



CURRICULUM CORE KNOWLEDGE PLAN

SUBJECT: Science -KS4 Biology
term

YEAR GROUP: 10

DATE: Autumn

Term and unit	Core knowledge	Core vocabulary	Revisiting prior knowledge	Links to Walney Ways & Employability skills/Careers
Autumn term 1- Cells	Substantive knowledge: - Explain how the main subcellular structures in animal and plant cells are related to their functions. - Describe the structure and function of structure in bacterial cells; compare eukaryotes and prokaryotes - Compare light and electron microscopes in terms of magnification and resolution; carry out magnification calculations - Know that cells become differentiated at an early stage; describe the structure and function of a range of specialised cells in tissues, organs or organ systems in both plants and animals. - Describe the stages of the cell cycle, including the stages of mitosis. - Describe cancer as the result of changes in cells that lead to uncontrolled growth and division. Describe the difference between benign and malignant tumours; identify risk factors. - Describe stem cells as undifferentiated cells that can give rise to a range of cells; describe functions of stem cells in plants and animals; sources and medical uses of stem cells; pros and cons	Cell Nucleus Cytoplasm Cell membrane Ribosome Mitochondria Cell wall Vacuole Chloroplast Plasmid Chromosomal DNA Microscope Magnification Focus Eyepiece Lens Objective lens Resolution Sperm Nerve Muscle Root hair cells Xylem Phloem Mitosis Stem cells	Students have previously been taught: - Describe animal and plant cell parts and functions - Know how to use a light microscope - Describe specialised cells including their parts and functions - Know the process of diffusion - Describe the structure and function of the lungs including gas exchange - Explain the particles model	Curious Self aware Resilient Aspirational Team work



	- Describe the process of diffusion(using the particle theory) and examples of diffusion in plant and animal cells/tissues. - Explain how different factors affect the rate of diffusion to include - the difference in concentrations (concentration gradient), the temperature and the surface area of the membrane. - Calculate and compare surface area to volume ratios and relate these to the need for exchange surfaces and a transport system in multicellular organisms (e.g. gills and alveoli). - Describe osmosis (using the particle theory) and describe examples of this in plants and animals. - Describe factors affecting osmosis (e.g. external concentration) by measuring percentage change of mass - Describe the process of active transport (using the particle theory) and describe examples in plants (mineral uptake in roots) and animals (absorption in the small intestine). Disciplinary knowledge - Microscopes – observations, making drawings, finding the magnification - Required practical 1 - Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included. - Calculating magnification from actual and image sizes - Use of prefixes – centi, milli, micro and nano	Undifferentiated Meristems Cancer Benign Malignant Tumour Diffusion Osmosis Concentration Concentration gradient Active transport SA:Volume	- Know how to prepare a slide and make microscope drawings - Know how to calculate the total magnification	
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	• Using standard form • Modelling diffusion and osmosis • Calculating SA, volumes and SA:volume ratio • Calculating rates of diffusion • Required practical 3 - Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. • use the theory of osmosis to create hypotheses on plant tissue. • plan experiments to test hypotheses. • have due regard for accuracy of measurements and health and safety. • make and record observations and measurements of mass. • evaluate the method and suggest possible improvements and further investigations. • present observations and other data in graphical form. • translate mass data into graphical form. • Finding (experimentally) changes in mass and percentage change in mass • Drawing line graphs and describing and explaining patterns in evidence • Identifying and explaining the x-intercept • Evaluating the method • Evaluate the practical benefits and risks of stem cell therapies •			
Autumn term 1 - Organisation	Substantive knowledge: • Describe how organisms are organised (cell>organism).	Organisation Cell Tissue	Students have previously been taught:	Organisation Self aware



