BTEC Revision Checklist Biology – B1, B2 & B3

This checklist covers the first section of the Biology content in Paper 1. Use this to help you reflect upon what you know and to help direct your revision.

B1 – Cell structure and function		**1**	**2**	**3**
Know that cell theory is a unifying concept stating that cells are a fundamental unit of structure, function and organisation in all living organisms	• understand that differentiation is the process by which cells become specialised for a particular function from stem cells			
	• know that tissues are collections of similar specialised cells, performing a specific function/set of functions, to include epithelial, skeletal muscle and nervous tissue			
	• know that organs are collections of tissues performing specific physiological functions			
	• understand how organs are organised into systems, to include cardiovascular, respiratory, muscular, nervous systems			
Understand the relationship between the ultrastructure and function of cell organelles listed for prokaryotic and eukaryotic (plant and animal) cells	Understand the ultrastructure and function of organelles, to include: prokaryote cells (bacterial cell) – nucleoid, plasmids, 70S ribosomes, capsule, cell wall. eukaryotic cells (plant and animal cells) - plasma membrane, cytoplasm, nucleus, nucleolus, endoplasmic reticulum (smooth and rough), Golgi apparatus, vesicles, lysosomes, 80S ribosomes, mitochondria, centriole eukaryotic cells (plant-cell specific) - cell wall, chloroplasts, vacuole, tonoplast, amyloplasts, plasmodesmata, pits			
Recognise cell organelles from electron micrographs and the use of light microscopes	• recognise prokaryote and eukaryotic organelles (plant and animal cells, plant specific) from electron micrographs			
	• know how to use a light microscope to recognise cells and cell organelles			
	• understand the advantages and limitations of using a light microscope			
Understand how to distinguish between Gram-positive and Gram-negative	• understand that Gram positive bacteria have a wall made of a thick layer of peptidoglycan and no outer lipopolysaccharide membrane			
	• understand that Gram positive bacteria are susceptible to some antibiotics, such as penicillin, • that can damage the peptidoglycan layer			

bacterial cell walls and why each type reacts differently to some antibiotics	• know how to carry out the Gram stain to distinguish between Gram positive and Gram negative bacteria			
	• understand that Gram negative bacteria are not susceptible to some antibiotics, such as penicillin, because the peptidoglycan layer is protected by the lipopolysaccharide outer membrane which is not susceptible to some antibiotics			
Calculate magnification and size of cells and organelles from drawings or images	• know how to measure the size of cells and organelles using an eye piece graticule and stage micrometer			
	• know how to convert mm to μm			
	• know how to use the formula: magnification = $\frac{\text{measured size}}{\text{actual size}}$			

B2 – Tissue structure and function		1	2	3
Palisade mesophyll cells in a leaf	• know and understand the structural and functional significance of palisade mesophyll cell features, to include: o major site of photosynthesis o cylindrical shape o arranged at right angles to the upper epidermis o cells arranged close together o long narrow gaps between palisade cells for air to circulate for gas exchange o thin and transparent cellulose cell walls so easy gas diffusion o large vacuole o chloroplasts near to edge of cell so can absorb more light o large number of chloroplasts o cytoskeleton can move chloroplasts around/up/down in cell to maintain photosynthesis in low light and protect chloroplasts in intense light			
Sperm and egg cells in reproduction	• know and understand the structural and functional significance of sperm and egg cell features, to include: <u>sperm cell</u> o nucleus contains 23 chromosomes (haploid nucleus) o head – acrosome o acrosome - enzyme to digest a path through the outer membrane (zona pellucida) of egg (ovum) o mid-section contains large numbers of mitochondria - aerobic respiration o tail – motility <u>egg cell</u> o nucleus contains 23 chromosomes (haploid nucleus) o large cytoplasm, organelles and energy store o outer membrane (zona pellucida) o corona radiata – outer protective layer, supplies protein to the fertilised egg cell			

