YEAR 10		AUTUMN TERM				YEAR 10		SPRING TERM				YEAR 10		SUMMER TERM			
POWERFUL IDEAS	**Disease Bioenergetics**	**CEIAG**	Immunology Agriculture	**Focused retrieval 6 topics**	Cells Ecosystems	**POWERFUL IDEAS**	**Bioenergetics Homeostasis**	**CEIAG**	Dieticians (with the link to diabetes)	**Focused retrieval 6 topics**	Cells Organisation	**POWERFUL IDEA**	**Ecosystems**	**CEIAG**	Environment agency	**Focused retrieval 6 topic**	Ecosystems Bioenergetics
TOPICS	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**
Infection and response	- spread of pathogens - how bacterial and viral pathogens cause disease - viral diseases - measles, HIV, TMV - bacterial diseases - gonorrhoea, salmonella - fungal disease - rose black spot - protist disease - malaria - barriers to infection - role of the immune system - vaccination - painkillers and antibiotics - drug discovery		- explain how disease spread can be reduced - compare how different pathogens cause disease - explain how named diseases can be treated or prevented - explain how the body, including the immune system, respond to pathogens. - interpret data relating to vaccination - evaluate the use of vaccination in preventing disease - compare the use of painkillers and antibiotics - justify the steps involved in drug trials, including the use of double blind trials	Frayer models: Pathogen Resistance Other key terms: Vector Mucus Cilia Engulf Antigen Antibody Antitoxin Vaccination Antibiotic Placebo	Bioenergetics - metabolism	- Metabolism and metabolic rate. - Factors affecting metabolic rate - Reactions involved in metabolism		- Explain the role of the liver in Metabolism - Describe how a range of factors can affect the metabolic rate. - Link metabolic rate to other topics such as enzymes and respiration.		Metabolism Respiration	Ecology - Ecosystems	- Carbon and Water Cycles - Classification systems developed by Linnaeus and Woese. - Interactions between populations, communities and ecosystems, including the idea of interdependence. - Sampling techniques to include quadrats and transects. - Adaptations, including extremophiles. - Competition between plants and animals. - Food chains and webs.		- Describe the events in the Carbon and water cycles - State the order of the classification hierarchy (K,P,C, O, F, G, S) - Use information provided to identify the classification groupings of organisms. - Explain the difference between a population and community. - Explain how organisms interact with one another in an ecosystem (interdependence). - Compare the use of quadrats and transects in sampling the environment. - Use data provided to estimate population sizes when sampling using quadrats. - Explain how adaptations help organisms survive in a range of habitats. - Explain what an extremophile is and the advantage in terms of competition. - Explain what plants and animals compete for and why. - Construct food chains when given appropriate information. - Interpret food chains and webs identifying the consequences of the removal of certain species.	Frayer models: Species Interdependence Other key terms: Respiration Photosynthesis Decay Combustion Kingdon Phylum Class Family Order Community Population Ecosystem Quadrat Transect Adaptation Extremophile
Bioenergetics - photosynthesis and respiration	- Photosynthesis - Uses of glucose from Photosynthesis - Limiting factors of Photosynthesis - Aerobic respiration - Uses of energy from respiration - Anaerobic respiration in plants/yeast (ethanol) and mammals (lactate) - Respiration linked to exercise - Oxygen debt		- Explain how the reactants for Photosynthesis are obtained by a plant. - Explain what happens to the glucose produced in photosynthesis. - Interpret graphs relating to the limiting factors of temperature, carbon dioxide concentration and light intensity. - Investigate the rate of photosynthesis using pondweed. - Explain the inverse square law for light intensity (higher only) - Explain the process of aerobic respiration, including the use of the equation. - Compare the processes of aerobic and anaerobic respiration, and the different methods of anaerobic respiration. - Interpret data linking to breathing rate, heart rate and exercise in terms of respiration. - Define the term oxygen debt and explain how it links to muscle fatigue.	