

Science Year 10 – Biology Rotation Genetics, Natural Selection & GM, Health and Disease, Plant Structures and Functions, Animal Coordination

	What? ONE OF THESE TOPICS WILL BE TAUGHT AS PART OF THE CHEMISTRY ROTATION DUE TO TIME CONSTRAINTS When? Why?				
	Health and Disease	Plant Structures and Functions	Natural Selection and Genetic Modification	Genetics	Animal Coordination and Control
Lesson 1 Learning intentions	<p>Describe health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, as defined by the World Health Organisation (WHO)</p> <p>Describe the difference between communicable and non-communicable diseases.</p> <p>Explain why the presence of one disease can lead to a higher susceptibility to other diseases</p>	<p>Describe photosynthetic organisms as the main producers of food and therefore biomass.</p> <p>Describe photosynthesis in plants and algae as an endothermic reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen</p> <p>B6.9: Describe ... the structure and function of the stomata.</p>	<p>Describe the evidence for human evolution, based on fossils, including:</p> <ul style="list-style-type: none"> a) Ardi from 4.4 million years ago b) Lucy from 3.2 million years ago c) Leakey’s discovery of fossils from 1.6 million years ago. <p>Describe the evidence for human evolution based on stone tools, including:</p> <ul style="list-style-type: none"> a) the development of stone tools over time b) how these can be dated from their environment. 	<p>Explain the role of meiotic cell division, including the production of four daughter cells, each with half the number of chromosomes, and that this results in the formation of genetically different haploid gametes</p> <p>The stages of meiosis are not required.</p> <p>Describe the genome as the entire DNA of an organism and a gene as a section of a DNA molecule that codes for a specific protein</p>	<p>Describe where hormones are produced and how they are transported from endocrine glands to their target organs including the pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes.</p>
Lesson 2 Learning intentions	<p>Describe that many non-communicable human diseases are caused by the interaction of a number of factors including cardiovascular diseases, many forms of cancer, some lung and liver diseases and diseases influenced by nutrition.</p> <p>Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels, including:</p>	<p>Explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis.</p> <p>Explain the interactions of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis.</p>	<p>Explain Darwin’s theory of evolution by natural selection.</p> <p>Explain how the emergence of resistant organisms supports Darwin’s theory of evolution including antibiotic resistance in bacteria.</p>	<p>Describe DNA as a polymer made up of:</p> <ul style="list-style-type: none"> a) two strands coiled to form a double helix b) strands linked by a series of complementary base pairs joined together by weak hydrogen bonds c) nucleotides that consist of a sugar and phosphate group 	<p>Explain that adrenalin can be controlled by a negative feedback mechanism and is produced by the adrenal glands to prepare the body for fight or flight, including:</p> <ul style="list-style-type: none"> a) increased heart rate b) increased blood pressure c) increased blood flow to the muscles d) raised blood sugar levels by stimulating the liver to change glycogen into glucose

	<p>a) ... diet on ... malnutrition...</p> <p>b) alcohol on liver diseases</p>	<p>Explain how the rate of photosynthesis is directly proportional to light intensity and inversely proportional to the distance from a light source, including the use of the inverse square law calculation.</p>		<p>with one of the four different bases attached to the sugar.</p> <p>Explain how DNA can be extracted from fruit</p>	<p>Explain how thyroxine controls metabolic rate as an example of negative feedback, including:</p> <p>a) low levels of thyroxine stimulates production of TRH in hypothalamus</p> <p>b) this causes release of TSH from the pituitary gland</p> <p>c) TSH acts on the thyroid to produce thyroxine</p> <p>d) when thyroxine levels are normal thyroxine inhibits the release of TRH and the production of TSH</p>
Lesson 3 Learning intentions	<p>Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels, including:</p> <p>a) exercise and diet on obesity and malnutrition, including BMI and waist to hip ratios</p> <p>c) smoking on cardiovascular diseases</p> <p>Evaluate some different treatments for cardiovascular disease including:</p> <p>a) life-long medication</p> <p>b) surgical procedures</p> <p>c) lifestyle changes</p>	<p>Core practical: Investigate the effect of light intensity on the rate of photosynthesis</p> <p>Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport.</p> <p>Explain how the structure of the root hair cells is adapted to absorb water and mineral ions</p>	<p>Describe how genetic analysis has led to the suggestion of the three domains rather than the five kingdoms classification method.</p>	<p>Explain why there are differences in the inherited characteristics as a result of alleles.</p> <p>Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote.</p> <p>Explain monohybrid inheritance using genetic diagrams ... and family pedigrees</p>	<p>Describe the stages of the menstrual cycle including the roles of the hormones oestrogen and progesterone, in the control of the menstrual cycle.</p> <p>Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy.</p> <p>Evaluate hormonal and barrier methods of contraception.</p>
Lesson 4 Learning intentions	<p>Describe a pathogen as a disease-causing organism including viruses, bacteria, fungi and protists.</p> <p>Describe some common infections, including:</p>	<p>Explain how the structures of the xylem and phloem are adapted to their function in the plant, including:</p> <p>a) lignified dead cells in xylem transporting water</p>	<p>Explain selective breeding and its impact on food plants and domesticated animals</p> <p>Describe genetic engineering as a process</p>	<p>Explain monohybrid inheritance using ... Punnett squares.</p> <p>Describe how the sex of offspring is determined at</p>	<p>Explain the interactions of oestrogen, progesterone, FSH and LH in the control of the menstrual cycle, including the repair and maintenance of the uterus wall, ovulation and menstruation.</p>

