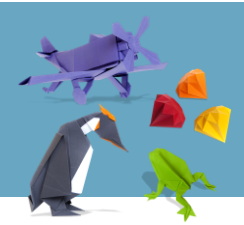

GCSE Biology to GCE Biology A – Specification mapping

The purpose of this document is to demonstrate the overlap between GCSE and GCE. For an effective progression through to A level, it will be useful if centres establish a baseline point from which to build on. The mapping document should enable teachers to streamline the teaching and get to the A level content within the first two weeks of term. This will serve two purposes:

a) Students will actually feel they are learning something new and maintain their interest in the subject.

b) Students will be able to discover very early on in the course whether Biology A level is really a suitable subject choice for them.

The following are some suggestions for how to use this resource:

1) post GCSE exams – if your school brings back the Year 11s after their exams

2) induction weeks at the start of 6th Form

3) setting summer homework in preparation for 6th Form

4) levelling the baseline of all students from their range of GCSE qualifications.

GCE Biology A - Topic 1 – Lifestyle, Health and Risk	GCSE Biology
1.1 Understand why many animals have a heart and circulation (mass transport to overcome limitations of diffusion in meeting the requirements of organisms).	**Topic 8– Exchange and transport in animals** 8.1 Describe the need to transport substances into and out of a range of organisms, including oxygen, carbon dioxide, water, dissolved food molecules, mineral ions and urea 8.2 Explain the need for exchange surfaces and a transport system in multicellular organisms including the calculation of surface area : volume ratio
1.3 Understand how the structures of blood vessels (capillaries, arteries and veins) relate to their functions.	**Topic 8– Exchange and transport in animals** 8.7 Explain how the structure of the blood vessels is related to their function
1.4 i) Know the cardiac cycle (atrial systole, ventricular systole and cardiac diastole) and relate the structure and operation of the mammalian heart, including the major blood vessels, to its function. ii) Know how the relationship between heart structure and function can be investigated practically.	**Topic 8– Exchange and transport in animals** 8.8 Explain how the structure of the heart and circulatory system is related to its function, including the role of the major blood vessels, the valves and the relative thickness of chamber walls 8.12 Calculate heart rate, stroke volume and cardiac output, using the equation cardiac output = stroke volume × heart rate

GCE Biology A - Topic 1 – Lifestyle, Health and Risk	GCSE Biology
1.5 Understand the course of events that leads to atherosclerosis (endothelial dysfunction, inflammatory response, plaque formation, raised blood pressure).	**Topic 5– Health, disease and the development of medicines** 5.25 Evaluate some different treatments for cardiovascular disease, including: a. life-long medication b. surgical procedures c. lifestyle changes
1.6 Understand the blood-clotting process (thromboplastin release, conversion of prothrombin to thrombin and fibrinogen to fibrin) and its role in cardiovascular disease (CVD).	**Topic 8– Exchange and transport in animals** 8.6 Explain how the structure of the blood is related to its function: a. red blood cells (erythrocytes) b. white blood cells (phagocytes and lymphocytes) c. plasma d. platelets **Topic 5– Health, disease and the development of medicines** 5.25 Evaluate some different treatments for cardiovascular disease, including: a. life-long medication b. surgical procedures c. lifestyle changes

GCE Biology A - Topic 1 – Lifestyle, Health and Risk	GCSE Biology
1.7 Know how factors such as genetics, diet, age, gender, high blood pressure, smoking and inactivity increase the risk of cardiovascular disease (CVD).	**Topic 5– Health, disease and the development of medicines** 5.23 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 5.24 Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels, including: a. exercise and diet on obesity and malnutrition, including: BMI and waist : hip calculations, using the BMI equation: BMI = mass (kg) / (height (m))^2 b. alcohol on liver diseases c. smoking on cardiovascular diseases
1.11 i) Be able to analyse data on energy budgets and diet. ii) Understand the consequences of energy imbalance, including weight loss, weight gain, and development of obesity.	**Topic 1– Key concepts in Biology** 1.14B Explain how the energy contained in food can be measured using calorimetry

