muscles, tendons, the skeleton and ligaments interact to enable movement, including antagonistic muscle pairs, extensors and flexors. • Antagonistic muscles and movement (Interactive and practical) • Muscle structure and function • Know the structure of a muscle fibre. (NB: part (ii) of this statement is covered later)	Card test to confirm KS4 terminology

	feedback are included. The topic goes on to consider some of the effects for humans of too much or too little exercise. This builds on ideas about the immune system covered in Topic 7 and revisits ideas covered in Topic 1. It also introduces the use of keyhole surgery and prosthetics. In the final section of the topic the use of performance-enhancing substances is used to revisit and extend understanding of the control of protein synthesis and the action of hormones. The topic ends by discussing the ethical issues surrounding the use of performance-enhancing substances.	• Understand the process of contraction of skeletal muscle in terms of the sliding filament theory, including the role of actin, myosin, troponin, tropomyosin, calcium ions (Ca2+), ATP and ATPase. Activity 7.2 Muscle structure and function (Interactive) **<u>Muscle structure and function</u>** • Understand the process of contraction of skeletal muscle in terms of the sliding filament theory, including the role of actin, myosin, troponin, tropomyosin, calcium ions (Ca2+), ATP and ATPase. Activity 7.3 Muscle model (Optional) (Practical) **<u>ATP and glycolysis</u>** • Understand the overall reaction of aerobic respiration as splitting of the respiratory substrate, to release carbon dioxide as a waste product and reuniting of hydrogen with atmospheric oxygen with the release of a large amount of energy. ii) Understand that respiration is a many-stepped process with each step controlled and catalysed by a specific intracellular enzyme. • Understand the roles of glycolysis in aerobic and anaerobic respiration, including the phosphorylation of hexoses, the production of ATP, reduced coenzyme, pyruvate and lactate (details of intermediate stages and compounds are not required).	Checkpoint question 7.1 Muscle Test

		• Understand the role of the link reaction and the Krebs cycle in the complete oxidation of glucose and formation of carbon dioxide (CO_2), ATP, reduced NAD and reduced FAD (names of other compounds are not required) and why these steps take place in the mitochondria, unlike glycolysis which occurs in the cytoplasm ***. Activity 7.4 Aerobic respiration (Interactive)*** ***Electron transport chain and chemiosmosis*** • Understand how ATP is synthesised by oxidative phosphorylation associated with the electron transport chain in mitochondria, including the role of chemiosmosis and ATP synthase. ***Activity 7.5 Mitochondrial diseases (Interactive)*** ***Activity 7.6 Respiration and other metabolic pathways*** **<u>Measuring respiration</u>** CORE PRACTICAL 16: Investigate rate of respiration. Activity 7.7 Measuring the rate of oxygen uptake (CORE PRACTICAL)	CORE PRACTICAL 16: Respiration Test

	This context for this topic is the misinterpretation of buffalo as insects when viewed for the first time across an open plain. This is based on the work of the anthropologist Colin Turnbull with Kenge, a Bambuti pygmi. Using this context the topic is structured to present a wide range of biological ideas related to the functioning of the nervous system and detection of stimuli. The development, structure and function of the brain are studied, along with how these are revealed through imaging techniques. Ideas about visual development, perception and learning are also introduced using the context. The final part of the topic widens out to revisit synapses by looking at the effects of drugs. The use of personalised medicine and genetic modification of organisms close the topic.	**Topic 8- Grey matter** Introductory presentation (Interactive) Introductory presentation (Interactive) **Organisation of the nervous system and the structure of neurones** • Know the structure and function of sensory, relay and motor neurones including the role of Schwann cells and myelination. Construction of organisation diagram Labelling neurone diagram/table of comparison Checkpoint question 8.1 **Reflex arcs** • Understand how the nervous systems of organisms can cause effectors to respond to a stimulus. • Understand how the pupil dilates and contracts . Activity 8.1 The pupil reflex (Practical The action potential • Understand how a nerve impulse (action potential) is conducted along an axon including changes in	Checkpoint question 8.1 Checkpoint question 8.2

		membrane permeability to sodium and potassium ions and the role of the myelination in saltatory conduction. Activity 8.2 Nerve impulse (Interactive) **<u>Conduction of the impulse</u>** • Understand how a nerve impulse (action potential) is conducted along an axon including changes in membrane permeability to sodium and potassium ions and the role of the myelination in saltatory conduction. Activity 8.3 Nerve impulse propagation Synapses • Know the structure and function of synapses in nerve impulse transmission, including the role of neurotransmitters, including acetylcholine. Activity 8.4 Crossing a synapse (Interactive) **<u>Nervous and hormonal coordination</u>** • Understand how coordination is brought about through nervous and hormonal control in animals. • Understand how phytochrome and IAA bring about responses in plants to environmental cues, including their effects on transcription.	Checkpoint question 8.3 Nerve Impulse Test Checkpoint question 8.4 Checkpoint question 8.5 Photoreceptors Test Checkpoint question 8.6