Frayer models: Photosynthesis Anaerobic Other key terms: Chloroplast Stomata Endothermic Limiting factor Aerobic Mitochondria Exothermic Ethanol Lactic acid Oxygen debt	Homeostasis - nervous sytem	- Structure and role of the nervous system - Neurones involved in a reflex arc - Importance of reflex actions - Role of synapses in a reflex action - Factors that affect reaction time.		- Describe the order of neurones in a reflex arc - Explain how reflex actions enable rapid response to a stimulus. - Compare transmission through neurones and across a synapse. - Describe the difference between reflex actions and conscious responses. - Plan an investigation into reaction time, identifying key variables to control. - Interpret data and results relating to reaction time investigations.		Frayer models: Receptor Other key terms: Stimulus Sensory neurone Relay neurone Motor neurone Electrical impulse Synpase Effector Response Reflex action Reaction time	Ecology - Human impacts	- Human impacts on the environment, including waste management and land use. - Deforestation - Global warming. - Biodiversity including its importance and methods to maintain Biodiversity levels.		- Describe the different ways humans can impact the environment, including pollution, waste management and land use. - Interpret data in relation to deforestation. - Explain the biological consequences of deforestation. - Explain the biological consequences of Global warming. - State what is meant by biodiversity. - Evaluate the impact humans have on Biodiversity by considering both the positive and negative impacts.	Key Terms Deforestation Global warming Greenhouse gas Biodiversity Rotation
						Homeostasis - hormones	- Structure and function of the endocrine system, including names of glands and hormones produced. - the process of homeostasis in controlling internal conditions. - The role of the pancreas and liver in controlling blood sugar levels. - The role of insulins (and for higher glucagon) in regulating blood sugar levels. - Symptoms and treatment of type 1 and type 2 diabetes. - Hormones involved in the female menstrual cycle. - Use of hormones in contraception. - Other forms of contraception. - Higher Tier - use of hormones in fertility treatments and IVF.		- Identify glands in the endocrine system from a diagram. - Describe the role of different hormones within the endocrine system. - Explain what conditions are controlled in homeostasis, and why this control is important. - Explain the role of insulin (and glucagon for higher) in controlling blood glucose levels. - Compare and contrast type 1 and type 2 diabetes. - Interpret data from graphs relating to the different types of diabetes. - Describe the role of oestrogen, LH, FSH and progesterone in the menstrual cycle. - Explain how the oral contraceptive pill prevents pregnancy. - Evaluate the use of different methods of contraception. - Explain the role of hormones in fertility treatments and IVF. - Interpret data relating to IVF. - Evaluate the use of IVF in different situations.		Frayer models: Homeostasis Other key terms Endocrine Pancreas Pituitary Adrenal Thyroid Testes Ovaries Chemical Insulin Glycogen Diabetes Oestrogen LH FSH Progesterone Ovulation					

YEAR 11	AUTUMN TERM				YEAR 11	SPRING TERM			YEAR 11	SUMMER TERM			
POWERFUL IDEAS	Genetics Evolution	CEIAG	Paleotologist Genetic Counsellor	Focused retrieval 6 topics	Homeostasis Disease	POWERFUL IDEAS	Genetics Evolution Homeostasis Ecosystems	CEIAG	Ophthalmologist Focused retrieval 6 topics	Cells Organisation Disease Bioenergetics	POWERFUL IDEA		CEIAG	Focused retrieval 6 topic	Genetics Evolution Homeostasis Ecosystems
TOPICS	Substantial knowledge (KNOW)		Disciplinary Knowledge (KNOW HOW TO)		Literacy	TOPICS	Substantial knowledge (KNOW)		Disciplinary Knowledge (KNOW HOW TO)	Literacy	TOPICS	Substantial knowledge (KNOW)		Disciplinary Knowledge (KNOW HOW TO)	Literacy