GCE Biology A Topic 1 – Lifestyle, Health and Risk	GCSE Biology
1.11 i) Be able to analyse data on energy budgets and diet. ii) Understand the consequences of energy imbalance, including weight loss, weight gain, and development of obesity.	**Topic 5– Health, disease and the development of medicines** 5.24 Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels, including: a. exercise and diet on obesity and malnutrition, including: BMI and waist : hip calculations, using the BMI equation: BMI = mass (kg) / (height (m))^2 b. alcohol on liver diseases c. smoking on cardiovascular diseases
1.13 Know how monosaccharides join to form disaccharides (sucrose, lactose and maltose) and polysaccharides (glycogen and amylose) through condensation reactions forming glycosidic bonds, and how these can be split through hydrolysis reactions.	**Topic 1– Key concepts in Biology** 1.12 Explain the importance of enzymes as biological catalysts in the synthesis of carbohydrates, proteins and lipids and their breakdown into sugars, amino acids and fatty acids and glycerol
1.14 i) Know how a triglyceride is synthesised by the formation of ester bonds during condensation reactions between glycerol and three fatty acids. ii) Know the differences between saturated and unsaturated lipids.	**Topic 1– Key concepts in Biology** 1.12 Explain the importance of enzymes as biological catalysts in the synthesis of carbohydrates, proteins and lipids and their breakdown into sugars, amino acids and fatty acids and glycerol

GCE Biology A Topic 1 – Lifestyle, Health and Risk	GCSE Biology
1.16 Understand how people use scientific knowledge about the effects of diet, including obesity indicators, body mass index and waist-to-hip ratio, exercise and smoking to reduce their risk of coronary heart disease.	**Topic 5– Health, disease and the development of medicines** 5.24 Explain the effect of lifestyle factors on non-communicable diseases at local, national and global levels, including: a. exercise and diet on obesity and malnutrition, including: BMI and waist : hip calculations, using the BMI equation: BMI = mass (kg) / (height (m))^2 b. alcohol on liver diseases c. smoking on cardiovascular diseases 5.25 Evaluate some different treatments for cardiovascular disease, including: a. life-long medication b. surgical procedures c. lifestyle changes
1.18 Know the benefits and risks of treatments for cardiovascular disease (CVD) (antihypertensives, statins, anticoagulants and platelet inhibitors).	**Topic 5– Health, disease and the development of medicines** 5.25 Evaluate some different treatments for cardiovascular disease, including: a. life-long medication b. surgical procedures c. lifestyle changes

GCE Biology A Topic 2 – Genes and Health	GCSE Biology
2.1 i) Know the properties of gas exchange surfaces in living organisms (large surface area to volume ratio, thickness of surface, difference in concentration). ii) Understand how the rate of diffusion is dependent on these properties and can be calculated using Fick's Law of Diffusion. iii) Understand how the structure of the mammalian lung is adapted for rapid gaseous exchange.	**Topic 8– Exchange and transport in animals** 8.2 Explain the need for exchange surfaces and a transport system in multicellular organisms including the calculation of surface area : volume ratio 8.3 Explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries 8.4B Describe the factors affecting the rate of diffusion, including surface area, concentration gradient and diffusion distance 8.5B Calculate the rate of diffusion using Fick's law: rate of diffusion $\propto$ $\frac{\text{surface area x concentration difference}}{\text{thickness of membrane}}$
2.2 i) Know the structure and properties of cell membranes. ii) Understand how models such as the fluid mosaic model of cell membranes are interpretations of data used to develop scientific explanations of the structure and properties of cell membranes.	**Topic 1– Key concepts in Biology** 1.1 Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: a) animal cells – nucleus, cell membrane, mitochondria and ribosomes b) plant cells – nucleus, cell membrane, cell wall, chloroplasts, mitochondria, vacuole and ribosomes c) bacteria – chromosomal DNA, plasmid DNA, cell membrane, ribosomes and flagella

