



Term	Autumn			Spring		Summer
Topic	Fundamental development and function			Immune response, dysfunction and treatment of immune disorders		Genetics and Health
Big Question	What are the relationships between structure, function and activities of cells and tissues?	What are the structure and function of the Nervous, Cardiovascular, respiratory, digestive and excretory systems?	How and why do cells and tissues respond and adapt? How are relative diagnostic techniques used in disease prevention?	What are the methods of immune response to different pathogens?	How is immune dysfunction treated?	What are the processes and structures involved in inheritance characteristics, diseases and genetic conditions?
Content	<p>Cells, Tissues and Biological molecules</p> <p>a) General structure and function of biological molecules</p> <p>b) Structure and function of specific biological molecules</p> <p>c) Cellular ultrastructure and function, to include recognition in light and electron micrographs</p> <p>d) Transport of substances into and out of cells, including reference to drug delivery, cell recognition and signalling.</p> <p>e) Cellular activities, to include function, reactants, products and locations</p> <p>f) Stages and cellular activities during the cell cycle and divisions</p> <p>g) Chromosome formation and nuclear division, to include the recognition of each stage from images.</p> <p>h) Principles of homeostasis, to include negative feedback loops.</p> <p>i) Control of body temperature and physiological responses to extremes of temperature, to include hypothermia, hyperthermia, burns and frostbite.</p>	<p>Nervous system</p> <p>a) Sensory, motor and relay neurones.</p> <p>b) Central and peripheral nervous system.</p> <p>c) Transmission of action potential.</p> <p>d) Synaptic transmission</p> <p>e) Reflex actions and reflex arcs.</p> <p>Cardiovascular and respiratory</p> <p>a) Circulatory and respiratory system structure and function.</p> <p>b) Causes and common symptoms of coronary heart disease (CHD), stroke, chronic obstructive pulmonary disease (COPD), hypertension and hypotension.</p> <p>Digestive and Excretory systems</p> <p>a) Structure and function of the kidneys, nephron, ureters, urinary bladder and urethra.</p> <p>b) Water balance control, and its effect on blood pressure.</p> <p>c) Structure and function of the stomach, pancreas, gall bladder, duodenum, ileum and colon.</p> <p>d) Digestion, absorption and assimilation of carbohydrates, lipids and proteins.</p> <p>e) Location and conditions required for effective action of digestive enzymes, including amylase, lipase, trypsin, pepsin.</p> <p>f) Control of blood glucose levels</p> <p>g) Dietary needs.</p> <p>h) Assessing dietary and nutritional problems.</p>	<p>Cellular injury and repair</p> <p>a) Cellular responses, to include cellular swelling, effect on ATP production.</p> <p>b) Cell adaptations: hyperplasia, hypertrophy, atrophy, metaplasia.</p> <p>c) Responses of tissues to injury: blood clotting and scab formation, swelling and bruising, burst blood vessels.</p> <p>d) Causes, mechanisms and health consequences of reversible and irreversible cell and tissue injury.</p> <p>Diagnostic techniques</p> <p>a) Basic methods, equipment, result format, unit of measurement and interpretation for the following diagnostic techniques</p> <p>Haematology: full blood counts, blood tests for autoantibodies, blood tests for c-reactive protein (CRP). The mechanism for production of CRP in the body is not required, blood typing limited to ABO blood types.</p> <p>b)</p>	<p>Immune response</p> <p>a) Innate (non-specific) physical, chemical and biological defences: role of physical barriers, chemical defences and their location within the body, to include the inflammation response and its consequences. Specific details of the chemicals involved in inflammation are not required, biological defences to include: mast cells, phagocytes, basophils and eosinophils, natural killer cells. The roles of complement and natural killer T cells are not required.</p> <p>b) Adaptive primary immunity: recognition of self and non-self, humoral and cell-mediated responses, to include the roles of helper T cells, killer T cells and B cells. The mechanism behind antigen presentation is not required.