	- Describe the structures and functions of the digestive system. - Describe adaptations of the digestive system (e.g. villi, and tissues – muscular, glandular, epithelial). - Describe how to test for different food groups – starch, glucose, protein and lipids. - Describe the role of enzymes of the digestive system (amylase, protease/pepsin and lipase). - Describe the role of bile in the digestive system. - Describe how enzyme function works (lock and key theory) and the effect of factors on the rate of enzyme action (temperature and pH). - Describe the structures and functions of the respiratory system and relate structure to function of the alveoli to describe gaseous exchange. - Describe the structure and functions of the heart to include the chambers and major blood vessels. - Describe the location and function of the pacemaker. - Relate the structure to function of arteries, veins and capillaries. - Describe the causes and consequences of coronary heart disease. - Evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs, mechanical devices or transplant. - Describe the risk factors of coronary heart disease and be able to describe the relationship between health and disease.	Organ Organ system Organism Digestion Mouth Oesophagus Stomach Small intestine Large intestine Anus Liver Gall bladder Pancreas Villi Enzyme Amylase (carbohydrase) Protease (pepsin) Lipase Active site Substrate Lock and key theory Optimum pH Temperature Glucose Benedicts solution Starch Iodine Protein Biuret test Lipid Sudan III	- Describe the different organ systems - Know the structure and functions of the digestive system - Describe the features of a healthy diet - Know how to carry out food tests - Describe the structure and function of the lungs - Know the structure of the heart - Know the effects of smoking - Know what a non-communicable disease is - Describe aerobic and anaerobic respiration	
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	- Describe the four components of the blood and their functions. Be able to recognise images or diagrams and use them to explain functions. - Describe aerobic respiration in living things and use word and balanced equations. Describe the need for energy in organisms. - Describe the process of anaerobic respiration in animals (using word equation) and explain the consequences of this on the body (HT) - Explain how exercise affects the heart rate, breathing rate and breath volume in order to supply the muscles with more oxygenated blood. - Explain the importance of sugars, amino acids, fatty acids and glycerol in the synthesis and breakdown of - carbohydrates, proteins and lipids (metabolism). Disciplinary knowledge - Required practical 4: Use qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein. - Carry out experiments appropriately having due regard for the correct manipulation of apparatus, and health and safety considerations. - Draw and interpret enzyme graphs varying the temperature and pH. - Required practical 5: Investigate the effect of pH on the rate of reaction of amylase enzymes. Students should use a continuous sampling technique to	Respiratory system Trachea Lung Bronchus Bronchiole Alveoli Diaphragm Rib cage Intercostal muscles Cartilage Circulatory system Heart Atrium Ventricle Artery Vein Capillary Aorta Vena cava Pulmonary artery Pulmonary vein Valve Oxygenated Deoxygenated Non-communicable Stents Statins Pacemaker Artificial blood Artificial heart Valve replacement Risk factors Red blood cells White blood cells		
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determine the time taken to completely digest a starch solution at a range of pH values. Iodine reagent is to be used to test for starch every 30 seconds. Temperature must be controlled by use of a water bath or electric heater.

- Use scientific theories and explanations and hypotheses on how pH affects amylase activity.
- Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements, and health and safety.
- Describe the appropriate sampling technique to ensure samples are representative.
- Make and record observations and measurements of time.
- Present a graph of amylase activity against pH.
- Translate numeric data into graphical form.
- Calculating rates (e.g. blood flow, lung volume flow).
- Evaluating information and data of using different types of procedures to reduce coronary heart disease.
- Evaluating information about different risk factors (of CHD)
- Balancing equations
- Assimilating information from different sources – e.g. describing the effect of exercise on the body; describing metabolism.
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Platelets
Plasma
Haemoglobin
oxyhaemoglobin
Biconcave
Antibodies
Antitoxins
Phagocytosis
Respiration
Aerobic
Anaerobic
Exothermic
Mitochondria
Lactic acid
Oxygen debt
Metabolism



