John Taylor High School
Home of the John Taylor Teaching School Hub

Subject Curriculum Map:	Biology	Year Group:	10

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Microscopes and cell transport	Enzymes and digestion	Organisation (Heart & health)	Infection and response	Energy transfers in Biology	Inheritance
Big Question	How do substances move into and out of cells?	What roles do enzymes have in breaking down food?	What is the job of the circulatory system and what happens when it goes wrong?	What are pathogens and how do immune responses defend our bodies?	What factors affect the rate of photosynthesis?	How is genetic information stored and passed on to offspring?
Content	•How microscopy techniques have developed over time •Electron microscopy has increased understanding of sub-cellular structures calculations involving magnification, real size and Image size •Diffusion is the spreading out of the particles of any substance in solution, or particles of a gas •Factors which affect the rate of diffusion •The need for exchange surfaces and a transport system in multicellular organisms in terms of surface area to volume ratio. •Water may move across cell membranes via osmosis. •Active transport moves substances from a more dilute solution to a more concentrated solution.	•The digestive system is an example of an organ system in which several organs work together •relate knowledge of enzymes to Metabolism •describe the nature of enzyme molecules and relate their activity to temperature and pH changes. •carry out rate calculations for chemical reactions • Enzymes catalyse specific reactions in living organisms due to the shape of their active site. •Digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream. • Carbohydrases •Amylase is a carbohydrase which breaks down starch. • Proteases break down proteins •Lipases break down lipids •Bile emulsifies fat	•the structure and functioning of the human heart and lungs, including how lungs are adapted for gaseous exchange. •The heart is an organ that pumps blood around the body in a double circulatory system. •The body contains three different types of blood vessel: veins, arteries and capillaries •Blood is a tissue consisting of plasma, in which the red blood cells, white blood cells and platelets are suspended. •Coronary heart disease, its causes treatment and prevention •Non-communicable diseases	•the relationship between health and disease •communicable diseases including sexually transmitted infections in humans (including HIV/AIDs) •non-communicable diseases •bacteria, viruses and fungi as pathogens in animals and plants •body defences against pathogens and the role of the immune system against disease •reducing and preventing the spread of infectious diseases in animals and plants •the process of discovery and development of new medicines •the impact of lifestyle factors on the incidence of non-communicable diseases.	•photosynthesis as the key process for food production and therefore biomass for life •the process of photosynthesis •factors affecting the rate of photosynthesis. •Cellular respiration as an exothermic reaction which is continuously occurring in living cells. •Respiration in cells can take place aerobically (using oxygen) or anaerobically (without oxygen), to transfer energy. •The energy transferred by respiration in cells is used by the organism for the continual enzyme controlled processes of metabolism that synthesise new molecules.	•the genome as the entire genetic material of an organism •most phenotypic features being the result of multiple genes •single gene inheritance and single gene crosses with dominant and recessive phenotypes •sex determination in humans
Assessment	• Pupils will be assessed through homework activities, lesson starter activities, end of Unit class tests and a range of required practicals aimed at assessing the pupils' practical abilities.					

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Subject Curriculum Map:	Biology	Year Group:	11