Inheritance	- Causes of variation - Meiosis - Sexual and Asexual reproduction - DNA and the genome - Sex determination - Genetic inheritance - Inherited disorders and embryo screening		- Describe the causes of variation in terms of genetic and environmental. - Describe the process of meiosis. - Compare the processes of mitosis and meiosis. - Compare sexual and asexual reproduction. - Describe how DNA is arranged in the nucleus. - Evaluate the use of the genome in a range of applications. - Define key terms relating to inheritance. - Be able to interpret genetic diagrams (punnet squares) to predict inheritance of gender and other characteristics. - Higher tier - be able to construct genetic diagrams. - Interpret pedigree charts to predict inheritance.	Frayer Models: Chromosome Heterozygous Other key terms Allele Genotype Phenotype Dominant Recessive Homozygous Meiosis Genome Cystic fibrosis Polydactyly Asexual Sexual	Inheritance Part 2 T	- Asexual and Sexual Reproduction - DNA structure - Protein Synthesis - Cloning plants - cuttings and tissue culture - Cloning animals - embryo tranplants and adult cell cloning - Theories of evolution - Speciation - History of understanding genetics.	- Evalutate Sexual and Asexual reproduction. - Explain why some organisms have life cycles that include both types of reproduction. - Describe the structure of DNA, including the structure of an individual nucleotide. - Explain how DNA is used to code for proteins. - Explain the effect mutations can have on the proteins produced from the DNA code. - Evaluate the use of cuttings and tissue culture to clone plants. - Explain how embryo transplants are used to clone animals. - Explain how adult cell cloning is used to clone animals. - Evaluate methods of cloning animals. - Explain Lamarcks theory of evolution. - Explain what happens in the process of speciation, linked to evolution. - Explain how the understanding of genetics has changed over time.	Key terms: Double helix Chromosome Gene Amino acid Mutation RNA Clone Embryo Lamarck Acquired Speciation	Summer term is spent completing structured and targeted review and practice of the curriculum For Dual students this will focus on paper 2: - Homeostasis and response - nerves, reflexes, glucoregulation, female hormones - Ecology - Cycles, classification, adaptations, ecosystems, human impact - Inheritance - inheritance and disorders, variation, evolution For Triple students this will focus on both paper 1 and 2 content, due to limited revision time topics will be taken based on areas of weakness from exams.				
Variation and Evolution	- Selective breeding - Genetic Engineering - Evolution by natural selection - Evidence for evolution - Extinction - Evolution of anitbiotic resistance.		- Explain how organisms can be selectively bred. - Explain the process of genetic engineering. - Evaluate the uses of genetic engineering. - Explain how natural selection happens. - Explain how fossils provide evidence for evolution and identify limitations with their use. - Explain what may cause a species to go extinct. - Explain how antibiotic resistant bacteria may develop.	Frayer Models Evolution Other key terms Variation Reproduction Selection Adaptation Vector (higher) Enzyme Plasmid Resistance Extinction	Homeostasis part 2 T	- Structure and function of the cerebral cortex, medulla and cerebellum of the brain. - Methods used to study the brain. - Structure of the eye and function of the parts. - Accommodation reflex (focussing). - Myopia and Hyperopia. - Thermoregulation - Role of thyroxine and adrenaline.	- Describe the structure and functions of parts of the brain. - Evaluate the different methods used to study brain structure and function. - Be able to label a diagram of the eye and give functions for the main parts. - Explain how the pupil reflex happens. - Explain what accommodation is and how the ciliary muscles and suspensory ligaments control the lens shape. - Explain the issues that occur with myopia and hyperopia. - Explain how different lenses can be used to correct myopia and hyperopia. - Explain how the hypothamus detects and regulates internal body temperature. - Interpret data related to thermoregulation. - Explain the role of thyroxine and adrenaline in the body. - Explain how negative feedback regulates the amount of thyroxine released.	Key terms: Cerebral cortex Medulla Cerebellum MRI Stimulation Retina Cornea Lens Accommodation Myopia Hyperopia Thermoregulation Hypothalamus Vasoconstriction Vasodilation					