</p> <p>c) Adaptive secondary immunity: o the role of T and B memory cells o artificial adaptive immunity, to include vaccinations.</p> <p>d) Passive immunity: natural passive immunity and artificial passive immunity</p>	<p>Immune Dysfunction</p> <p>a) Autoimmune diseases, to include: diabetes mellitus (type I), multiple sclerosis (MS), Crohn’s, rheumatoid arthritis.</p> <p>b) Primary and secondary immunodeficiency diseases, to include: severe combined immunodeficiency (SCID), HIV, immune deficiency due to chemotherapy, immunodeficiency due to organ transplants.</p> <p>c) Allergies and allergens, to include: allergy-induced asthma, anaphylaxis, dermatitis.</p>	<p>Gene Expression</p> <p>a) Transcription of DNA to RNA, to include reference to role of RNA polymerase.</p> <p>b) Translation and splicing of RNA to produce proteins to include codons, anticodons, introns and exons.</p> <p>c) Hereditary and acquired genetic mutations.</p> <p>Genetic disorders and diagnosis</p> <p>a) Understand the terms allele, dominant, recessive, genotype, phenotype, heterozygous, homozygous, sex linkage, carrier, affected/sufferer, non-affected/non-sufferer.</p> <p>b) Genetic and chromosomal disorders, to include cystic fibrosis (CF), Huntington’s, Down’s syndrome, haemophilia.</p> <p>c) Characteristics of benign and malignant tumour growth. Characteristics are limited to behaviour on a cellular level or greater.</p> <p>d) Effects of mutations in oncogenes and tumour suppressing genes.</p> <p>e) Interpretation of genetic diagrams, to include familial pedigrees.</p> <p>f) Methods and limitations of obtaining DNA samples, to include swabs and body fluids. Learners are not expected to know how DNA is extracted from samples or to be able to describe the process of DNA sequencing.</p> <p>g) Diagnostic tests for genetic and chromosomal disorders, to include amniocentesis and chorionic villus sampling. Learners are required to describe diagnostic tests limited to how and when samples are taken and the interpretation of the results in the context of health of the foetus.</p>
Assessment	<ul style="list-style-type: none"> Pupils will be assessed through homework activities, lesson starter activities, a series of external examinations, internal examinations and coursework reviews 					
<p>Note: This unit content can be examined in both the January and June series.</p>						

 John Taylor High School Home of the John Taylor Teaching School Hub				Subject Curriculum Map:	BTEC Human Biology – single award (Unit 2)	Year Group: 12
Term	Autumn			Spring		Summer
Topic	LAA: Classification and nature of microorganisms LAB Transmission and treatments of infectious disease			LAC: Explore the application of techniques to culture and identify microorganisms		LAD Investigate the effect of antimicrobial agents on the growth of microorganisms
Big Question	What is the nature of microorganisms and how are they classified?	How does a pathogen cause disease?		Applying knowledge gained in unit 1 and unit 2 What are the best techniques to culture microorganisms?		What is the most effective method for investigating microbes effects on the body?
Content	<p>Characteristics of different microorganisms</p> <p>a) Prokaryotes: physical characteristics, to include – cellular structure, including the cell wall (Gram negative and positive), appendages for movement, genome and plasmids, growth characteristics, to include – binary fission, growth curves, reproductive strategies, the effect of temperature on the rate of enzyme activity and its impact on microorganism growth.</p> <p>b) Eukaryotes: protists – eukaryotic nature of single-celled protists, classification based on mode of movement such as amoeboid (e.g. Entamoeba histolytica), flagellate (e.g. Giardia duodenalis), ciliate (e.g. Balantidium coli) and sporozoa (e.g. Plasmodium falciparum), structures and life cycles, fungi – structures, reproductive strategies.</p> <p>c) Acellular viruses and prions: main characteristics, to include – structure of the virion, types of genetic material in viruses, capsid, possibility of envelope, structure of prions, reproductive strategies of viruses (lysogenic and lytic cycles), characteristics of prions.