	<p>a) cholera (bacteria) causes diarrhoea b) tuberculosis (bacteria) causes lung damage c) chalarash dieback (fungi) causes leaf loss and bark lesions d) malaria (protists) causes damage to blood and liver e) HIV (virus) destroys white blood cells, leading to the onset of AIDS f) stomach ulcers caused by Helicobacter (bacteria) g) Ebola (virus) causes haemorrhagic fever</p>	<p>and minerals through the plant b) living cells in phloem using energy to transport sucrose around the plant.</p> <p>Describe how water and mineral ions are transported through the plant by transpiration, including the structure and function of the stomata.</p> <p>Describe how sucrose is transported around the plant by translocation</p> <p>Explain the effect of environmental factors on the rate of water uptake by a plant, to include light intensity, air movement and temperature.</p> <p>Demonstrate an understanding of rate calculations for transpiration</p>	<p>which involves modifying the genome of an organism to introduce desirable characteristics</p>	<p>fertilisation, using genetic diagrams.</p> <p>Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits.</p>	<p>Explain the use of hormones in Assisted Reproductive Technology (ART) including IVF and clomifene therapy.</p> <p>Explain the importance of maintaining a constant internal environment in response to internal and external change.</p> <p>Explain how the hormone insulin controls blood glucose concentration.</p> <p>Explain how blood glucose concentration is regulated by glucagon.</p> <p>Explain the cause of type 1 diabetes and how it is controlled.</p>
<p>Lesson 5 Learning intentions</p>	<p>Explain how pathogens are spread and how this spread can be reduced or prevented, including:</p> <p>a) cholera (bacteria) – water</p>		<p>Evaluate the benefits and risks of genetic engineering and selective breeding in modern agriculture and medicine including</p>	<p>State that most phenotypic features are the result of multiple genes rather than single gene inheritance. Describe the causes of variation that influence phenotype, including a genetic variation –</p>	<p>Explain the cause of type 2 diabetes and how it is controlled.</p> <p>Evaluate the correlation between body mass and type 2 diabetes including BMI and</p>

	<p>b) tuberculosis (bacteria) – airborne</p> <p>c) chalarash dieback (fungi) – airborne</p> <p>d) malaria (protists) – animal vectors</p> <p>e) stomach ulcers caused by Helicobacter (bacteria) – oral transmission</p> <p>f) Ebola (virus) – body fluids</p>		<p>practical and ethical implications.</p> <p>Describe the main stages of genetic engineering including the use of:</p> <p>a) restriction enzymes</p> <p>b) ligase</p> <p>c) sticky ends</p> <p>d) vectors</p>	<p>different characteristics as a result of mutation...</p> <p>Discuss the outcomes of the Human Genome Project and its potential applications within medicine.</p> <p>State that there is usually extensive genetic variation within a population of a species and that these arise through mutations.</p> <p>State that most genetic mutations have no effect on the phenotype, some mutations have a small effect on the phenotype and, rarely, a single mutation will significantly affect the phenotype.</p>	<p>waist:hip calculations using the BMI equation.</p>
Lesson 6 Learning intentions	<p>Describe how the physical barriers and chemical defences of the human body provide protection from pathogens, including:</p> <p>a) physical barriers including mucus, cilia and skin</p> <p>b) chemical defence including lysozymes and hydrochloric acid</p>			<p>Describe the causes of variation that influence phenotype including</p> <p>a) genetic variation – different characteristics as a result of mutation and sexual reproduction</p> <p>b) environmental variation – different characteristics caused by an organism's environment (acquired characteristics)</p>	
Lesson 7 Learning intentions	<p>Explain the role of the specific immune system of the human body in defence against disease including:</p> <p>a) exposure to pathogen</p>				

	<p>b) the antigens trigger an immune response which causes the production of antibodies</p> <p>c) the antigens also trigger production of memory lymphocytes</p> <p>d) the role of memory lymphocytes in the secondary response to the antigen.</p>				
Lesson 8 Learning intentions	Explain the body's response to immunisation using an inactive form of a pathogen.				
Lesson 9 Learning intentions	Explain that antibiotics can only be used to treat bacterial infections because they inhibit cell processes in the bacterium but not the host organism.				
Lesson 10 Learning intentions	Describe that the process of developing new medicines, including antibiotics, has many stages including discovery, development, preclinical and clinical testing.				
Lesson 11 Learning intentions	<p>Explain how sexually transmitted infections (STIs) are spread and how this spread can be reduced or prevented, including:</p> <p>a) Chlamydia (bacteria)</p> <p>b) HIV (virus)</p>				