Homeostasis T	- Role of the kidney in homeostasis - ADH and osmoregulation - Kidney disease and treatments - Role of auxin in plant growth - Role of ethene and giberellins in plant growth.		- Describe how the kidney produces urine. - Interpret data relating to reabsorption of different molecules by the kidney. - Explain how ADH affects the permeability of the collecting duct, and therefore the concentration of the urine produced. - Evaluate kidney dialysis and transplant. - Explain how auxin enables both phototropism gravitropism. - Investigate the effect of light on growth of newly germinated seeds. - Interpret data in relation to growth of seedlings in response to light or gravity. - Exaplin how ethene and giberellins affect plant growth and evaluate the ways humans can use these hormones.	Key terms Osmoregulation Filtration Reabsorption Permeable Dialysis Immunosuppressant Auxin Phototropism Gravitropism Ethene Giberellins	Ecology part 2 T	- Impact of environmental change. - Food security - Farming techniques - Sustainability - Role of biotechnology in Food production.	- Describe how environmental changes such as temperature affect ecosystems. - Interpret data relating to these changes. - State what is meant by food security. - Explain what factors affect food security, and evaluate their importance. - Compare intensive and free range farming. - Evaluate different farming techniques when give appropriate information. - Describe what is meant by sustainability. - Explain how fishing is done sustainably. - Explain how a fermenter works. - Evaluate the use of mycoprotein instead of more traditional food supplies.	Key terms: Migration Organic Intensive Sustainability Biotechnology Fermenter Mycoprotein Fusarium					
Ecology T	- Trophic levels in ecosystems - Pyramids of number and biomass - Decomposition		- Describe food chains and webs in terms of trophic levels. - Explain how energy is lost between trophic levels in a food chain. - Be able to calculate the biomass present at different trophic levels in an ecosystem. - Be able to construct accurate pyramids of biomass when given sufficient data. - Explain how different factors affect the rate of decay of organisms. - Use a model to investigate the deca. - Describe and explain data relating to the rate of decay.	Key terms Trophic Biomass Respiration Egestion Excretion Decomposition Aerobic Anaerobic	Dual students begin revision after Christmas covering Paper 1 - Cells, magnification, cell division, cell transport - Organisation, digestion, circulation, plant organisation - Bioenergetics - respiration, photosynthesis, metabolism - Immunity - Diseases, immune system, vaccination, drug development.									
Disease T	- Aseptic techniques and culturing microorganisms. - Production of monoclonal antibodies. - Uses of monoclonal antibodies. - Plant diseases - Plant defences.		- Describe how to carry out Aseptic techniques in order to produce uncontaminated cultures. - Calculate areas of clear zones and use to interpret results from culturing microorganisms. - Explain how monoclonal antibodies are produced. - Evaluate uses of monoclonal antibodies. - Describe factors that can affect plant growth such as diseases and pests. - Explain how plants use different defences to protect themselves.	Frayer models: Culturing Other key terms: Aseptic Innoculating Monoclonal Lymphocyte Hybridoma Nitrate Magnesium Physical Chemical Mechanical.										

YEAR 12		AUTUMN TERM				YEAR 12		SPRING TERM			YEAR 12		SUMMER TERM		
POWERFUL IDEAS	Cells Biological molecules	CEIAG	Microbiologist	Focused retrieval 6 topics	Cells Organisation	POWERFUL IDEAS	Disease Organisation Bio molecules Genetics	CEIAG	Immunologist	Focused retrieval 6 topics	Organisation Disease Genetics	POWERFUL IDEA	Organisation Evolution	CEIAG	Cardiologist	Focused retrieval 6 topic	Cells Organisation Evolution
TOPICS	Substantial knowledge (KNOW)		Disciplinary Knowledge (KNOW HOW TO)		Literacy	TOPICS	Substantial knowledge (KNOW)		Disciplinary Knowledge (KNOW HOW TO)		Literacy	TOPICS	Substantial knowledge (KNOW)		Disciplinary Knowledge (KNOW HOW TO)		Literacy