</p> <p>Methods of pathogenicity</p> <p>a) Virulence factors of bacteria: access to the host, the role of adhesins, endotoxins and exotoxins, damage to host cells and tissues, evasion of the immune system, incubation periods.</p> <p>b) Virulence factors of eukaryotes: access to the host o the production of proteases and endotoxins in fungi, use of adhesins, toxins, antigenic variation, the ability to survive inside phagocytic vesicles.</p> <p>c) Virulence mechanisms of viruses and prions: access to the host, direct cell damage, latency, misfolded proteins.</p> <p>d) Underlying mechanism for the evaluation of pathogens: mutations, e.g. in relation to bacteria, tuberculosis and viruses, HIV.</p> <p>Classification Strategies</p> <p>a) Phenotypic methods to classify bacteria: shape and cell structure, e.g. cocci, bacilli, flagellate rods, spirilla, vibrios, structure of cell wall (Gram positive and Gram negative), oxygen requirements, e.g. aerobes, obligate aerobes, anaerobes, facultative anaerobes.</p> <p>b) Classification of viruses: Baltimore classification using type of nucleic acid and mode of replication, other methods, e.g. size, host organism, capsule structure.</p> <p>c) Classification of protists, e.g. cell structures, metabolisms, and methods of motility.</p>	<p>Classification overview of infectious disease</p> <p>a) Target organ: intestinal, respiratory tract, blood, urinary, systemic.</p> <p>b) Agent: bacterial, viral, protozoan, fungal, prionic, helminthic, ectoparasitic.</p> <p>c) Source: anthroponoses, zoonoses and sapronoses.</p> <p>Transmission of infectious agents</p> <p>a) Direct: physical contact, bodily fluids, across the placenta, animal contact, animal waste.</p> <p>b) Indirect: transmission through intermediates (vectors), e.g. mosquito, fleas, lice, ticks ,airborne, e.g. aerosols, droplets , vehicle borne, e.g. surfaces, objects , food and waterborne.</p> <p>c) Chain of infection: agent, host, reservoir, portals of exit, mode of transmission, portals of entry.</p> <p>Infectious diseases, Signs, symptoms and progression</p> <p>a) Bacterial, e.g. Mycobacterium tuberculosis, meningitis, Chlamydia, cholera.</p> <p>b) Viral, e.g. human immunodeficiency virus (HIV), Ebola, norovirus, influenza, severe acute respiratory syndrome (SARS).</p> <p>c) Fungal, e.g. ringworm, mucormycosis, candidiasis.</p> <p>d) Prionic: Creutzfeldt-Jakob disease (CJD), acquired and variant, kuru.</p> <p>e) Parasitic: protozoal, e.g. malaria, Giardia, amoebic dysentery; helminthic, e.g. roundworm, tapeworms; ectoparasitic, e.g. pediculosis.</p> <p>Prevention and treatment of infectious diseases</p> <p>a) Prevention: mode of action of vaccines (active and passive), vaccine types , use of antiseptics and disinfectants, behaviours, e.g. hospital strategies, safe sex, environmental, e.g. water sources, mosquito nets, sanitation facilities.</p> <p>b) Treatments: antibiotics – disruption of the cell wall formation and cellular processes, antifungal agents – disruption of cell wall, disruption of reproductive process, antivirals – entry to cell, disruption of replication process, antiprotozoal drugs, specifically those used to treat malaria linked to stage of infection, antiparasitic drugs, to include anthelmintics and anti-ectoparasitic drugs.</p> <p>c) Current issues: emergence of antibiotic resistance in bacterial populations, e.g. multi-drug resistant tuberculosis (MDRTB), Methicillin-resistant Staphylococcus aureus (MRSA), C. difficile, causes of antibiotic resistance, e.g. horizontal and vertical evolution, modern practices that have led to the increase in infectious diseases, e.g. overuse and inappropriate use of antibiotics, use in agriculture, significance of herd immunity, antigenic variation in viruses, e.g. influenza, human immunodeficiency virus (HIV), advantages, disadvantages and ethics of alternative/innovative treatments, e.g. phage therapy, genetically modified bacteriocins, immunotherapy, monoclonal antibodies, mutations: emergence of antibiotic resistance and antigenic variance, contributory causes of hospital-acquired infections relating to antibiotic prescription and hospital practice.</p>	<p>Health and Safety</p> <p>a) Current legislation relating to the use of microorganisms in the workplace.