CURRICULUM CORE KNOWLEDGE PLAN

SUBJECT: Science -KS4 Biology

YEAR GROUP: 10

DATE: Spring term

Term and unit	Core knowledge	Core vocabulary	Revisiting prior knowledge	Links to Walney Ways & Employability skills/Careers
Spring term 2- Organisation	Continued from previous term			
Autumn term 1 - Bioenergetics	Substantive knowledge: - Describe the process of fermentation in microorganisms like yeast and uses in the food industry. - Describe the leaf to include the following tissues - epidermis, palisade and spongy mesophyll, xylem and phloem, and guard cells surrounding stomata. - Describe photosynthesis as word and balanced equations. - Describe the factors affecting photosynthesis to include carbon dioxide, light intensity, variegated leaves and effect on starch tests of a leaf. - Describe the uses of glucose to include: respiration, insoluble starch, fat or oil, cellulose and to produce amino acids. - Describe and explain the effects of temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll on the rate of photosynthesis. - Explain (using graphs) how factors interact and any one of them may be the factor that limits photosynthesis (HT only). - Describe how limiting factors are important in the economics of enhancing the conditions in greenhouses to	Fermentation Yeast Anaerobic respiration Photosynthesis Epidermis Palisade Spongy mesophyll Xylem Phloem Guard cells Stomata Vein Turgid Flaccid Variegated Chlorophyll Chloroplast Limiting factors Aerobic respiration Transpiration Root hair cells Potometer	Students have previously been taught: - Describe the process of fermentation, knowing that bread and alcohol are produced - Describe the parts of a plant - Describe the process of photosynthesis - Know the role of stomata - Know the structure and function of a root hair cell - Know how to use microscopes - Describe evidence to know that a chemical reaction has taken place	Team work Problem solving Communication Customer service



	gain the maximum rate of photosynthesis while still maintaining profit. (HT only) ● Compare aerobic respiration and photosynthesis (using hydrogen carbonate indicator) ● Describe the transpiration stream. ● Describe and explain how the structure of root hair cells, xylem, guard cells and stomata are adapted to perform their function in transpiration. ● Describe the effect of changing temperature, humidity, air movement and light intensity on the rate of transpiration. ● Describe the process of translocation and describe phloem structure and function. Disciplinary knowledge ● Observation and drawing of a transverse section of leaf. ● Analyse data and information concerning the effect of factors on starch formation. ● Measure and calculate rates of photosynthesis ● Required practical 6: Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed. ● Use scientific theories and explanations to develop hypotheses on how light intensity affects the rate of photosynthesis. ● Plan experiments to test hypotheses. ● Recognise that multiple samples will be needed at each light intensity. ● Make and record observations of gas production. ● Present a graph of light intensity against rate of photosynthesis. ● Translate numeric data into graphical form.	Translocation		
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- Extract and interpret graphs of photosynthesis rate involving one limiting factor
- Plot and draw appropriate graphs selecting appropriate scale for axes
- Translate information between graphical and numeric form.
- Draw conclusions based on evidence.
- Evaluate data; identifying anomalies and calculating means.
- Students should understand and use inverse proportion – the inverse square law and light intensity in the context of photosynthesis. (HT only)
- Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses. (HT only)
- Use tests to identify starch, glucose and proteins using simple qualitative reagents.
- Use of hydrogen carbonate indicator to indicate relative respiration and photosynthesis rates
- Measure the rate of transpiration by the uptake of water.
- Investigate the distribution of stomata and guard cells.
- Process data from investigations involving stomata and transpiration rates to find arithmetic means, understand the principles of sampling.
- Use appropriate means (e.g. potometer, loss of mass) to find transpiration rates.
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CURRICULUM CORE KNOWLEDGE PLAN

SUBJECT: Science -KS4 Biology

YEAR GROUP: 10

DATE: Summer term

Term and unit	Core knowledge	Core vocabulary	Revisiting prior knowledge	Links to Walney Ways & Employability skills/Careers
Summer term 3 - Bioenergetics	Continued from previous term			
Summer term 3 - Ecology	Substantive knowledge: - Describe different levels of organisation in an ecosystem from individual organisms to the whole ecosystem - Describe the importance of interdependence and competition in a community. - Suggest the factors for which organisms are competing in a given habitat and suggest how organisms are adapted to the conditions in which they live. - Explain how a change in an abiotic or a biotic factor would affect a given community given appropriate data or context.	Ecology Ecologist Interdependence Competition Community Organism Ecosystem Habitat Environment Biotic Abiotic Species	Students have previously been taught: - Know the structure and function of plants - Know that different species need different habitats to survive - Describe food chains and food webs and the relationship between them	Curious Resilient Communicative Self-aware Wider thinking Business aware Problem solving