GCE Biology A Topic 2 – Genes and Health	GCSE Biology
2.3 Understand what is meant by osmosis in terms of the movement of free water molecules through a partially permeable membrane (consideration of water potential is not required).	**Topic 1– Key concepts in Biology** 1.15 Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport *1.16 Core practical: Investigate osmosis in potatoes* 1.17 Calculate percentage gain and loss of mass in osmosis
2.4 i) Understand what is meant by passive transport (diffusion, facilitated diffusion), active transport (including the role of ATP as an immediate source of energy), endocytosis and exocytosis. ii) Understand the involvement of carrier and channel proteins in membrane transport.	**Topic 1– Key concepts in Biology** 1.15 Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport
2.5 i) Know the basic structure of mononucleotides (deoxyribose or ribose linked to a phosphate and a base, including thymine, uracil, cytosine, adenine or guanine) and the structures of DNA and RNA (polynucleotides composed of mononucleotides linked through condensation reactions). ii) Know how complementary base pairing and the hydrogen bonding between two complementary strands are involved in the formation of the DNA double helix.	**Topic 3– Genetics** 3.4 Describe DNA as a polymer made up of: 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 with one of the four different bases attached to the sugar

GCE Biology A Topic 2 – Genes and Health	GCSE Biology
2.6 i) Understand the process of protein synthesis (transcription) including the role of RNA polymerase, translation, messenger RNA, transfer RNA, ribosomes and the role of start and stop codons. ii) Understand the roles of the DNA template (antisense) strand in transcription, codons on messenger RNA and anticodons on transfer RNA.	**Topic 3– Genetics** 3.7B **Explain how the order of bases in a section of DNA decides the order of amino acids in the protein and that these fold to produce specifically shaped proteins such as enzymes** 3.8B **Describe the stages of protein synthesis, including transcription and translation:** **a. RNA polymerase binds to non-coding DNA located in front of a gene** **b. RNA polymerase produces a complementary mRNA strand from the coding DNA of the gene** **c. the attachment of the mRNA to the ribosome** **d. the coding by triplets of bases (codons) in the mRNA for specific amino acids** **e. the transfer of amino acids to the ribosome by tRNA the linking of amino acids to form polypeptides**

GCE Biology A Topic 2 – Genes and Health		GCSE Biology
2.7	Understand the nature of the genetic code (triplet code, non-overlapping and degenerate).	**Topic 3– Genetics** 3.8B **Describe the stages of protein synthesis, including transcription and translation:** **a. RNA polymerase binds to non-coding DNA located in front of a gene** **b. RNA polymerase produces a complementary mRNA strand from the coding DNA of the gene** **c. the attachment of the mRNA to the ribosome** **d. the coding by triplets of bases (codons) in the mRNA for specific amino acids** **e. the transfer of amino acids to the ribosome by tRNA the linking of amino acids to form polypeptides**
2.8	Know that a gene is a sequence of bases on a DNA molecule that codes for a sequence of amino acids in a polypeptide chain.	**Topic 3– Genetics** 3.7B **Explain how the order of bases in a section of DNA decides the order of amino acids in the protein and that these fold to produce specifically shaped proteins such as enzymes** 3.13 Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote

GCE Biology A Topic 2 – Genes and Health	GCSE Biology
2.9 i) Know the basic structure of an amino acid (structures of specific amino acids are not required). ii) Understand the formation of polypeptides and proteins (amino acid monomers linked by peptide bonds in condensation reactions). iii) Understand the significance of a protein's primary structure in determining its three-dimensional structure and properties (globular and fibrous proteins and the types of bonds involved in its three-dimensional structure). iv) Know the molecular structure of a globular protein and a fibrous protein and understand how their structures relate to their functions (including haemoglobin and collagen).	**Topic 3– Genetics** 3.7B **Explain how the order of bases in a section of DNA decides the order of amino acids in the protein and that these fold to produce specifically shaped proteins such as enzymes**
2.10 i) Understand the mechanism of action and the specificity of enzymes in terms of their three-dimensional structure. ii) Understand that enzymes are biological catalysts that reduce activation energy. iii) Know that there are intracellular enzymes catalysing reactions inside cells and extracellular enzymes produced by cells catalysing reactions outside of cells.	**Topic 1: Key concepts in Biology** 1.7 Explain the mechanism of enzyme action including the active site and enzyme specificity 1.8 Explain how enzymes can be denatured due to changes in the shape of the active site 1.9 Explain the effects of temperature, substrate concentration and pH on enzyme activity 1.11 Demonstrate an understanding of rate calculations for enzyme activity