</p> <p>b) Biosafety cabinets, biosafety classification levels, use of personal protective equipment (PPE).</p> <p>c) Methods of sterilisation and disinfection.</p> <p>d) Aseptic technique: to include reducing activity in the immediate vicinity of the area, reducing exposure, use of sterile equipment, consideration of airflow in the vicinity, use of Bunsen burner flame to draw air currents upwards, flaming the neck of bottles, use of a sterile loop, pipette or spreader, sterilisation and safe disposal after exposure.</p> <p>e) Safe culturing of microorganisms, to include – implications of temperature, contamination and sealing the Petri dishes, incubation time..</p> <p>Microscopy and staining techniques</p> <p>a) Microscopy and colony characterisation: use of a microscope to observe microorganisms, to include hanging drop method to view protists; preparation of a smear slide, to include air drying, fixing, use of oil immersion lens, staining techniques, to include Gram staining of bacteria, methylene blue stain and India ink staining for capsules around bacteria and yeast cells, use of mordants, growth characteristics in broths, e.g. turbid, pellicle, sediment, flocculent, colony morphology identification on plates, e.g. form, elevation, margin, limitations of staining techniques and morphological studies for identifying microorganisms.</p> <p>Culture of Microbes</p> <p>a) Types of media: preparation of nutrient media, nutrient broth, nutrient agar, selective media, e.g. MacConkey agar, mannitol salt agar, blood agar, potato dextrose agar.</p> <p>b) Methods of cell culture: stab cultures, pour plates, streaking, lawn spreads, slant tubes, broth cultures, incubation temperatures.</p> <p>c) Differential media, e.g. O-Nitrophenyl-β-D-galactopyranoside (ONPG) test for lactose fermentation, MacConkey for gram-positive and gram-negative bacteria, mannitol salt agar for selecting Staphylococci, starch hydrolysis test.</p> <p>d) Isolation of pure cultures from mixed populations.</p> <p>Quantitative analysis of microbes</p> <p>a) Total population count: haemocytometer, counting chamber, turbidimetric methods.</p> <p>b) Viable counts: serial dilutions, streak/spread plating.</p>	<p>Investigating substances that inhibit the growth of microorganisms</p> <p>a) Identification of variables to change and control.</p> <p>b) Suitability of pour plate or spread plate with confluent growth, incubation times, correct measurement of zones of inhibition.</p> <p>c) Antimicrobial susceptibility testing: o disinfectants/antiseptics/natural compounds, e.g. garlic, essential oils, concentration effects, bactericidal or bacteriostatic antibiotics, age of antibiotic, type of antibiotic (broad or narrow spectrum), type of microorganism used.</p> <p>d) Measurement of antimicrobial susceptibility by zones of inhibition.</p> <p>Interpretation, analysis and evaluation</p> <p>a) Data collection and awareness of anomalous data, repeats and validity.</p> <p>b) Numerical data identified and presented, including graphs, tables and statistics as appropriate.</p> <p>c) Trends and patterns in data.</p> <p>d) Sources of error in data, including the use and interpretation of error bars.</p> <p>e) Draw conclusions in relation to the purpose of the investigation.</p> <p>f) Evidence to support conclusions/claims made.</p> <p>g) Common limitations, e.g. false susceptibility or resistance to antibiotic due to nonstandard confluent growth, use of old disks, disks not stored at 4 °C, depth of agar inconsistent resulting in non-standard diffusion of the antibiotic, incorrect growth conditions for the bacteria.</p> <p>h) Potential areas for further research and development identified.</p>		
Assessment	<ul style="list-style-type: none"> Pupils will be assessed through homework activities, lesson starter activities, a series of external examinations, internal examinations and coursework reviews 					



Term	Autumn	Spring	Summer
Topic	Contemporary Health issues	Interpretation, analysis and evaluation of scientific information	Scientific Reporting
Big Question	How can research help us understand health issues?	What are the best forms of information to get true data from?	How are health issues and initiatives reported in the media for different audiences?