Term	Autumn 1	Autumn 2	Spring 1	Spring 2		Summer
Topic	Homeostasis (Electrical)	Homeostasis (hormonal)	Variation and evolution	Interdependence and adaptation	Human impact on the ecosystem	COURSE REVIEW
Big Question	How does the body transfer electrical information?	How does the body use hormones to regulate the body?	How does the genetic information of a species change over time?	How do organisms adapt to compete for resources?	What impact do humans have on the biodiversity of an ecosystem?	
Content	•principles of nervous coordination and control in humans •the relationship between the structure and function of the human nervous system •the relationship between structure and function in a reflex arc • able to identify the following structures on a diagram of the eye and explain how their structure is related to their function •Accommodation is the process of changing the shape of the lens to focus on near or distant objects.	•principles of hormonal coordination and control in humans •hormones in human reproduction, hormonal and non-hormonal methods of contraception •homeostasis. •Type 1 diabetes is a disorder in which the pancreas fails to produce sufficient insulin. It is characterised by uncontrolled high blood glucose levels and is normally treated with insulin injections. •In Type 2 diabetes the body cells no longer respond to insulin produced by the pancreas. A carbohydrate controlled diet and an exercise regime are common treatments. Obesity is a risk factor for Type 2 diabetes.	•the genome as the entire genetic material of an organism •how the genome, and its interaction with the environment, influence the development of the phenotype of an organism •the potential impact of genomics on medicine •most phenotypic features being the result of multiple genes •genetic variation in populations of a species •natural selection •the evidence for evolution •developments in biology affecting classification •the importance of selective breeding of plants and animals in agriculture •the uses of modern biotechnology including gene technology • some of the practical and ethical considerations of modern biotechnology	•some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community •organisms are interdependent and are adapted to their environment •the importance of biodiversity •Some organisms live in environments that are very extreme, such as at high temperature, pressure, or salt concentration. These organisms are called extremophiles. Bacteria living in deep sea vents are extremophiles.	•positive and negative human interactions with ecosystems. •Scientists and concerned citizens have put in place programmes to reduce the negative effects of humans on ecosystems and biodiversity. •breeding programmes for endangered species •protection and regeneration of rare habitats •reintroduction of field margins and hedgerows in agricultural areas where farmers grow only one type of crop • reduction of deforestation and carbon dioxide emissions by some governments •recycling resources rather than dumping waste in landfill	•This term will include structured topic-based revision tasks , required practical review and past exam papers. •Embedding subject content to ensure that, when you return to school and the next step of your education, you are well prepared.
Assessment	• Pupils will be assessed through homework activities, lesson starter activities, end of Unit class tests and a range of required practicals aimed at assessing the pupils' practical abilities.					

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Subject Curriculum Map:	Biology	Year Group:	12