	● Explain how organisms are adapted to live in their natural environment, given appropriate information. ● Know how to detect and identify plant disease. ● Know that nitrate ions are needed for protein synthesis and therefore growth, and that magnesium ions are needed to make chlorophyll. ● Describe physical, chemical and mechanical plant defence responses. ● Know that photosynthetic organisms are the producers of biomass for life on Earth. ● Know how many different materials cycle through the abiotic and biotic components of an ecosystem ● Explain the importance of the carbon and water cycles to living organisms. ● Explain the role of microorganisms in cycling materials through an ecosystem by returning carbon to the atmosphere as carbon dioxide and mineral ions to the soil. ● Explain how temperature, water and availability of oxygen affect the rate of decay of biological material. ● Evaluate the impact of environmental changes on the distribution of species in an ecosystem given appropriate information. (H tier only) ● Explain how waste, deforestation and global warming have an impact on biodiversity. ● Know the causes and effects of pollution. ● Know that humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste. ● Evaluate the environmental implications of deforestation. ● Describe some of the biological consequences of global warming.	Stable community Light intensity Predators Prey Pathogens Adaptations Structural Behavioural Functional Nitrate ions Protein synthesis Magnesium ions Chlorophyll Physical Chemical Mechanical Tobacco mosaic Virus Rose Black Spot Cellulose Cuticle Mimicry Extremophiles Photosynthetic Biomass Food Chains Food Webs Producer Primary consumer Secondary Consumer Tertiary consumer Transects Quadrats Sampling techniques	● Describe the different adaptations that plants and animals have ● Know the composition of the atmosphere ● Describe the greenhouse effect and global warming ● Explain how to reduce carbon dioxide emissions ● Know the process and benefits of recycling	
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	- Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity. - Describe the differences between the trophic levels of organisms within an ecosystem. - Describe pyramids of biomass - Explain how biomass is lost between the different trophic levels. - Describe some of the biological factors affecting levels of food security. - Evaluate the advantages and disadvantages of modern farming techniques. - Understand how application of different fishing techniques promotes recovery of fish stocks. - Describe and explain some possible biotechnical and agricultural solutions, including genetic modification, to the demands of the growing human population. Disciplinary knowledge - Understand the terms mean, mode and median - Calculate arithmetic means - Extract and interpret information from charts, graphs and tables. - Plot and draw appropriate graphs selecting appropriate scales for the axes. - Interpret graphs used to model predator-prey cycles. - Required practical activity 9: measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species. - calculate rate changes in the decay of biological material	Predator-prey cycles Carbon cycle Microorganisms Detritovores Decomposers Decay Photosynthesis Respiration Carbon Dioxide Mineral ions Compost Fertiliser Anaerobic decay Methane gas Biogas generators Water cycle Evaporation Precipitation Biodiversity Waste Deforestation Global Warming Climate change Resources Pollution Emissions Sewage Landfill Quarrying Peat bogs Biofuels Consequences Peer Review		
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- Required practical activity 10: investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.
- Construct accurate pyramids of biomass from appropriate data.
- Calculate the efficiency of biomass transfer between trophic levels.

Breeding programmes
 Endangered Species Protection
 Regeneration
 Field margins
 Hedgerows
 Agriculture
 Monoculture
 Recycling
 Trophic levels
 Herbivores
 Carnivores
 Apex predators
 Pyramids of Biomass
 Biomass transfers
 Incident energy
 Ingested
 Absorbed
 Egested
 Faeces
 Urea
 Urine
 Glucose
 Biological factors
 Food security
 Population
 Famine
 Conflict
 Sustainable
 Sustainability
 Energy transfer
 Intensive farming
 Fish stocks



		Fishing quotas Fishing techniques Biotechnology Genetic Modification <i>Fusarium</i> Mycoprotein Insulin Diabetes Golden rice Efficiency Percentage Fraction Optimum Rate Fluctuate Mean Median Mode Interval		
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CURRICULUM CORE KNOWLEDGE PLAN