Cell Structure	- Eukaryotic cell structure and organelle function - Magnification equation - Microscopy and types of microscope. - Prokaryotic structure - Viral structure - Cell fractionation		- Describe the structure of eukarotic cells. - Be able to recognise organelles from diagrams - Describe the function of Eukaryotic organelles, and explain how they link together. - Be able to convert between different units. - Use the magnification equation, including unit conversions and the use of scale bars. - Evaluate the use of optical and electron microscopes and explain the limitations of each. - Describe prokaryotic cell structure. - Compare prokaryotes and eukaryotes. - Describe viral structure, particularly with reference to HIV. - Explain the process of cell fractionation and ultracentrifugation.		Eukaryotic Prokaryotic Endoplasmic Reticulum Golgi Apparatus Lysosome Vesicle Magnification Capsule Flagellum Fractionation Ultracentrifugation Isotonic Buffered	Immunity	- Phagocytosis - Cell mediated immunity - Humoral immunity -Vaccination - HIV - Monoclonal antibodies - ELISA		- Describe the process of phagocytosis. - Explain how macrophages initiate an immune response - Describe what happens in the cell mediated and humoral responses - Compare the cell mediated and humoral responses - Evaluate the use of vaccination - Describe the structure of HIV - Explain how the HIV virus causes disease, and how it develops into AIDS - Interpret data linked to the use of monoclonal antibodies. - Evaluate the uses of monoclonal antibodies.	Phagocytosis Antigen Hydrolytic Antibody Plasma Cytotoxic Active immunity Passive immunity Monoclonal Cell mediated Humoral Lymphocyte Phagocyte	Mass transport - Animals	- Heart structure and function - Pressure changes in the Heart - Cardiac cycle - Circulatory system - Tissue fluid - Haemoglobin		- Describe the structure of the heart. - Explain what causes valves to open in terms of pressures. - Interpret graphs relating to pressure changes in the heart. - Explain what happens during the cardiac cycle. - Identify the main blood vessels of the circulatory system from a range of diagrams. - Explain how tissue fluid forms and is returned to the capillaries. - Explain the role of lymph. - Compare plasma, tissue fluid and lymph. - Be able to carry out a dissection safely and produce biological drawings.		Ventricle Atria Systole Diastole Semilunar Atrioventricular Renal Hepatic Carotid Hydrostatic Osmotic Lymphatic
Cell division	- Cell cycle and mitosis - Binary fission in bacteria - Lytic and Lysogenic cycles in viral reproduction		- Explain what the cell cycle is and why it is important. - Identify stages of the cell cycle from photographs. - explain what happens in the different stages of mitosis and cytokinesis. - Be able to calculate the mitotic index. - Set up stained mounts of root tips and use to Identify stages of mitosis. - explain how bacteria divide by Binary fission. - Compare the processes of mitosis and binary fission. - Explain how viral reproduction occurs.		Mitosis Pro/Meta/Ana/ Telophase Cytokinesis Chromosome Chromatid Centromere Spindle Centriole Binary fission	Gas exchange	- Surface area to volume ratio - Gas exchange in insects - Gas exchange in plants - Gas exchange in fish - Gas exchange in humans - Mechanism of breathing		- Calculate Surface area:volume ratios - Explain the importance of V:SA ratios in exchange and heat loss. - Describe the Gas exchange system of an insect. - Compare Gas exchange in insects and plants. - Explain the adaptations of fish gills, including counter-current mechanism. - Explain the structure of the lungs. - Explain the role of muscles in inspiration and expiration. - Interpret data relating to lung volumes and breathing rates. - Interpret data relating to lung diseases.	Spiracles Trachea Tracheoles Lamella Filaments Counter-current Alveoli External Intercostal Internal Diaphragm Tidal volume	Mass transport - Plants	- Water movement in plants (transpiration) - Factors affecting transpiration. - Translocation - Evidence for Translocation		- Explain the cohesion-tension theory of water movement. - Explain how different factors affect the rate of water movement. - Investigate, using a potometer, transpiration. - Explain the adaptations found in xerophytes. - Explain how translocation occurs. - Evaluate the evidence we have for translocation.		Transpiration Translocation Phloem Xylem Tension Cohesion Adhesion Potometer