Term	Autumn TEACHER A		Autumn TEACHER B			Spring TEACHER A			Spring TEACHER B			Summer		
Topic	Biological molecules- Cell material	Biological molecules- cell reactions	Cells and transport	Cell division	Immunity	DNA, chromosomes and proteins	Mutations and Meiosis	Classification and biodiversity	Gas Exchange	Digestion and absorption	Mass transport in animals	Mass transport in plants	Introduction to populations	Nutrient cycles
Big Question	What compounds make up the majority of cell material?	What chemical transfers can occur within a cell	How do the structure of cell organelles allow them to function?	How do chromosomes behave during cell replication	What is the immune system's role in protecting and organism?	How does DNA code for protein production?	How does a change in the DNA base sequence cause a mutation?	Why do species and biodiversity change over time?	How do organisms control the gas concentration into and out of their body?	How a large molecules broken down in mammals to be small enough to be absorbed?	How are substances moved large distances in animals?	How are substances moved large distances in plants?	What changes occur in a species population and how can it be monitored?	How are nutrients used in ecosystems?
Content	•Monomers and polymers •Monosaccharides •Disaccharides •Polysaccharides •Biochemical tests •Properties of Triglycerides and phospholipid •Saturated and unsaturated fats •General properties of proteins • relate the structure of proteins to properties of proteins •Peptide and dipeptide bonds •how models of enzyme action have changed over time •Uses and functions of enzymes used as catalysts	•Structure of DNA and RNA •Role of ribosomes •Condensation reactions between nucleotides to form a phosphodiester bond •Watson–Crick model of DNA replication •The function of ribose in forming adenosine triphosphate •Role of hydrolase in the hydrolysis of ATP •The condensation of ADP and Pi to form ATP •Waters role as a metabolite, solvent, buffering, coolant and providing surface tension. •Role of ions in the cytoplasm	•adaptations of eukaryotic cells Differences between eukaryotic and prokaryotic cells •Structure of viruses •Measuring the size of an object viewed with an optical microscope •principles and limitations of optical microscopes •adaptations of specialised cells in relation to the rate of transport across their internal and external membranes	• recognise the stages of the cell cycle-interphase, prophase, metaphase, anaphase and telophase •appearance of cells in each stage of mitosis •Consequences of uncontrolled cell division •cancer treatments examples •Binary fission in prokaryotic cells •Preparation of stained squashes of cells from plant root tips; set-up and use of an optical microscope to identify the stages of mitosis in these stained squashes and calculation of a mitotic index.	•The immune's systems role in identifying pathogens, cells from other organisms of the same species, abnormal body cells and toxins. •Antibody structure and definition •formation of an antigen-antibody complex •roles of plasma cells and of memory cells •The use of vaccines •herd immunity •differences between active and passive immunity. •ethical issues associated with the use of vaccines and monoclonal antibodies	•Structure of DNA in prokaryotic and eukaryotic cells •DNA structure in chloroplasts and mitochondria •The role of genes •The role of exons and introns •The structure of molecules of messenger RNA (mRNA) and of transfer RNA (tRNA). • Transcription in prokaryotes and eukaryotes •Producing polypeptides from codons •the base sequence of nucleic acids to the amino acid sequence of polypeptides	•complete diagrams showing the chromosome content of cells after the first and second meiotic division, when given the chromosome content of the parent cell •the different outcome of mitosis and meiosis •where meiosis occurs when given information about an unfamiliar life cycle •how random fertilisation of haploid gametes further increases genetic variation within a species.	•Production of new alleles causing random mutations and how these can lead to increased reproductive success •How alleles are passed through the genetic line •Natural selection •interpreting data relating to the effect of selection in producing change within populations •evolution and contributions to the diversity of living organisms • the phylogenetic classification system of	•the relationship between surface area to volume ratio •Adaptations of gas exchange systems, such as across the body surface of a single-celled organism; in the tracheal system of an insect ; across the gills of fish; by the leaves of dicotyledonous plants •effects of lung disease on gas exchange and/or ventilation •analysing and interpreting data associated with specific risk factors and the incidence of lung disease.	•Digestion in mammals of carbohydrates, lipids and proteins •Mechanisms for the absorption of the products of digestion by cells lining the ileum of mammals • the role of micelles in the absorption of lipids.	•The role of haemoglobin •dissociation curve and the effects of carbon dioxide •The general pattern of blood circulation in a mammals •The gross structure of the human heart •interpret data relating to pressure and volume changes during the cardiac cycle • structure & function of arteries, arterioles and veins •tissue fluid and its return to the circulatory system •interpret data associated with specific risk factors for CV disease	•Xylem as the tissue that transports water in the stem and leaves of plants •The cohesion-tension theory of water transport in the xylem •Phloem as the tissue that transports organic substances in plants •mass flow hypothesis for the mechanism of translocation in plants •The use of tracers and ringing experiments to investigate transport in plants.	•Reasons for varying populations •Maintaining sustainability of resources •Conservation of species and habitats Estimation of population sizes Mark-release-recapture method	•The role of saprobionts in decomposition. •The role of mycorrhizae in facilitating the uptake of water and ions •The role of bacteria in the nitrogen cycle. •The use of natural and artificial fertilisers to replace the nitrates and phosphates lost by harvesting plants and removing livestock. •The environmental issues arising from the use of fertilisers including leaching and eutrophication.
Assessment	• Pupils will be assessed through homework activities, lesson starter activities, end of Unit class tests and a range of required practicals aimed at assessing the pupils' practical abilities.													

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Subject Curriculum Map:	Biology	Year Group:	13