Root hair cells in plants	• know and understand the structural and functional significance of root hair cell features, to include: o large surface area increases the rate of absorption of water and ions o cell membrane channels and carrier proteins to enable ions to cross membrane o cell membrane partially permeable to water o mitochondria to provide energy (ATP) for active transport of ions o short distance across cell wall increases rate of diffusion			
White blood cells	• know and understand the structural and functional significance of white blood cell features, to include involvement in immunity, allergy and rejection of transplants <u>lymphocytes</u> o T and B cells o large nucleus o immunological memory o T cells send signals to B cells o B cells produce antibodies o B cell proliferation - some of which make antibodies and some become memory cells o T cells destroy infected/cancerous cells <u>Neutrophils</u> o the commonest type of white blood cell o nucleus has several lobes o flexible, mobile – can squeeze between cells in the capillary wall o migrate to areas of infection o phagocytic – engulf and destroy pathogens			

Red blood cells	• know and understand the structural and functional significance of red blood cells features, to include: o haemoglobin that carries oxygen o lacks nucleus, endoplasmic reticulum and mitochondria o small and flexible so can squeeze along narrow capillaries o biconcave shape that gives large surface area to volume ratio			

B3 – Tissue structure and function		**1**	**2**	**3**
Understand the structure and function of epithelial tissue, to include: Squamous as illustrated by the role of alveolar epithelium in gas exchange to include the effect of chronic obstructive pulmonary disease (COPD) in smokers Columnar as illustrated by goblet cells and ciliated cells in the lungs to include their role in protecting lungs from pathogens	• know and understand the structural and functional significance of squamous tissue features, to include: o simple squamous epithelium makes up the walls of the alveoli o alveoli are sites where oxygen and carbon dioxide are exchanged o oxygen from air to the blood in the capillaries around the alveoli o carbon dioxide as a waste product from blood into air in the capillaries around the alveoli			
	• chronic obstructive pulmonary disease (COPD), to include: emphysema and chronic bronchitis <u>chronic bronchitis</u> o inflammation of airways in lungs o squamous epithelium thickens o excessive secretion of mucus - cough o blocked airways – difficulty breathing <u>emphysema</u> o smoking is the main cause o damage to the air sacs in the lungs o destruction of the alveoli walls /membranes o abnormally large air spaces in the lungs o decreased surface area for gas exchange o destruction of elastin means alveoli do not recoil – difficulty exhaling o causes respiratory problems and difficulty breathing and reduction of gaseous exchange			
	• know and understand the structural and functional significance of columnar epithelium and goblet cells features, to include: o single layer of cells lining the trachea o cilia cover free surfaces of cells o epithelium contains goblet cells o goblet cells secrete mucus o cilia produce rapid wave-like motions			

	○ cilia move mucus and trapped foreign bodies (e.g. pathogens) up and out of the respiratory system			
Understand the structure and function of endothelial tissue, as illustrated by blood vessels in the cardiovascular system, including the risk factors that damage endothelial cells and affect the development of atherosclerosis	• know and understand the structural and functional significance of endothelial tissue features, to include: ○ epithelium and endothelium are both types of lining tissue ○ epithelium covers outer surfaces ○ endothelium covers inner surfaces ○ single layer of squamous endothelium lines the inner surfaces of arteries, veins and capillaries <u>arteries and veins</u> ○ endothelium reduces friction and allows for smooth flow of blood ○ damaged endothelial cells release substances that cause blood vessels to constrict ○ regulates blood flow and pressure <u>capillaries</u> ○ single layer of endothelium ○ easy exchange of nutrients and oxygen into the tissues and the removal of waste products <u>atherosclerosis</u> ○ risks: smoking, diet and high blood pressure ○ effect of white blood cells (foam cells) ○ plaque in artery walls ○ reduction of lumen diameter ○ rupture of protective membrane over plaque ○ formation of blood clot (thrombus)			
Understand the structure and function of muscular tissue, to include: The microscopic structure of a skeletal muscle fibre structural and	know and understand the microscopic structural and functional significance of skeletal muscular tissue features, to include: ○ muscle fibres ○ multi nucleated ○ striated appearance ○ myofibrils ○ sarcomere ○ sarcolemma ○ sarcoplasmic reticulum ○ mitochondria ○ neuromuscular junctions ○ T tubules ○ sliding filament theory - actin and myosin, troponin, tropomyosin, calcium ions, ATP ○ recognise the microscopic structure of skeletal muscle fibre from diagrams and photomicrographs			