Content	<p><u>Understand health issues and associated initiatives and research</u></p> <p>a) General structure and function Infections: reducing the transmission of infectious diseases, controlling the spread of antibiotic resistance in bacteria, antibiotic- and antimicrobial-resistant infections, role of vaccination programmes in controlling disease.</p> <p>b) Health and lifestyle initiatives related to: cardiovascular diseases, respiratory diseases, ageing population, obesity, smoking, alcohol and substance misuse, sexually transmitted infections (STIs).</p> <p>c) Genetic initiatives: genetic screening, genetic diseases, pre-implantation genetic diagnosis.</p> <p>d) Medical prevention and treatments: cancer screening o medical imaging stem-cell therapy, epigenetic modification and reprogramming, developing new drugs, hormone therapies.</p> <p><u>Understand the influence of organisations/individuals on health issues</u></p> <p>a) Government and global organisations: World Health Organization (WHO), Public Health Agency, NHS, Health Education England (HEE).</p> <p>b) Non-government organisations, and associations: General Medical Council (GMC), the Nursing and Midwifery Council (NMC), universities and research groups/teams, private and multinational organisations, pharmaceutical companies, charities and trusts.</p> <p>c) Individuals, such as pioneers; service users, such as patients.</p>	<p><u>Interpret, analyse and evaluate information</u></p> <p>a) Primary and secondary research.</p> <p>b) Qualitative evidence – reference to established sources of information.</p> <p>c) Quantitative evidence – numerical data, including calculations, graphs, tables and statistics.</p> <p>d) Use of accurate/reliable sources of information.</p> <p>e) Trends/patterns/anomalous data and sources of error in data.</p> <p>f) Comparisons of primary and secondary data.</p> <p>g) Validity and reliability, including: sample size, number and suitability of references to publications, use of peer review, use and misuse of data – extracting or misquoting data, authenticity – date of publication, author/source of information, article(s), influence of funding source.</p> <p>h) Validity of conclusions identified and relevance to the purpose of the investigation.</p> <p>i) Evidence to support conclusions/claims made.</p>	<p><u>Understand how health issues are reported</u></p> <p>a) Reporting medium: specialist journals, peer-reviewed journals; health science magazines; internet and social media; broadcasting media and newspaper articles.</p> <p>b) Target audience: general public; healthcare professionals, healthcare users o scientific community; political representatives – MP, local councillor.</p> <p>c) Presentation and reporting: detail and accuracy; level of language used; writing style and correct use of terminology, referencing, technical language and quotations; visuals – use of graphs, diagrams, tables, charts; use of bias; quantity and quality of scientific information, e.g. a scientific article versus tabloid extract.</p>

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Term	Autumn	Spring	Summer
Topic	LAA: Musculoskeletal system	LAB: Endocrine and Nervous systems	LAC Homeostasis
Big Question	How does musculoskeletal system work throughout a person's life?	How do structure, function and disorders of the endocrine and nervous system impact a person's life?	Why is the process of homeostasis so important to the body?
Content	<p>Muscular tissue</p> <p>a) Characteristics and ultrastructure of muscular tissue: smooth (visceral/involuntary); striated (skeletal/voluntary); cardiac; structure of the following – sarcolemma, sarcoplasmic reticulum, motor end plate, muscle fibres, adenosine triphosphate (ATP), myosin, actin, myofibrils.</p> <p>b) Function of the muscular system, movement, levers, motor units: antagonistic pairs (agonist, antagonist); synergist; fixator.</p> <p>c) Attachment of muscles: to bone; via tendons; to fascia.</p> <p>d) Contraction of muscle: contraction cycle, motor neurons, neuromuscular junctions, neurotransmitters, sliding filament theory, electrochemical gradient, calcium ions.</p> <p>Skeletal system</p> <p>a) Structure of skeletal system to include major bones of the: axial skeleton, appendicular skeleton.