Term	Autumn A				Autumn B		Spring A		Spring B / Early summer B			Summer
Topic	Photosynthesis	Respiration	Energy and ecosystems	Nutrient cycles	Populations and speciation	Inheritance	Genome and gene expression	Gene technology	Nervous coordination	Muscles and skeletal structures	Homeostasis	Course review
Big Question	How does photosynthesis use the energy from light?	How are glucose and oxygen used in the process of respiration?	How is chemical energy transferred within an ecosystem?	How are nutrients used in ecosystems?	What changes occur in a species population and how can it be monitored?	How do genes present themselves in an organism and can they be predicted?	What factors can affect what genes are expressed?	How can we gain a better understanding of an organisms function?	How are electrical signals carried around the body and what can affect them?	How do muscles work on a chemical level?	How do organisms regulate their bodies in changing environments?	
Content	•chlorophyll absorbs light, leading to photoionisation of chlorophyll •production of ATP and reduced NADP •photolysis of water produces protons, electrons and oxygen. The light-independent reaction uses reduced NADP from the lightdependent reaction to form a simple sugar •the Calvin cycle •identify ing environmental factors that limit the rate of photosynthesis •evaluating data relating to common agricultural practices used to overcome the effect of these limiting factors	• phosphorylation of glucose to glucose phosphate, using ATP •production of triose phosphate •oxidation of triose phosphate to pyruvate with a net gain of ATP and reduced NAD. •The Krebs cycle and the chemical reactions involved with it. •Active transport of pyruvate and its uses •Role of glycolysis in respiration	•Calorimetry of biomass •Defining gross primary and net primary production •Calculation of net production of consumers •Calculating primary and secondary productivity •Increasing efficiency by simplifying food webs to reduce energy losses to non-human food chains •Increasing efficiency by reducing respiratory losses within a human food chain	•The role of saprobionts in decomposition. •The role of mycorrhizae in facilitating the uptake of water and inorganic ions by plants. •The role of bacteria in the nitrogen cycle including the processes of saprobiotic nutrition, ammonification, nitrification, nitrogen fixation and denitrification. •The use of natural and artificial fertilisers to replace the nitrates and phosphates lost by harvesting plants and removing livestock. •The environmental issues arising from the use of fertilisers including leaching and eutrophication.	•The Hardy–Weinberg principle •The concepts of gene pool and allele frequency • why individuals within a population of a species may show a wide range of variation in phenotype •why genetic drift is important only in small populations •how natural selection, evolution + isolation may result in change in the allele + phenotype frequency + lead to the formation of a new species	• defining genotype. And phenotype •Dominant, recessive and co-dominant alleles •Alleles in diploid organisms •homozygous or heterozygous alleles. •genetic diagrams to interpret, or predict, results •Use of the chi-squared test to compare the goodness of fit of observed phenotypic ratios with expected ratios.	•Mutation rates •Changes to the triplet codes of DNA •relating the nature of a gene mutation to its effect on the encoded polypeptide. •Totipotent cells •Pluripotent cells • multipotent and unipotent cells • the formation of cardiomyocytes • Inducing pluripotent stem cells from adult somatic cells •Transcription and translation of the genetic code to change gene expression •tumour suppressor genes and oncogenes • effects of increased oestrogen concentrations •Applications of determining the genome of simpler organisms	•Recombinant DNA technologies •Producing fragments of DNA •Amplifying fragments of DNA •Principles of polymerase chain reaction •The addition of promoter and terminator regions to the fragments of DNA •The use of restriction endonucleases and ligases to insert fragments of DNA into vectors. •Transformation of host cells using these vectors •The use of marker genes to detect genetically modified (GM) cells or organisms.	•The structure of a myelinated motor neurone. •The establishment of a resting potential in terms of differential membrane permeability, electrochemical gradients and the movement of sodium ions and potassium ions •Changes in membrane permeability generating action potentials •The passage of an action potential along non-myelinated and myelinated axons •The nature and importance of the refractory period •Factors affecting the speed of conductance • transmission across a cholinergic synapse •comparison of transmission across a cholinergic synapse and across a neuromuscular junction	•Muscles acting as antagonistic pairs against an incompressible skeleton. •Gross and microscopic structure of skeletal muscle •ultrastructure of a myofibril. •The roles of actin, myosin, calcium ions and ATP in myofibril contraction. •The roles of calcium ions and tropomyosin in the cycle of actinomyosin bridge formation. •The roles of ATP and phosphocreatine in muscle contraction. •The structure, location and general properties of slow and fast skeletal muscle fibres	•maintaining a stable core temperature and stable blood pH in relation to enzyme activity •maintaining a stable blood glucose concentration •Negative feedback loops •The action of insulin •The action of glucagon •The role of adrenaline •The second messenger model of adrenaline and glucagon action, •The causes of types I and II diabetes and their control by insulin and/ or manipulation of the diet. •roles of the hypothalamus, posterior pituitary and antidiuretic hormone (ADH) in osmoregulation. • The structure of the nephron and its roles	This term will include structured topic-based revision tasks , required practical and maths skills and trial exam papers
Assessment	Pupils will be assessed through homework activities, lesson starter activities, end of Unit class tests and a range of required practicals aimed at assessing the pupils' practical abilities.											