GCE Biology A Topic 2 – Genes and Health	GCSE Biology
CORE PRACTICAL 4: Investigate the effect of enzyme and substrate concentrations on the initial rates of reactions.	**Topic 1: Key concepts in Biology** 1.10 *Core practical: Investigate the effect of pH on enzyme activity*
2.12 i) Understand how errors in DNA replication can give rise to mutations. ii) Understand how cystic fibrosis results from one of a number of possible gene mutations.	**Topic 3– Genetics** 3.22 State that there is usually extensive genetic variation within a population of a species and that these arise through mutations 3.23 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
2.13 i) Know the meaning of the terms: gene, allele, genotype, phenotype, recessive, dominant, incomplete dominance, homozygote and heterozygote. ii) Understand patterns of inheritance, including the interpretation of genetic pedigree diagrams, in the context of monohybrid inheritance.	**Topic 3– Genetics** 3.12 Explain why there are differences in the inherited characteristics as a result of alleles 3.13 Explain the terms: chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype, gamete and zygote 3.14 Explain monohybrid inheritance using genetic diagrams, Punnett squares and family pedigrees 3.16 Calculate and analyse outcomes (using probabilities, ratios and percentages) from monohybrid crosses and pedigree analysis for dominant and recessive traits

GCE Biology A Topic 2 – Genes and Health		GCSE Biology
2.15	i) Understand the uses of genetic screening, including the identification of carriers, pre-implantation genetic diagnosis (PGD) and prenatal testing, including amniocentesis and chorionic villus sampling. ii) Understand the implications of prenatal genetic screening.	**Topic 3– Genetics** 3.21 Discuss the outcomes of the Human Genome Project and its potential applications within medicine
2.16	Be able to identify and discuss the social and ethical issues related to genetic screening from a range of ethical viewpoints.	

GCE Biology A Topic 3 – Voice of the genome	GCSE Biology
3.2 Know the ultrastructure of eukaryotic cells, including nucleus, nucleolus, ribosomes, rough and smooth endoplasmic reticulum, mitochondria, centrioles, lysosomes, and Golgi apparatus.	**Topic 1: Key concepts in Biology** 1.1 Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: a. animal cells – nucleus, cell membrane, mitochondria and ribosomes b. plant cells – nucleus, cell membrane, cell wall, chloroplasts, mitochondria, vacuole and ribosomes
3.4 Know the ultrastructure of prokaryotic cells, including cell wall, capsule, plasmid, flagellum, pili, ribosomes, mesosomes and circular DNA.	

GCE Biology A Topic 3 – Voice of the genome	GCSE Biology
3.5 Be able to recognise the organelles in 3.2 from electron microscope (EM) images.	**Topic 1: Key concepts in Biology** 1.6 *Core practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations*
3.6 Understand how mammalian gametes are specialised for their functions (including the acrosome in sperm and the zona pellucida in the egg).	**Topic 1: Key concepts in Biology** 1.2 Describe how specialised cells are adapted to their function, including: a. sperm cells – acrosome, haploid nucleus, mitochondria and tail b. egg cells – nutrients in the cytoplasm, haploid nucleus and changes in the cell membrane after fertilisation
3.7 Know the process of fertilisation in mammals, including the acrosome reaction, the cortical reaction and the fusion of nuclei.	
3.8 i) Know that a locus (loci) is the location of genes on a chromosome. ii) Understand the linkage of genes on a chromosome and sex linkage.	**Topic 3– Genetics** 3.18B **Explain how sex-linked genetic disorders are inherited**

GCE Biology A Topic 3 – Voice of the genome	GCSE Biology
3.9 Understand the role of meiosis in ensuring genetic variation through the production of non-identical gametes as a consequence of independent assortment of chromosomes and crossing over of alleles between chromatids (details of the stages of meiosis are not required).	**Topic 3– Genetics** 3.3 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 The stages of meiosis are not required 3.20 Describe the causes of variation that influence phenotype, including: genetic variation – different characteristics as a result of mutation and sexual reproduction
3.10 Understand the role of mitosis and the cell cycle in producing identical daughter cells for growth and asexual reproduction.	**Topic 2– Cells and control** 2.1 Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis 2.2 Describe the importance of mitosis in growth, repair and asexual reproduction 2.3 Describe the division of a cell by mitosis as the production of two daughter cells, each with identical sets of chromosomes in the nucleus to the parent cell, and that this results in the formation of two genetically identical diploid body cells