physiological differences between fast- and slow-twitch muscle fibres and their relevance in sport	• understand the structural and physiological differences between fast- and slow-twitch muscle fibres and their relevance in sport, to include: o rate of contraction o rate of fatigue o suitability for activity o mitochondria o glycogen o sarcoplasmic reticulum o respiratory enzymes o myoglobin o appearance o blood supply			
Understand the structure and function of nervous tissue, to include: non-myelinated and myelinated neurones:	• know the structure of myelinated motor neurone • know that action potentials are conducted along non-myelinated and myelinated axons • know that the speed of conduction of nerve impulses in non-myelinated is slower than in myelinated neurones			
the conduction of a nerve impulse (action potential) along an axon, including changes in membrane permeability to sodium and potassium ions and the role of the myelination in saltatory conduction:	• know and understand the conduction of a nerve impulse (action potential) along an axon, including changes in membrane permeability to sodium and potassium ions and the role of the myelination in saltatory conduction, to include: o resting membrane potential (c -70mV) o concentration gradients for K^+ and Na^+ o conduction/ propagation o changes in membrane permeability to Na^+ which leads to depolarisation and the generation of an action potential o threshold potential and the all-or-nothing principle o voltage-gated ion channels o repolarisation owing to K^+ diffusion out of cell o hyperpolarisation o refractory period o factors affecting the speed of conductance such as myelination and saltatory conduction between nodes of Ranvier			

interpretation of graphical displays of a nerve impulse and electrocardiogram (ECG) recordings	• be able to interpret graphical displays of a nerve impulse and electrocardiogram (ECG) recordings, to include: o threshold, depolarisation, repolarisation and hyperpolarisation, refractory period, and resting state phases of a nerve impulse o identify the PQRST points on ECG recording			
synaptic structure and the role of neurotransmitters, including acetylcholine	• understand synaptic structure and the role of neurotransmitters, including acetylcholine, to include: o presynaptic knob/membrane o postsynaptic neurone/membrane o synaptic cleft o exocytosis of neurotransmitter, role of calcium ions o diffusion of neurotransmitter across the synaptic cleft o receptors on post synaptic membrane o depolarisation of post synaptic membrane, triggers action potential o breakdown, reuptake and recycling of neurotransmitters o acetylcholine at the neuromuscular junction o acetylcholine receptors on the muscles o propagation of action potential			
how imbalances in certain, naturally occurring brain chemicals can contribute to ill health, including dopamine in Parkinson's disease and serotonin in depression	• understand: o how varying concentrations of dopamine and serotonin contribute to ill health o the effect of the imbalances of dopamine in Parkinson's disease • the effect of the imbalances of serotonin in depression			
the effects of drugs on synaptic transmission, including the use of L-Dopa in the treatment of Parkinson's disease	• know the types of neurotransmitters o inhibitory – decrease the likelihood of an action potential o excitatory - increase the likelihood of an action potential • understand antagonist and agonist effects of drugs on synaptic transmission, including: o L-Dopa as precursor of dopamine, raises levels of dopamine, reduces muscle tremor and other motor problems o antagonist – blocks action of transmitter on its receptors (e.g. atropine or curare) o agonist – mimics action of transmitter on its receptors (e.g. nicotine or muscarine)			