		Activity 8.5 Do plants have hormones? (Practical) Checkpoint question 8.4 Checkpoint question 8.5 <u>Detecting stimuli</u> • Understand how the nervous systems of organisms can detect stimuli with reference to rods in the retina of mammals, the roles of rhodopsin, opsin, retinal, sodium ions, cation channels and hyperpolarisation of rod cells in forming action potentials in the optic neurones. Activity 8.7 Dark adaptation Activity 8.6 Eye quiz	
Spring Term 2B **Year 13**	**<u>Intent</u>** Why is this taught now? Topic 7- Run for your life This topic uses the context of movement and, in particular, speed of running to develop understanding of a range of biological ideas. The context introduced and revisited at points throughout compares the fast-moving cheetah and the slower but long-distance travels of wildebeest, and also human sprinters and long-distance athletes. The action of muscles is considered, from the use of antagonistic pairs to the detail of the sliding filament theory. After studying the different types of respiration that are required for sprint and endurance activities,	Topic 7- Run for your life **<u>Anaerobic respiration</u>** • Understand what happens to lactate after a period of anaerobic respiration in animals. ***Activity 7.8 Anaerobic respiration*** Checkpoint question 7.2 Aerobic capacity • Be able to calculate cardiac output.	Checkpoint question 7.2

	the topic looks at how cardiac output and ventilation are controlled to ensure that there is a continuous supply of ATP for muscle contraction. It then returns to apply some of the ideas to the different types of muscle fibres. The topic also examines thermoregulation as an example of homeostasis. Negative and positive feedback are included. The topic goes on to consider some of the effects for humans of too much or too little exercise. This builds on ideas about the immune system covered in Topic 7 and revisits ideas covered in Topic 1. It also introduces the use of keyhole surgery and prosthetics. In the final section of the topic the use of performance-enhancing substances is used to revisit and extend understanding of the control of protein synthesis and the action of hormones. The topic ends by discussing the ethical issues surrounding the use of performance-enhancing substances.	• Understand how variations in ventilation and cardiac output enable rapid delivery of oxygen to tissues and the removal of carbon dioxide from them, including how the heart rate and ventilation rate are controlled and the roles of the cardiovascular control centre and the ventilation centre in the medulla oblongata. ***Activity 7.9 Aerobic capacity (Practical)*** **<u>Cardiac output</u>** • Be able to calculate cardiac output. • Understand how variations in ventilation and cardiac output enable rapid delivery of oxygen to tissues and the removal of carbon dioxide from them, including how the heart rate and ventilation rate are controlled and the roles of the cardiovascular control centre and the ventilation centre in the medulla oblongata. ***Activity 7.10 Effect of exercise on cardiac output*** **<u>Control of a single heart beat</u>** • Know the myogenic nature of cardiac muscle. • Understand how the normal electrical activity of the heart coordinates the heart beat, including the roles of the sinoatrial node (SAN), the atrioventricular node (AVN), the bundle of His and the Purkyne fibres. • Understand how the use of electrocardiograms (ECGs) can aid the diagnosis of cardiovascular disease (CVD) and other heart conditions. ***Activity 7.11 Conductive pathway of the heart (Interactive)***	

		Activity 7.12 What does an ECG show? **<u>Control of heart rate</u>** • Know the myogenic nature of cardiac muscle. • Understand how the normal electrical activity of the heart coordinates the heart beat, including the roles of the sinoatrial node (SAN), the atrioventricular node (AVN), the bundle of His and the Purkyne fibres. • Understand how the use of electrocardiograms (ECGs) can aid the diagnosis of cardiovascular disease (CVD) and other heart conditions. Checkpoint question 7.3 Measuring lung volumes and breathing rate ***CORE PRACTICAL 17:*** ***Investigate the effects of exercise on tidal volume, breathing rate, respiratory minute ventilation and oxygen consumption using data from spirometer traces.*** ***Activity 7.13 Investigating breathing (CORE PRACTICAL) (Interactive)*** **<u>Control of breathing rate</u>** • Be able to calculate cardiac output. • Understand how variations in ventilation and cardiac output enable rapid delivery of oxygen to tissues and the removal of carbon dioxide from them, including how the heart rate and ventilation rate are controlled and	Control of Heart Rate Test ***CORE PRACTICAL 17:*** ***Investigate the effects of exercise on tidal volume, breathing rate, respiratory minute ventilation and oxygen consumption using data from spirometer traces*** ***Activity 7.13 Investigating breathing (CORE PRACTICAL) (Interactive)***

	This context for this topic is the misinterpretation of buffalo as insects when viewed for the first time across an open plain. This is based on the work of the anthropologist Colin Turnbull with Kenge, a Bambuti pygmi.	the roles of the cardiovascular control centre and the ventilation centre in the medulla oblongata. ***Activity 7.14 Locust practical (Practical)*** ***Checkpoint question 7.4*** **<u>Adaptation</u>** • Know the structure of a muscle fibre. • Understand the structural and physiological differences between fast and slow twitch muscle fibres. ***Activity 7.15 Fish muscles (Practical)*** **<u>Temperature regulation</u>** • Understand what is meant by negative feedback and positive feedback control. • Understand the principle of negative feedback in maintaining systems within narrow limits. • Understand homeostasis and its importance in maintaining the body in a state of dynamic equilibrium during exercise, including the role of the hypothalamus and the mechanisms of thermoregulation. ***Activity 7.16 Body temperature (Practical)*** Topic 8- Grey matter **<u>Plants detect stimuli</u>**	Control of Breathing Rate Test