GCE Biology A Topic 3 – Voice of the genome	GCSE Biology
CORE PRACTICAL 5: Prepare and stain a root tip squash to observe the stages of mitosis.	**Topic 2– Cells and control** 2.1 Describe mitosis as part of the cell cycle, including the stages interphase, prophase, metaphase, anaphase and telophase and cytokinesis
3.11 i) Understand what is meant by the terms 'stem cell, pluripotency and totipotency'. ii) Be able to discuss the way society uses scientific knowledge to make decisions about the use of stem cells in medical therapies.	**Topic 2– Cells and control** 2.6 Explain the importance of cell differentiation in the development of specialised cells 2.8 Describe the function of embryonic stem cells, stem cells in animals and meristems in plants 2.9 Discuss the potential benefits and risks associated with the use of stem cells in medicine
3.12 Understand how cells become specialised through differential gene expression, producing active mRNA leading to synthesis of proteins, which in turn control cell processes or determine cell structure in animals and plants, including lac operon.	**Topic 2– Cells and control** 2.6 Explain the importance of cell differentiation in the development of specialised cells **Topic 3– Genetics** 3.9B **Describe how genetic variants in the non-coding DNA of a gene can affect phenotype by influencing the binding of RNA polymerase and altering the quantity of protein produced**

GCE Biology A Topic 3 – Voice of the genome	GCSE Biology
3.13 Understand how the cells of multicellular organisms are organised into tissues, tissues into organs and organs into systems.	**Topic 2– Cells and control** 2.5 Describe growth in organisms, including: a cell division and differentiation in animals b cell division, elongation and differentiation in plants
3.14 i) Understand how phenotype is the result of an interaction between genotype and the environment. ii) Know how epigenetic changes, including DNA methylation and histone modification, can modify the activation of certain genes. iii) Understand how epigenetic changes can be passed on following cell division.	**Topic 3– Genetics** 3.20 Describe the causes of variation that influence phenotype, including: a. genetic variation – different characteristics as a result of mutation and sexual reproduction b. environmental variation – different characteristics caused by an organism's environment (acquired characteristics)
3.15 Understand how some phenotypes are affected by multiple alleles for the same gene at many loci (polygenic inheritance) as well as the environment and how this can give rise to phenotypes that show continuous variation.	**Topic 3– Genetics** 3.19 State that most phenotypic features are the result of multiple genes rather than single gene inheritance

GCE Biology A Topic 4 – Exchange and transport		GCSE Biology
4.1	Know that over time the variety of life has become extensive but is now being threatened by human activity	**Topic 9– Ecosystems and material cycles** 9.9 Explain the positive and negative human interactions within ecosystems and their impacts on biodiversity, including: a) fish farming b) introduction of non-indigenous species c) eutrophication
4.2	i) Understand the terms biodiversity and endemism. ii) Know how biodiversity can be measured within a habitat using species richness and within a species using genetic diversity by calculating the heterozygosity index iii) Understand how biodiversity can be compared in different habitats using a formula to calculate an index of diversity (D)	**Topic 9– Ecosystems and material cycles** 9.6 Explain how to determine the number of organisms in a given area using raw data from field-work techniques, including quadrats and belt transects
4.3	Understand the concept of niche and be able to discuss examples of adaptation of organisms to their environment (behavioural, physiological and anatomical).	**Topic 6– Plant structures and their functions** 6.14B Explain how plants are adapted to survive in extreme environments including the effect of leaf size and shape, the cuticle and stomata