</p> <p>b) Structure/ultrastructure and function of bones to include: long bones, short bones, flat bones, irregular bones, sesamoid bones; basic structure of a typical long bone to include, articular cartilage, spongy bone, bone marrow, endosteum, compact bone, periosteum, medullary cavity and blood vessels (for blood supply to and circulation within bones).</p> <p>c) Function of the skeletal system: protection, support, assisting movement, attachment for skeletal muscle, source of blood cell production, store minerals.</p> <p>d) Structure and function of tendons, ligaments and cartilage: tendons, strength, arrangement of fibres; ligaments, resistance, control of movement, arrangement of fibres; cartilage, chondrocytes, matrix, support; articular cartilage; medullary cavity.</p> <p>e) Classification of joints: fibrous/fixed, e.g. skull; cartilaginous/slightly moveable, e.g. sternum, pubic symphysis, mandible; synovial/freely moveable: classification of synovial joints by movement: hinge, saddle, plane, pivot, condyloid and ball and socket.</p> <p>Disorders of the muscular and skeletal systems</p> <p>a) Muscular: genetic, e.g. muscular dystrophy/Duchenne muscular dystrophy; degenerative, e.g. tendinitis, muscle fatigue, loss of muscle strength, speech, chewing, swallowing; accidental, e.g. sprains and strains; autoimmune, e.g. myasthenia gravis.</p> <p>b) Skeletal: accidental, e.g. fractures, dislocations, degenerative, e.g. osteoarthritis, osteoporosis; autoimmune, e.g. rheumatoid arthritis, cancer, e.g. leukemia, osteosarcoma (bone cancer).</p>	<p>Endocrine</p> <p>a) Target organs, ductless glands, hormones, transported in blood.</p> <p>b) Hypothalamus – control of pituitary gland via releasing hormones, control of daily rhythms.</p> <p>c) Pituitary gland – control of growth, function of sex organs, osmoregulation.</p> <p>d) Thyroid gland – regulation of growth and function of many body systems, role in regulation of blood calcium levels.</p> <p>e) Pancreas – regulation of blood sugar via production of insulin and glucagon.</p> <p>f) Adrenal glands – the ‘fight or flight’ response via the hormone adrenaline, regulation of blood pressure via the hormone aldosterone.</p> <p>g) Ovaries – production of oestrogen and progesterone (sex hormones).</p> <p>h) Testes – production of androgen hormones which are involved in the development of maleness and the production of sperm.</p> <p>Disorders of the endocrine system</p> <p>a) Under production of hormones, e.g. Cushing’s disease, hypothyroidism.</p> <p>b) Overproduction of hormones, e.g. gigantism (acromegaly), polycystic ovary syndrome.</p> <p>Nervous system</p> <p>a) The central nervous system (CNS): brain and spinal cord, motor neurons, sensory neurons, nerve cells, reflex arc; coordination of both voluntary and involuntary activities of the body ; conduction of nerve impulses to and from the CNS.</p> <p>b) The peripheral nervous system (PNS): nerves and ganglia outside the brain and spinal cord; somatic nervous system; autonomic nervous system.</p> <p>c) The parasympathetic nervous system.</p> <p>d) The sympathetic nervous system.</p> <p>Disorders of the Nervous system</p> <p>a) Parkinson’s disease</p> <p>b) Multiple sclerosis (MS)</p> <p>c) Motor neurone disease.</p>	<p>Homeostasis</p> <p>a) terminology, optimum, variable, stimulus, receptors/sensors, control centres, effectors, feedback</p> <p>b) Negative feedback loops, blood pressure, body fluids (osmoregulation), gas concentration, blood sugar levels</p> <p>c) Positive feedback loops, blood clotting, labour contractions, lactation.</p> <p>Interrelationship between nervous and endocrine system</p> <p>a) Role of the autonomic nervous system, breathing, heartbeat</p> <p>b) Role of adrenal glands (fight and flight, heart rate)</p> <p>c) Hypothalamus, link between endocrine and nervous system</p> <p>d) Regulation of hunger, sleep rhythms, secretion of various hormones</p> <p>e) Peripheral nervous system, autonomic system, relaying information to the brain.</p> <p>Disturbance of homeostasis</p> <p>a) Ageing, weakening of feedback loops, heart failure, diabetes.</p> <p>b) Interruption, deficiency (pathways blocked and cells lack vitamins or minerals)</p> <p>c) Genetics, e.g. diabetes</p> <p>d) Lifestyle, nutrition, physical activity. Drug/alcohol abuse, too much sugary food, lack of exercise/too much exercise.</p>
Assessment	<ul style="list-style-type: none"> Pupils will be assessed through homework activities, lesson starter activities, a series of external examinations, internal examinations and coursework reviews 		