SUBJECT: Science -KS4 Biology

YEAR GROUP: 11

DATE: Autumn term



Term and unit	Core knowledge	Core vocabulary	Revisiting prior knowledge	Links to Walney Ways & Employability skills/Careers
Autumn term 1 - Ecology	Continued from the end of year 10			
Autumn term 1 - homeostasis	Substantive knowledge: - explain that homeostasis is the regulation of the internal conditions of a cell or organism to maintain optimum conditions for function (of enzyme action and cell function) in response to internal and external changes. - explain how the structure of the nervous system is adapted to its functions. - Describe a nervous system response in terms of; stimulus → receptor → coordinator → effector → response - explain how the various structures in a reflex arc – including the sensory neurone, synapse, relay neurone and motor neurone – relate to their function. - know why reflex actions are important. - identify the cerebral cortex, cerebellum and medulla on a diagram of the brain, and describe their functions. - explain some of the difficulties of investigating brain function and treating brain damage and disease. (H) - Evaluate the benefits and risks of procedures carried out on the brain and nervous system. (H) - to identify the following structures on a diagram of the eye and explain how their structure is related to their function: retina, optic nerve, sclera, cornea, iris, ciliary muscles, suspensory ligaments. - relate the structures of the eye to their functions. This includes: accommodation to focus on near or distant objects and adaptation to dim light. - Describe myopia and hyperopia and their treatments. Interpret ray diagrams, showing these two common	Homeostasis Optimum Temperature Nervous system Nerve Neurone Chemical Response Receptors Stimuli Stimulus Coordinator Coordination Brain Spinal Cord CNS (Central Nervous System) MRI scanner Pancreas Effectors Muscles Glands Responses Behaviour Reflex arc Synapse Cerebral cortex Cerebellum Medulla	Students have previously been taught: - Know the different organ systems - Describe the role of enzymes - Know the different structures and function of a nerve cell - Describe the parts of the eye - Know the process of refraction - Describe the risks factors for disease - Know the process of osmosis - Describe the process of fertilisation, where gametes are produced and the menstrual cycle	Aspirational Curious Resilient Communicative Self-motivated Self-aware Wider thinking



	defects of the eye and demonstrate how spectacle lenses correct them. ● Know how body temperature is monitored and controlled. ● Explain how thermoregulatory mechanisms lower or raise body temperature in a given context. (H) ● describe the principles of hormonal coordination and control by the human endocrine system. ● Identify the position of the following on a diagram of the human body; pituitary gland, pancreas, thyroid, adrenal gland, ovary, testes. ● explain how insulin controls blood glucose (sugar) levels in the body. ● compare Type 1 and Type 2 diabetes and explain how they can be treated. ● explain how glucagon (from the pancreas) interacts with insulin in a negative feedback cycle to control blood glucose (sugar) levels in the body. (H) ● describe and explain the effect on cells of osmotic changes in body fluids (osmoregulation). ● Know that the digestion of proteins from the diet results in excess amino acids which need to be excreted safely. Describe how this happens. (HT) ● describe the function of kidneys in maintaining the water balance of the body (<u>Knowledge of other parts of the urinary system, the structure of the kidney and the structure of a nephron is NOT required</u>) ● describe the effect of ADH on the permeability of the kidney tubules. (H) ● know the basic principles of dialysis. ● Evaluate the advantages and disadvantages of treating organ failure by mechanical device or transplant. ● describe the roles of hormones in human reproduction, including the menstrual cycle.	Neuroscientist Procedures Evaluate Retina Optic nerve Sclera Cornea Iris Ciliary muscles Suspensory ligaments Accommodation Focus Myopia Hyperopia Lenses Temperature Thermoregulation Vasodilation Vasoconstriction Hormones Pituitary gland Pancreas Thyroid gland Adrenal gland Ovary Testes Insulin Glucose Diabetes Glucagon Glycogen Negative feedback Osmosis		
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	● explain the interactions of FSH, oestrogen, LH and progesterone, in the control of the menstrual cycle. ● evaluate the different hormonal and nonhormonal methods of contraception. ● explain the use of hormones in modern reproductive technologies to treat infertility. ● Understand social and ethical issues associated with IVF treatments. ● explain the roles of thyroxine and adrenaline in the body. ● Interpret and explain simple diagrams of negative feedback control. ● Know that plants produce hormones to coordinate and control growth and responses to light (phototropism) and gravity (gravitropism or geotropism). ● Describe how unequal distributions of auxin cause unequal growth rates in plant roots and shoots. ● Know that Gibberellins are important in initiating seed germination and that Ethene controls cell division and ripening of fruits. (H) ● describe the effects of some plant hormones and the different ways people use them to control plant growth. (H) ● Understand how the everyday use of hormones as weed killers has an effect on biodiversity. (H) Disciplinary knowledge ● extract and interpret data from graphs, charts and tables, about the functioning of the nervous system. ● translate information about reaction times between numerical and graphical forms.	Osmotic Osmoregulation Proteins Amino Acids Urea Urine Kidneys Liver Deaminated ammonia ADH (anti-diuretic hormone) Permeability Kidney tubules Filtration Selective reabsorption Dialysis Mechanical device Transplant Reproduction Testosterone Sperm Menstrual cycle FSH (follicle stimulating hormone) LH (luteinising hormone) Oestrogen Progesterone Uterus Infertility Contraception		
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	● Required practical activity 7: plan and carry out an investigation into the effect of a factor on human reaction time. ● Evaluate information around the relationship between obesity and diabetes, and make recommendations, taking into account social and ethical issues. ● extract information and interpret data from graphs that show the effect of insulin in blood glucose levels in both people with diabetes and people without diabetes. ● translate tables and bar charts of glucose, ions and urea before and after filtration. ● Students should be able to extract and interpret data from graphs showing hormone levels during the menstrual cycle. ● Show why issues around contraception cannot be answered by science alone. ● Explain every-day and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. ● Evaluate from the perspective of patients and doctors the methods of treating infertility. ● Required practical activity 8: investigate the effect of light or gravity on the growth of newly germinated seedlings. Record results as both length measurements and as careful, labelled biological drawings to show the effects. ● safe and ethical use of plants to measure physiological function of growth in response to light or gravity. ● observations of biological specimens to produce labelled scientific drawings. ● plan experiments to make observations to explore the phenomena of plant responses.	Condoms Diaphragms IUD's (Intra-uterine devices) Spermicide Abstinence Sterilisation IVF (In-vitro fertilisation) Implantation Embryo Social Ethical Thyroxine Adrenaline Phototropism Gravitropism Geotropism Auxin Gibberellins Ethene Biodiversity Evaluate		
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	• apply knowledge of a range of techniques, apparatus and materials appropriate to the experiment. • make and record observations and measurements using length and biological drawings. • suggest improvements and further investigations. • present observations as tables, graphs or drawings.			
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CURRICULUM CORE KNOWLEDGE PLAN