Cell transport	- Structure of the plasma membrane - Diffusion and facilitated Diffusion - Osmosis - Active transport - Co-transport		- Describe the structure of the plasma membrane. - Explain the roles of the components of the plasma membrane. - Investigate factors that affect the permeability of the plasma membrane. - Interpret results relating to the permeability of the plasma membrane. - Compare the processes of diffusion, facilitated diffusion, osmosis and active transport. - Investigate how concentration affects the rate of osmosis. - Interpret results of osmosis investigations. - Explain how the sodium potassium pump works as an example of active transport. - Describe what co- transport is. - Explain how glucose is absorbed from the ileum to include the role of active transport, co-transport and facilitated diffusion.		Facilitated diffusion Osmosis Active transport Co transport Carrier Channel Phospholipid Cholesterol Permeability Isotonic Hypertonic Hypotonic.	Biological molecules	- Nucleic acids - DNA replication - ATP - Water - Ions		- Describe the structure of a nucleotide. - Describe how phosphodiester bonds form. - Explain the role of enzymes in DNA replication. - Describe the structure of ATP. - Explain how ATP can be made and broken down into ATP and Pi and the importance of this in biological systems. - Describe the properties of water. - Explain how the protperties of water support biological systems. - Explain why certain ions are important in biological systems.	Nucleotide Phosphodiester DNA Helicase DNA polymerase ATP synthase Cohesion Adhesion Latent heat Specific heat capacity	Variation	- Genetic diversity - Natural Selection - Types of Selection - Bacterial growth		- Define Genetic diversity. - Explain how Genetic bottlenecking and the founder affect influence the Genetic diversity of a population. - Explain how Natural Selection occurs to produce orgnisms that have better anatomical, behavioural or physiological adaptations. - Explain what happens in directional and stabilising selection. - Interpret data relating to Types of selection. - Investigate the growth of bacteria in relation to different dilutions of antiseptics. - Use aseptic techniques to produce uncontaminated cultures. - Interpret results from bacterial colonies.		Diversity Bottleneck Anatomical Physiological Selection Directional Stabilising Aseptic Colony Dilution
Biological molecules	- Sugars - Polysaccharides - Lipids - Proteins - Enzymes - Enzymes in digestion - Enzyme inhibition		- Describe the structures of monosaccharides and disaccharides. - Describe how to test for reducing and non-reducing sugars. - Explain how monosaccharides form glycosidic bonds - Explain how the structure of different polysaccharides links to function. - Describe the structure of lipids. - Describe how to test for lipids. - Describe the structure of amino acids. - Explain how amino acids form peptide bonds. - Explain the levels of structure in a protein. - Use colorimetry to test for protein. - Describe the induced fit model of enzyme action. - Investigate how a range of factors affect the rate of reaction of enzyme controlled reactions. - Interpret data for enzyme investigations. - Describe the role enzymes play in digestion, including different types of peptidases. - Explain different types of inhibition. - Interpret data relating to enzyme inhibition.		Saccharide Glycosidic Condensation Hydrolysis Benedicts Peptide Biuret Ester Triglyceride Induced fit Active site Competitive Non-competitive Allosteric site Dipeptidase Endopeptidase Exopeptidase	Genetic information	- DNA in prokaryotes and eukaryotes - Protein synthesis - Transcription - Protein synthesis - Translation - Gene mutations - Meiosis - Meiosis and Life cycles		- Describe how DNA is different in prokaryotes and eukaryotes. - Describe the process of Transcription to produce mRNA. - Describe the process of Translation to produce a polypeptide from mRNA. - Compare DNA, mRNA and tRNA. - Describe addition, delation and substitution mutations. - Explain how different mutations will affect the polypeptide produced using amino acid code charts. - Explain the process of meiosis. - Compare the processes of mitosis and meioisis - Explain why meiosis is important in organisms that reproduce sexually. - Interpret life cycle diagrams and identify where meiosis and mitosis occur.	