	Using this context the topic is structured to present a wide range of biological ideas related to the functioning of the nervous system and detection of stimuli. The development, structure and function of the brain are studied, along with how these are revealed through imaging techniques. Ideas about visual development, perception and learning are also introduced using the context. The final part of the topic widens out to revisit synapses by looking at the effects of drugs. The use of personalised medicine and genetic modification of organisms close the topic.	• Understand how phytochrome and IAA bring about responses in plants to environmental cues, including their effects on transcription. ***Activity 8.8 The effect of light on germination of seeds (Practical)*** ***Activity 8.9 How does light affect flowering?*** **<u>Regions of the brain</u>** • Know the location and functions of the cerebral hemispheres, hypothalamus, cerebellum and medulla oblongata in the human brain. **<u>Brain imaging</u>** • Understand how magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), positron emission tomography (PET) and computed tomography (CT) scans are used in medical diagnosis and the investigation of brain structure and function. ***Activity 8.10 Structure and function of the brain (Interactive)*** ***Activity 8.11 In the doctor's surgery Optional*** ***Activity 8.12 What happens where? Optional*** **<u>Critical period for visual development</u>** • Understand what happens during the critical period so that mammals can develop their visual capacities to the full.	Temperature Regulation Test

		• Understand the role animal models have played in the research into human brain development and function, including Hubel and Wiesel's experiments with monkeys and kittens. ***Activity 8.13 Critical window for visual development*** **<u>Visual perception</u>** • Understand the methods used to investigate the contributions of nature and nurture to brain development, including evidence from the abilities of new-born babies, animal experiments, studies of individuals with damaged brain areas, twin studies and cross-cultural studies. ***Activity 8.14 Stereoscopic vision*** ***Activity 8.15 Cross-cultural studies of perception*** **<u>Learning and memory</u>** • Understand how animals, including humans, can learn by habituation. C***ORE PRACTICAL 18: Investigate habituation to a stimulus.*** • Understand the role animal models have played in the research into human brain development and function, including Hubel and Wiesel's experiments with monkeys and kittens. ***Activity 8.16 Can snails become habituated to a stimulus? (CORE PRACTICAL)***	

		<u>Learning</u> • Understand how animals, including humans, can learn by habituation. ***Activity 8.17 Habituation*** **<u>The role of animal models</u>** • Understand the role animal models have played in the research into human brain development and function, including Hubel and Wiesel's experiments with monkeys and kittens. • Be able to discuss moral and ethical issues relating to the use of animals in medical research from two ethical standpoints. ***Activity 8.18 Using animals in medical research*** **<u>Nature or nurture?</u>** • Understand the methods used to investigate the contributions of nature and nurture to brain development, including evidence from the abilities of new-born babies, animal experiments, studies of individuals with damaged brain areas, twin studies and cross-cultural studies. ***Activity 8.19 Nature or nurture?***	

		This could be left until the end of the topic to draw together ideas from across the topic.	
Summer Term 3A Year 13	**Intent** Why is this taught now? This context for this topic is the misinterpretation of buffalo as insects when viewed for the first time across an open plain. This is based on the work of the anthropologist Colin Turnbull with Kenge, a Bambuti pygmi. Using this context the topic is structured to present a wide range of biological ideas related to the functioning of the nervous system and detection of stimuli. The development, structure and function of the brain are studied, along with how these are revealed through imaging techniques. Ideas about visual development, perception and learning are also introduced using the context. The final part of the topic widens out to revisit synapses by looking at the effects of drugs. The use of personalised medicine and genetic modification of organisms close the topic.	Topic 8- Grey matter **Effect of chemicals on synapses** • Understand how imbalances in certain, naturally occurring brain chemicals can contribute to ill health, including dopamine in Parkinson's disease and serotonin in depression, and to the development of new drugs. **The effect of drugs on synapses** • Understand the effects of drugs on synaptic transmissions, including the use of L-Dopa in the treatment of Parkinson's disease and the action of MDMA in Ecstasy. ***Activity 8.20 Ecstasy*** ***Checkpoint question 8.7*** **Genome sequencing projects** • Understand how the outcomes of genome sequencing projects are being used in the development of personalised medicine and the social, moral and ethical issues this raises **GM organisms**	

		• Know how drugs can be produced using genetically modified organisms (plants, animals and microorganisms). • Understand the risks and benefits associated with the use of genetically modified organisms. ***Activity 8.21 Genetic modification (Interactive)*** ***Activity 8.22 Making decisions about GM***	**<u>End of Topic 8 Test</u>**
Summer Term 3B Year 13	**Study Leave**		