SUBJECT: Science -KS4 Biology

YEAR GROUP: 10

DATE: Spring term

Term and unit	Core knowledge	Core vocabulary	Revisiting prior knowledge	Links to Walney Ways & Employability skills/Careers
Spring term 2- Inheritance, variation and evolution	Substantive knowledge: • Know that meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed.	Meiosis Mitosis Sexual Asexual Genetic Variety	Students have previously been taught: • Know how different characteristics are inherited	Aspirational Curious Resilient Communicative Self-motivated Self-aware



	• Know that sexual reproduction involves the joining (fusion) of male and female gametes and leads to variation in the offspring • Asexual reproduction involves only one parent and no fusion of gametes and leads to genetically identical offspring (clones). Only mitosis is involved. • explain how meiosis halves the number of chromosomes in gametes and fertilisation restores the full number of chromosomes. <u>Knowledge of the stages of meiosis is not required.</u> • Explain the advantages and disadvantages of sexual and asexual reproduction for any organism is given appropriate information. • Know that some organisms reproduce by both methods depending on the circumstances. Specific knowledge required of; Malarial parasites, fungi, strawberry plants, and daffodils. • to describe the structure of DNA and define genome. • discuss the importance of understanding the human genome. • describe DNA as a polymer made from four different nucleotides. Each nucleotide consists of a common sugar and phosphate group with one of four different bases attached to the sugar. • Interpret a diagram of DNA structure <u>but will not be required to reproduce it.</u> • recall a simple description of protein synthesis. (H) • explain simply how the structure of DNA affects the protein made (H) • describe how genetic variants may influence phenotype: a) in coding DNA by altering the activity of a protein: and b) in non-coding DNA by altering how genes are expressed (H)	Gametes Fusion Clones Chromosomes Genes DNA Chromosomes Embryo Differentiate Genome Polymer Strands Double helix Sequence Amino acids Protein Nucleotides Phosphate Bases Synthesis Variants Coding Non-coding Ribosomes Template Carrier molecules Enzymes Hormones Collagen Mutations Substrate Insertions Deletions Gamete	• Describe the process of mitosis • Explain the role of bacteria-binary fission • Describe what a polymer is • Describe inherited diseases • Know the genetic and environmental effects on variation • Explain continuous and discontinuous variation • Know the formation and properties of sedimentary rocks	Wider thinking
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- **Describe mutations and explain their effects. (H)**