Prokaryote Eukaryote Histone Transcription Translation tRNA Codon Anticodon Addition Deletion Substition Meiosis Diploid Haploid	Relationships	- Classification - Phylogeny and Courtship - Evidence for Phylogeny - Variation and Standard deviation - Species diversity - Investigating Variation		- Describe the classification hierarchy. - Describe the binomial system for naming organisms. - Explain how phylogenies are created. - Explain how courtship behaviour provides evidence for species relationships. - Interpret and explain relationships from phylogentic trees. - Explain how genetic sequancing and immunology can be used to improve knowledge of phylogenies. - Compare interspecific and intraspecific variation. - Be able to calculate standard deviation and explain what it means. - Use standard deviation calculations to interpret variation. - Describe what is meant by species richness and index of diversity. - Be able to calculate index of diversity and use it to compare ecosystems.		Classification Hierarchy Binomial Phylogeny Immunology Interspecific Intraspecific Standard deviation Species richness Index of diversity

YEAR 13	AUTUMN TERM				YEAR 13	SPRING TERM			YEAR 13	SUMMER TERM			
POWERFUL IDEAS	**Bioenergetics Genetics**	**CEIAG**	Environmental agency	**Focused retrieval 6 topics**	**POWERFUL IDEAS**	**Genetics Homeostasis**	**CEIAG**	Geneticist **Focused retrieval 6 topics**	**POWERFUL IDEA**	**Genetics Ecosystems**	**CEIAG**	**Focused retrieval 6 topic**	Genetics Ecosystems
TOPICS	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**	**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)** / **Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**	**Literacy**
Respiration	- Glycolysis - Link/Krebs cycle - Electron transport chain - Anaerobic respiration - Respirometers - Respiration of other substrates - Respiratory quotient.		- Describe each stage of respiration. - Identify compounds and stages from diagrams. - Explain how the stages of respiration link together. - Explain the role of oxygen. - Describe the differences between lactate and ethanol pathways. - Explain how a range of respirometers work. - Use Electron acceptors to investigate the rate of respiration. - Calculate RQ values and use to predict respiratory substrates.	Glycolysis Decarboxylation Dehydrogenation Oxidation Reduction Pyruvate Cristae Matrix Respirometer Quotient	Populations	- Chi-square test - Hardy-Weinberg		- Calculate the chi-squared test from given data. - Interpret the results of the chi-squared test in terms of probability and chance. - Calculate values for H-W when given appropriate information. - Identify the conditions that must be met for H-W to be true.	Probability Chance Gene pool Allelic frequency	Gene cloning continued	- Gene therapy - Locating and sequencing genes - Screening for genes - Genetic fingerprinting.		- Evalutate the Use of Gene therapy in treating disease. - Explain how genes can Be located within the genome. - Interpret information relating to DNA sequencing. - Evaluate the uses of genetic Screening and Link to genetic councellers. - Explain how genetic fingerprinting is carried out. - Interpret results from gel electrophoresis.	Sequencing Terminator Screening Electrophoresis
Nutrient cycles	- Nitrogen cycle - Phosphorus cycle - Fertilisers - Eutrophication		- Explain what happens in the nitrogen and phosphorus cycles. - Describe why nitrogen and phosphorus containing compounds are important. - Evaluate the Use of different types of fertilisers. - Explain what happens in eutrophication. - Evaluate data linked to eutrophication.	Nitrification Denitrification Nitrogen fixation Ammonification Saprobiotic Extracellular Leaching Eutrophication	Gene cloning	- Gene mutations - Mutations linked to cancer - Totipotency and stem cells - Regulation of protein synthesis - Epigenetics - In vivo Gene cloning - In vitro Gene cloning - PCR		- Describe how a range of mutations can affect the phenotype. - Explain the role of proto-oncogenes and tumour suppressor genes in cell division. - Explain how mutations and methylation in these genes can lead to tumours. - Evaluate the Use of embryonic and iPS stem cells. - Explain how hormones and transcription factors can regulate protein synthesis. - Explain what Epigenetics is. - Explain the steps involved in in vivo Gene cloning. - Explain the steps involves in in vitro Gene cloning. - Evaluate the uses of Gene cloning.	Mutation Translocation Inversion Duplication Oncogene Transcription factor Totipotent Pluripotent Mutlipotent Unipotent Epigenetics Vector	Populations and ecosystems	- Speciation - Ecosystems - Populations - Succession - Conservation		- Explain how disruptive selection can lead to speciation. - Compare allopatric and sympatric speciation - Define niche - Explain factors that can affect the carrying capacity of an ecosyetem. - Use quadrats and transects to investigate population sizes. - Explain what succession is. - Compare primary and secondary succession. - Evaluate evidence relating to conservation.	Speciation Allopatric Sympatric Niche Succession