GCE Biology A Topic 4 – Exchange and transport		GCSE Biology
4.4	Understand how natural selection can lead to adaptation and evolution.	**Topic 4– Natural selection and genetic modification** 4.1B 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 4.2 Explain Darwin's theory of evolution by natural selection 4.3 Explain how the emergence of resistant organisms supports Darwin's theory of evolution including antibiotic resistance in bacteria
4.6	i) Understand that classification is a means of organising the variety of life based on relationships between organisms using differences and similarities in phenotypes and in genotypes, and is built around the species concept. ii) Understand the process and importance of critical evaluation of new data by the scientific community, which leads to new taxonomic groupings, including the three domains of life based on molecular phylogeny, which are Bacteria, Archaea, Eukaryota	**Topic 4– Natural selection and genetic modification** 4.7 Describe how genetic analysis has led to the suggestion of the three domains rather than the five kingdoms classification method

GCE Biology A Topic 4 – Exchange and transport	GCSE Biology
4.7 Know the ultrastructure of plant cells (cell walls, chloroplasts, amyloplasts, vacuole, tonoplast, plasmodesmata, pits and middle lamella) and be able to compare it with animal cells. 4.8 Be able to recognise the organelles in 4.7 from electron microscope (EM) images.	**Topic 1: Key concepts in Biology** 1.1 Explain how the sub-cellular structures of eukaryotic and prokaryotic cells are related to their functions, including: plant cells – nucleus, cell membrane, cell wall, chloroplasts, mitochondria, vacuole and ribosomes 1.6 *Core practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations*
4.10 Understand how the arrangement of cellulose microfibrils and secondary thickening in plant cell walls contributes to the physical properties of xylem vessels and sclerenchyma fibres in plant fibres that can be exploited by humans.	**Topic 6: Plant structures and their functions** 6.8 Explain how the structures of the xylem and phloem are adapted to their function in the plant, including: a. lignified dead cells in xylem transporting water and minerals through the plant b. living cells in phloem using energy to transport sucrose around the plant
CORE PRACTICAL 6: Identify sclerenchyma fibres, phloem sieve tubes and xylem vessels and their location within stems through a light microscope.	**Topic 1: Key concepts in Biology** 1.6 *Core practical: Investigate biological specimens using microscopes, including magnification calculations and labelled scientific drawings from observations*

GCE Biology A Topic 4 – Exchange and transport	GCSE Biology
4.11 Know the similarities and differences between the structures, position in the stem and function of sclerenchyma fibres (support), xylem vessels (support and transport of water and mineral ions) and phloem (translocation of organic solutes).	**Topic 6: Plant structures and their functions** 6.8 Explain how the structures of the xylem and phloem are adapted to their function in the plant, including: a. lignified dead cells in xylem transporting water and minerals through the plant b. living cells in phloem using energy to transport sucrose around the plant
4.12 Understand the importance of water and inorganic ions (nitrate, calcium ions and magnesium ions) to plants.	**Topic 6: Plant structures and their functions** 6.7 Explain how the structure of the root hair cells is adapted to absorb water and mineral ions
4.13 Understand the development of drug testing from historic to contemporary protocols, including William Withering's digitalis soup, double blind trials, placebo, three-phased testing	**Topic 5: Health, disease and the development of medicines** 5.20 Describe that the process of developing new medicines, including antibiotics, has many stages, including discovery, development, preclinical and clinical testing

GCE Biology A Topic 4 – Exchange and transport	GCSE Biology
4.14 Understand the conditions required for bacterial growth.	**Topic 5: Health, disease and the development of medicines** 5.18B *Core practical: Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures*
CORE PRACTICAL 9: Investigate the antimicrobial properties of plants, including aseptic techniques for the safe handling of bacteria	**Topic 5: Health, disease and the development of medicines** 5.17B Explain the aseptic techniques used in culturing microorganisms in the laboratory, including the use of an autoclave to prepare sterile growth medium and petri dishes, the use of sterile inoculating loops to transfer microorganisms and the need to keep petri dishes and culture vials covered 5.18B *Core practical: Investigate the effects of antiseptics, antibiotics or plant extracts on microbial cultures*
4.16 Be able to evaluate the methods used by zoos and seed banks in the conservation of endangered species and their genetic diversity, including scientific research, captive breeding programmes, reintroduction programmes and education.	**Topic 9– Ecosystems and material cycles** 9.10 Explain the benefits of maintaining local and global biodiversity, including the conservation of animal species and the impact of reforestation