- Students should be able to explain the terms: gamete, chromosome, gene, allele, dominant, recessive, homozygous, heterozygous, genotype, phenotype.
- use direct proportion and simple ratios to express the outcome of a genetic cross.
- complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees.
- **construct a genetic cross by Punnett square diagram and use it to make predictions using the theory of probability.**
- Know that some disorders are inherited. These disorders are caused by the inheritance of certain alleles.
- Describe the symptoms and inheritance of Cystic Fibrosis and Polydactyly.
- make informed judgements about the economic, social and ethical issues concerning embryo screening, given appropriate information.
- carry out a genetic cross to show sex inheritance.
- understand and use direct proportion and simple ratios in genetic crosses.
- describe simply how the genome and its interaction with the environment influence the development of the phenotype of an organism.
- state that there is usually extensive genetic variation within a population of a species
- recall that all variants arise from mutations and that: most have no effect on the phenotype; some influence phenotype; very few determine phenotype.

Chromosome
Gene
Allele
Dominant
Recessive
Homozygous
Heterozygous
Genotype
Phenotype
Inheritance
Probability
Punnet square diagram
Genetic crosses
Family trees
Disorders
Cystic fibrosis
Polydactyly
Economic
Social
Ethical
Embryo Screening
Characteristics
Sex
XX
XY
Variation
Environment
Species
Variant
Evolution
Natural Selection
Evolved
Billion



	• 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 a new species. • explain the impact of selective breeding of food plants and domesticated animals. • Explain the benefits and risks of selective breeding given appropriate information and consider related ethical issues. • describe genetic engineering as a process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic. • explain the potential benefits and risks of genetic engineering in agriculture and in medicine and that some people have objections. • describe the main steps in the process of genetic engineering. • Describe the different methods of cloning (tissue culture, cuttings, embryo transplants and adult cell cloning) and the processes involved in adult cell cloning. • Explain the potential benefits and risks of cloning in agriculture and in medicine and that some people have ethical objections. • Charles Darwin, as a result of observations on a round the world expedition, backed by years of experimentation and discussion and linked to developing knowledge of geology and fossils, proposed the theory of evolution by natural selection. • appreciate that the theory of evolution by natural selection developed over time and from information gathered by many scientists.	Interbreed Fertile offspring Selective breeding (artificial selection) Inbreeding Defects Genetic Engineering Agriculture Genetically modified Herbicides Yields Vector Bacterial plasmid Tissue Culture Cuttings Embryo transplants Specialised Transplanting Host Charles Darwin Geology Fossils Generation Jean-Baptiste Lamarck Alfred Russel Wallace Speciation Gregor Mendel Units Antibiotic resistance Evolutionary trees Extinction Strains		
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	• describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection • explain the impact of these ideas on biology. • describe the steps which give rise to new species (speciation). • describe the development of our understanding of genetics including the work of Mendel • understand why the importance of Mendel's discovery was not recognised until after his death. • describe the evidence for evolution including fossils and antibiotic resistance in bacteria. • Know that Fossils are the 'remains' of organisms from millions of years ago, which are found in rocks. • Describe how fossils formed and explain their importance as evidence for evolution. • Define extinction and describe factors which may contribute to the extinction of a species. • Know that mutations of bacterial pathogens produce new strains that might be resistant to antibiotics, and so are not killed. Explain this process. • Describe how to reduce the rate of development of antibiotic resistant strains, such as MRSA. • use information given to show understanding of the Linnaean system. • Students should be able to describe the impact of developments in biology on classification systems.	Immune MRSA Classification Carl Linnaeus Kingdom Phylum Class Order Family Genus Species Binomial Biochemical processes Three-domain system Carl Woese Archaea Bacteria Eukaryota		
	Disciplinary knowledge			



- **Modelling insertions and deletions in chromosomes to illustrate mutations. (H)**
- understand the concept of probability in predicting the results of a single gene cross, but recall that most phenotype features are the result of multiple genes rather than single gene inheritance.
- **Interpret information about genetic engineering techniques and to make informed judgements about issues concerning cloning and genetic engineering, including GM crops.**
- extract and interpret information from charts, graphs and tables such as evolutionary trees.
- Understand how scientific methods and theories develop over time.
- Interpret evolutionary trees.