Inheritance	- Co-dominant and multiple alleles - Sex linkage - Dihybrid crosses - Epistasis - Autosomal linkage		- Use punnet squares to predict outcomes of crosses involved co-dominant, multiple alleles and sex linkage. - predict inheritance from dihybrid crosses. - Explain what epistasis is and Use to Interpret genetic crosses. - Explain what autosomal linkage is. - Interpret data linked to autosomal linkage.	Dominant Recessive Co-dominant Phenotype Genotype Epistasis Autosome	Homeostasis - Nerves	- Reflex action - Receptors - Photoreceptors - Control of heart rate - Action potentials - Factors affecting speed of transmission - Synpotic transmission		- Describe the neurones involved in a reflex arc. - Explain how the pacinian corpuscle generates a receptor potential. - Explain how rods and cones work in the eye. - Compare rods and cones in terms of visual accuity. - Describe how the SAN and AVN control the cardiac cycle. - Explain how the sympathetic and parasymphathetic nervous system controls heart rate. - Explain how the resting potential is maintained. - Explain how an action potential is generated. - Explain how neurotransmitters pass information across a synapse.	Pacinian Generator Rods Cones Sympathetic Parasympathetic Action potential Resting potential Depolarisation Repolarisation Synapse Acetylcholine	Remaining time spent revising and developing exam technique.				
Photosynthesis	- Light dependent reactions of photosynthesis - Light independent reactions of photosynthesis - Limiting factors		- Describe the structure of a chloroplast. - Describe the role of chlorophyll in light dependent reactions. - Compare cyclic and noncyclic reactions. - Explain what happens in the Calvin cycle (light independent reactions) - Explain the role of RUBISCO. - Interpret diagrams and data comparing respiration and photosynthesis. - Explain how different factors affect photosynthesis. - Interpret data relating to factors that affect photosynthesis. - Use electron acceptors to investigate the rate of	Thylakoid Grana Stroma Cyclic Non cyclic RUBISCO Limiting factor	Muscles	- Neuromuscular junctions - Muscle structure - Muscle contraction		- Explain how a neuromuscular junction works. - Compare synapses and neuromuscular junctions. - Describe the structure of a muscle. - Explain how contraction occurs with reference to calcium ions and ATP	Sarcolemma Actin Myosin					
Energy transfers	- Energy transfers - Primary productivity - Farming practices		- Describe the Energy transfers that occur in an ecosystem. - Explain what is meant by Primary production. - Interpret data relating to GPP and NPP. - Explain how different farming practices influence the productivity.	Productivity Net Gross Respiratory	Homeostasis - Hormones	- Homeostasis - Glucoregulation - Adrenaline and secondary messengers - Diabetes		- Explain why homeostasis is important. - Explain how negative feedback works. - Explain how glucose levels are monitored and controlled. - Explain the role of GLUT4 in glucoregulation - Explain the role of adrenaline in glycogenolysis. - Compare type 1 and type 2 diabetes - Interpret data in relation to glucoregulation and diabetes. - Use calibration curves to identify blood glucose levels.	Glucoregulation Gluconeogenesis Glycogenolysis Glucogenesis Diabetes Secondary					
Simple Responses	- Taxis and Kinesis - Plant tropisms and IAA		- Explain what is meant by taxis and kinesis. - Interpret data to state if movement if taxis or kinesis. - Investigate maggot behaviour in terms of taxis and kinesis. - Explain how plants respond to Light and gravity. - Interpret data relating to investigations on Plant tropisms.	Taxis Kinesis Phototropism Gravitropism Elongated Auxin	Homeostasis - kidney	- Osmoregulation - Selective reabsorption		- Describe the structure of a nephron. - Explain how ultrafiltration and Selective reabsorption occur in the nephron. - Explain the role of ADH in osmoregulation. - Interpret data in relation to osmoregulation.	Ultrafiltration Selective reabsorption Nephron Osmoregulation Diuretic					
